

NEW STUDENT ORIENTATION HANDBOOK

This document supersedes all previous dated versions

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Welcome to the Machine Manufacturing Technology Department

We hope that the information contained here will help you get started as a new student in the Machine Manufacturing Technology Program. The instructors of this program are advisors; each instructor shares the same responsibility, so any one of them can help you in deciding which classes to enroll in. First, please read this booklet, and then seek out an instructor. And remember: the College Admissions/Advising and Counseling departments are also here to help you.

NOTE: New students are required to attend one of the Machine Manufacturing Technology program orientations held each Monday throughout each term at 9:30 a.m., and 3:00 p.m.

“This handbook cannot and does not attempt to address every possible situation or all questions about the Machine Manufacturing Technology Program. Nor does it constitute a contract between you as a student and Portland Community College. Everything in this handbook is subject to revision, change, or deletion at the College’s discretion. Thus, nothing in this or any other college handbook may be viewed as a contract. Portland community college reserves the right to revise and interpret the language of this handbook and all other handbooks and policies from time-to-time when deemed appropriate.”

MACHINE MANUFACTURING TECHNOLOGY FACULTY/STAFF

Name	Position	Telephone	Internet
Joe K. Bailey	Department Chair	971-722- 4897	joe.bailey15@pcc.edu
Pat Kraft, CMfgE	Faculty	971-722-8170	pkraft@pcc.edu
Scott Stewart	Faculty	971-722- 4611	scott.stewart5@pcc.edu
Rodney Willis	Tech Support	971-722- 4155	rwillis@pcc.edu
Dan Findley	Division Dean	971-722- 4141	dfindley@pcc.edu
Dorinda Gustafson	Div. Admin. Support	971-722- 4373	dgustafs@pcc.edu
Robin Burwell	Program Advisor	971-722- 4130	rburwell@pcc.edu

Machine Manufacturing Technology
Shop: Sylvania, AM 113
971-722-4155
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Portland Community College
12000 S.W. 49th
Portland, OR 97219
971-722-6111

First Step — Admissions

You need to complete an Application for Admission before anything else can happen. You can also apply for admission to PCC on-line. The College web site address is: www.pcc.edu. The Sylvania Admissions Office telephone number is 971-722-4519, and the office hours are Monday - Friday 8:00 am to 5:00 pm and Wednesday to 7:00 pm. Please contact the Admissions Office for additional information. Contact the advising/counseling office for additional advice on general education and graduation requirements.

Second Step — Testing

Placement assessment consists of several processes that the College uses to evaluate your skills and readiness for writing, reading, math, ESL and ENNL courses. Placement scores are valid for three years. You may retake all or part of the COMPASS test only one additional time. Please contact the Sylvania campus testing office at 971-722-4533 for information and testing schedules. NOTE: You will need to provide a picture ID when taking the test. All students entering the MMT program must take the COMPASS test unless waved by instructor of record. Must test in to math (MTH20) in the math portion, test in to writing (WR90) and reading (RD90) portion of the COMPASS test or place in to Level 8 in ESOL for reading, writing, and SPEAKING. **We strongly recommend that students complete MTH20 or higher before beginning MCH classes. It is strongly suggested that you place into MTH 60 because of shop trig and formulas.**

Third Step — Orientation and Advising

During a New Student Orientation program, College Admissions will give you tips about making the most of your college experience. Then, you will meet with an instructor, who is your advisor, to help you plan a course of study that will achieve your educational goals. *Please consider this important point:* in the Machine Manufacturing Technology program, one credit of a paper work class is about 20 class hours, whereas a class that require machining is about 30 class hours per credit hour.

IMPORTANT: New Machine Manufacturing Technology program students are required to attend a shop/program orientation given every Monday of the term at 9:30 a.m., 3:00 p.m.

Fourth Step — Financial Aid

If you are working toward a degree or certificate complete a Financial Aid application. The form can be requested from the PCC Financial Aid office. The form you need is the Free Application for Federal Student Aid. You can also apply over the internet at: <http://www.fafsa.ed.gov>. There is also a Veterans Services Office at Sylvania Campus for those who qualify for veterans benefits. Contact the Veterans office at 971-722-4502 for additional information.

Fifth Step — Registration

With an instructor's permission, a student can register for a course at anytime up to the 7th week the term. Be aware that there is a limit on the number of students that can enroll. After you have met with an instructor, he/she will give you an enrollment document that allows you to enroll for Machining courses. **You must project an attendance schedule that you plan to adhere to in order to complete your courses.** Take your completed PCC Registration form (new students) to the registration office along with your instructor signed enrollment document. If the registration office is closed you can drop off the two forms in the drop box located at the front of the office. If you register in person, please bring a copy of your class schedule back to the Machine Technology Resource room where Rodney will set up your record file. The PCC Business Office will send you confirmation of your class schedule and the amount charged to your account.

It is your responsibility to make sure that registration materials are presented to the Registration for processing, either in hard-copy or electronic form. You may wish to make a copy of

registration materials for your record prior to submission.

SETTING YOUR LONG TERM GOALS

Use your instructors as resources:

Where do you want to be in two years? Five Years? Ten Years? It may take some time to develop a vision of what your goals are. If there is a machine manufacturing technology specialty that is of particular interest to you, be sure to ask an instructor for advice about how to prepare you for such a specialty. Take a look at the list of MCH instructors on page two and remember you can ask them for advice.

Use Co-op Work Experience to explore your interests:

You might use a co-op education work experience to increase your understanding of a specialty that interests you. Co-op work experience allows you to explore your interest and suitability for a career by being exposed to actual work situations. With Co-op you can learn about your specialty, earn PCC credit, and make personal connections in your area of interest. These courses are offered as MCH 280. Co-op is generally done near the end of your degree studies, but can be done at an earlier time once a student has completed the basic courses. For details on the Co-op classes please contact George Knox at 971-722-4475 or e-mail him at gknox@pcc.edu.

Use the Career Resource Center to research job options:

The Career Resource Center has career and job market information which you can use. The center also provides assistance in job search skills, resume preparation, and interview techniques. The Career Resource Center is located in the Counseling Office. Please contact Sylvania Campus Counseling office at 971-722-4531.

Types of Recognition

There are several types of certificates of recognition available through the program, including certificate; 25.5credit Manufacturing Technician, and two one year certificate: 45.5 credit **CNC Turning** or 46 credit **CNC Milling**, or an 106 credit Associate of Applied Science (AAS) degree.

Consult a program advisor or department instructor for assistance in planning these.

When you complete your course of study, you will need to petition for graduation so that a certificate or AAS degree will be issued to you. Petition forms are available at the Business Office.

Catalog Page

Machinists operate various types of material processing equipment such as lathes, drill presses, milling machines, grinders, computer numerical control (CNC) machines, rapid prototyping, and computer assisted machining (CAM) systems. Machinists may specialize in the operation of one type of machine or work in a shop where they are required to perform equally well on several different machines.

The Machine Manufacturing Technology (MMT) program has been developed specifically in a modular self-paced format, allowing the student to attend courses on a schedule they define. The open exit design of the program allows a student to focus on a course and complete the materials in a matter of days or weeks instead of traditional term-long classroom formats. The program is designed to fit the needs of a student (take as few or as many modules as desired), self-paced (learn at your own pace); flexible (select your own attendance schedule); individualized (a program can be tailor-made to fit specific needs); and, open exit (leave the program when you have met your training goals/needs).

Existing MMT students are given priority enrollment until the final day of the previous term. New students will be admitted after that time until a predetermined enrollment count is reached. After that point, future students will be placed on a waiting list for enrollment. Consult a program advisor through the department to help plan a course of study that will allow you to achieve your educational goals.

Quarterly Credit Schedule

The Machine Manufacturing Technology (MMT) program has been developed specifically in a modular self-paced format, allowing the student to attend courses on a schedule they define. The open exit design of the program allows a student to focus on a course and complete the materials in a matter of days or weeks instead of traditional term-long classroom formats. Existing MMT students are given priority enrollment until the final day of the previous term. New students will be admitted after that time until a predetermined enrollment count is reached. After that point, future students will be placed on a waiting list for enrollment. Consult a program advisor through the department to help plan a course of study that will allow you to achieve your educational goals.

A Credit Course is one which can be applied towards the Associates of Applied Science (AAS) Degree Machine Manufacturing Technology at Portland Community College.

To drop a course during the term: A written *Instructor's Permission to Withdraw* is required for all Machine Manufacturing Technology courses. In order to receive a full refund for the class the written permission form must be submitted to the Registration office within first week of term.

INSTRUCTIONAL APPROACH

Modules and Courses will be presented by means of reading assignments audio-visual presentations, demonstrations, and lab experience. The course activities and design emphasize the development of skills and knowledge outcomes prescribed by established industry standards. The identified outcomes will be achieved by means of individual activities.

The students of the Machine Manufacturing Technology program are required to register for **COURSES** as per the 'Fifth Step — Registration' on page 3. For information on Financial Aid or Veterans Educational Benefits, students are referred to the PCC catalog section on 'FINANCING YOUR EDUCATION' in effect at the time of registration.

COURSES

A *course* is typically made up of one or more modules, and the grade assigned for completion can be applied towards one of the certificates or the Associates of Applied Science (AAS) Degree in Machine Manufacturing Technology at Portland Community College. Courses are based on performance outcomes. The performance outcomes are based upon established industry standards, of which, upon completion of each course, the student will demonstrate knowledge and understanding through practice/final exams and shop projects.

OUTCOME ASSESSMENT STRATEGIES:

POLICY - Student performance outcome measurements are based on established industry standards. The various areas of study during the course will be evaluated by a variety of activities. Typical of those activities are the following:

1. READING ASSIGNMENTS - Information sheets, textbooks, videos and the learning

resource center are potential sources of information that the student will reference as directed in the modules.

2. PRACTICE - Completion of tasks and projects identified in the reading assignments, information sheets, and textbooks.

3. PRACTICE EXAMS - Checking and evaluating the students understanding and knowledge gained through the reading assignments and practices typically done through a practice evaluation.

4. LAB ACTIVITIES - Participation in structured laboratory exercises with the emphasis on developing skills or increasing expertise in the areas of study identified in the module packets.

All final tests will be completed solely by the student. Do not work with or talk to other students when taking final test. This is cheating. Your final grade may be adjusted if cheating on a final test is verified. Please see the PCC Students Rights and Responsibilities Handbook for information and possible penalties for cheating and other forms of academic dishonesty.

5. FINAL EXAMS - An assessment in the form of a written exam and/or practical application that addresses the subject areas identified in the module packets.

GRADE DEFINITIONS

The students of the Machine Manufacturing Technology program are governed by the published Portland Community College Grading Guidelines. For a more detailed description of grade definitions, please refer to the current PCC catalog.

A = 90% - 100%; Superior; Honor grade indicating excellence in outcomes performance.

B = 80% - 89%; Above Average; Honor grade indicating commendable outcomes performance.

C = 70% - 79%; Average, Grade indicating successful outcomes performance.

D = 60% - 69%; Sub-Standard; Grade indicating successful but minimum outcomes performance.

F = 0 - 59%; Failure; Non-passing grade indicating failure to meet minimum outcomes performance.

P = Pass: Acceptable performance of outcomes competency or above on the regular grading scale).

NP = No Pass: Unacceptable outcomes performance.

NS = No Show: Not showing up for class in the first week.

CIP = Course in Progress: This option will be for extreme cases only and is not granted automatically. You have up to 12 months to complete outstanding work, subject to written agreement negotiated between the student and the instructor of record. The student does not have to re-register for the course. Work for any given class should be completed during the term in which the student originally registered. It is a departmental expectation that the CIP be cleared within a reasonable period of time following the awarding of the mark. Failure to complete the work within the agreed-upon timeframe will result in the CIP being converted to an F or NP grade, subject to the grading method chosen by the student.

GRADE CHANGES

If you feel that there are questions concerning your grade, the instructor of record should be contacted immediately. If a grade dispute cannot be resolved with the instructor, you may follow the student grievance procedure within one year after receiving a grade.

PREREQUISITE SKILLS AND KNOWLEDGE

If you are a degree seeking student you must take the COMPASS basic skills placement test or ENL test administered through test centers located at each campus. To begin the program, you must place into MTH 20, or a higher-level math class. We strongly recommend completion of a MTH20 or higher-level course before attempting MCH courses. You must also place into RD90

and WR90 or higher reading and writing levels. Students whose first language is not English should take the English test through the English for Speakers of Other Languages (ESOL) Department. Students who place in to Level 8 in ESOL for reading, writing, and SPEAKING, ready to begin machining courses. There are no prerequisites for some of the courses; however, previous manufacturing experience will be helpful. We recommended that the Machine Manufacturing series of classes be taken in sequence, but is not required. The Machine Manufacturing Technology series of classes can be taken simultaneously; you can sign up for Blueprint I and II in the same term and do them in numerical order.

TEXTBOOKS

You can check out textbooks from the library "On Reserve" system or you may check out textbooks from the department Resource Room to use in the study room only. The required textbooks differ for most MCH courses and are listed in the individual Course Outcome Guides. The required textbooks for the MCH courses are available through the Sylvania Campus bookstore for purchase.

HOURS OF OPERATION

Check the department bulletin board (Room AM 113) and available term work schedule document for the current term hours of operation and the instructor work shifts.

PLEASE NOTE: From time to time, there may be unscheduled closures that can affect normal department/program operation. We normally do a weekly department staff meetings from 2:30-3:30 pm on Wednesday afternoon. The shop will close for this meeting, but the study room will remain open.

REQUIRED TOOLS / EQUIPMENT

NOTE: BORROWING REQUIRED TOOLS IS NOT ALLOWED

*1 each Safety Glasses

1 each 6" Flexible Steel Rule with 32nd and 64th increments one side, and 10th

- and 100th increments on the other side
- 1 each Scientific Calculator with Fractional Function (Casio fx-260 SOLAR FRACTION model, with a a/b is preferred)
- 1 each Combination Lock
- (The above are required before any shop activity, including MCH 121)**
- The following personal tools are required to be purchased before starting course MCH 150 or higher.**
- 1 Machinists' Ready Reference
- 1 6" Dial Caliper (Starrett #120 or **equivalent**)
- 1 each Black Permanent Marker Pen
- 1 each Set of Hex-head (Allen) Wrenches - 1/16" to 3/8"
- 1 each Open-end / Box-end Wrenches - 3/8", to 3/4"
- 1 each Silica Carbide Hone Stone – for Carbide Tools
- 1 each Aluminum Oxide Hone Stone - for HSS Tools
- 1 Dial Test Indicator w/ dovetail mounts (Starrett #709AZ or **equivalent**)
- 1 Magnetic Base Indicator Holder (Noga #DG61003 or **equivalent**)
- 1 Universal Indicator Holders (Indicol #178 or **equivalent**)
- 1 Dial Indicator (Starrett #655-441J or **equivalent**)
- *1 Cemented Carbide Right-hand Turning Tool - 1/2" Shank; Grade: C5, K21 or all-purpose
- *1 Cemented Carbide Left-hand Turning Tool - 1/2" Shank; Grade: C5, K21 or all-purpose
- *3 HSS 5/16 square blanks
- *1 Edge Finder/Center Finder (3/8" x .200 or 1/2" x .200)
- *1 Thread Center Gage (Unified National)
- * **See instructor prior to acquisition**
- PCC Bookstore – Calculator

Sam Mesher Tool Inc., (10% student discount) 1704 NW Johnson, Portland, OR
503-227-6609

Western Cutting Tool, 4252 SE International Way, Unit C, Milwaukie, OR 503-786-0310

General Tool, 2705 NW Nicolai Ave., Portland, OR 503-226-3411

LAB POLICIES & PROCEDURES

1. **SAFETY GLASSES** must be worn in the lab at all times.
2. No long sleeves allowed in the lab.
3. No Smoking.
4. No open-toe or open-heel footwear can be worn in the lab.
5. No short pants or "cut-offs" of any kind are allowed in the lab.
6. Students' personal property should not be left in the lab.

7. PCC is not responsible for lost or stolen property.
8. All tools obtained from the Tool Crib must be returned to Tool Crib.
9. All packets and textbooks, including Machinery's Handbook, must be returned to the Resource Center.
10. Storage cabinets must be left in a clean and orderly state.
11. After completion of a packet, project, or at the end of a student's work schedule his/her machine must be thoroughly cleaned. This includes removing all chips from the machine, cleaning the bottom pan, wiping excessive oil from the machine and returning tooling and accessories to their proper places.
12. Any student having a machine set-up, who leaves the lab without notifying the instructor, will lose that machine.
13. Anyone who leaves the lab without notifying the instructor and leaves the machine dirty and/or leaves tools not in their proper places may lose their place in the lab and will be required to meet with the machine tool instructional manager and director before continuing with the program.
14. Steel scrap and aluminum, must be put in the proper containers are clearly marked.
15. No Tool boxes in tool crib.
16. No students in tool crib other than those assigned.
17. Two rags per student.
18. No student is to operate any machinery without being checked-out on related equipment by an instructor.
19. ONLY Combination locks are will be used on shop lockers.
20. All class projects will be preapproved and assigned by instructor of record.
21. Profanity or language referring to race, color, gender or religion will not be tolerated.
22. The use of snuff or chewing tobacco is not allowed in the shop or classrooms.
23. STUDENTS WILL BE REQUIRED INITIALLY TO COMPLETE A SAFETY ORIENTATION SHEET ON EACH MACHINE HE/SHE UTILIZES PRIOR TO OPERATION.

CLEANUP POLICY

The students of the Machine Manufacturing Technology program are responsible for cleanup of any and all machine tools, hand tools, machine accessories and general area they utilize during their use of the laboratory/shop facility. Time for cleanup will be allowed during the last half hour of each day the laboratory is open or when a student is finished during the day/night. The instructor will sign off on your time card in the column marked (CLEANUP / MACHINE NO.) as to the satisfactory completion of cleaning of your work area. Failure to clean the tools, accessories, machines and area you utilize can result in reduction of grade and/or limit shop privileges!

END-OF-TERM CLEANUP

On Tuesday of finals week the entire laboratory/shop will be shut down and thoroughly cleaned. All students of the Machine Manufacturing Technology program who utilized any machine in the laboratory/shop during the term are expected to participate in the term cleanup. Not participating in cleanup can result in reduction of grade! Tool checks (chips) are checked in and lockers are emptied. If contents of lockers are not cleared out, the lock will be removed and contents stored for one term, at which point contents will be disposed of. **Portland Community College and/or the Machine Manufacturing Technology Department will not be responsible for any financial loss because of this action.**

RESOURCE ROOM POLICY

1. All resource room materials are to be checked out with either a Drivers License, or PCC Student Identification card.

2. Return books, videos, or disks to the resource room attendant – NO MMT DEPARTMENT MATERIALS SHALL BE REMOVED FROM THE RESOURCES ROOM/SHOP AREA.
3. Clean up the general work area you utilized during your work session.
4. Recycle papers in appropriate containers.
5. A quiet atmosphere must be maintained at all times.
6. No food and/or drinks are allowed in the resource room / shop area.
7. Coats must be contained in the student's assigned locker or coat rack in the study room. – not on the shop benches.

TIME CARD POLICY

The students of the Machine Manufacturing Technology program are required to utilize a time card for all courses. The tool/resource room attendant will instruct the students as to the proper use of the time clock and placement of the time card. Turn in your time card at the end of each two-week period to the resource room attendant. It is the responsibility of the student to stamp IN and OUT and keep track of his/her time card. Should a student fail to stamp his/her time card on entry or exit, an instructor must sign off as to the accuracy of the time card.

NOTE: Only combination locks may be used on the department assigned lockers – **NO KEY LOCKS.** The combination will be recorded on the student's locker issue card.

STUDENT RIGHTS AND RESPONSIBILITIES

Heather Lang, Dean of Student Development - CC 247c, 971 722-4532

Admission to PCC carries with it the presumption that the student will conduct him/herself as a responsible member of the college community. Thus, when a student enrolls at Portland Community College, the student assumes the obligation to observe standards of conduct which are appropriate to the pursuit of educational goals. PCC may take appropriate disciplinary action when student conduct does not conform to this expectation. For further information regarding disciplinary policies and sanctions, please contact the Dean of Student Development.

ACADEMIC DISPUTES AND STUDENT GRIEVANCES

The student grievance procedure has been established to provide individuals and groups of students the opportunity to challenge decisions and/or actions taken by College staff which might be violations of student rights. The Grievance Handbook and petitions are available from the Dean of Student Development, CC 247.

ALCOHOL AND DRUG POLICY

The use of drugs or alcohol, or being under the influence while attending PCC is against school policy and will not be tolerated. Concern for your health and interference with the mission of the college has led PCC to take a strong anti-abuse stance to comply with related ORS legal statutes. The following services are available to help you with drug or alcohol issues:

- AA meets regularly on campus. Check with the Counseling Center for times and locations each term.
- The Counseling Center has referral information for programs and private counselors.

Cheating/Plagiarism Statement:

Taken from of the Students Rights and Responsibilities at:

Violations - Disciplinary action may result from the commission of any of the actions listed herein, or any violation of civil or criminal law while on College property or at College sponsored events.

Academic cheating or plagiarism or aiding or abetting cheating or plagiarism.

Machine Manufacturing Technology

Career and Program Description

Machinists operate various types of material processing equipment such as lathes, drill presses, milling machines, grinders, computer numerical control (CNC) machines, rapid prototyping, and computer assisted machining (CAM) systems. Machinists may specialize in the operation of one type of machine or work in a shop where they are required to perform equally well on several different machines.

Forms of Recognition

Associate of Applied Science Degree in Machine Manufacturing Technology - 106 credits.

This includes satisfactory completion of 90 credit hours of MCH courses, (62 required core course credits, 28 technical elective credits), WR121 and MTH65, and 16 credit hours of general education courses). General education courses include Arts & Humanities, Social Science, and Mathematics, Natural & Physical Sciences and Computer Studies.

Certificate: Machine Technician, 25.5 credit hours of required MCH courses

One-Year Certificate: CNC Turning, 45.5 credit hours of required MCH courses

One-Year Certificate: CNC Milling, 46 credit hours of required MCH courses

Consult a program advisor through the department (Room AM 113) to help plan a course of study that will allow you to achieve your educational goals.

Required Core Courses (62 credit hours)

MCH 100	Machine Tool Basics	1.0 cr.
MCH 105	Blueprint Reading I	1.5 cr.
MCH 110	Blueprint Reading II	1.5 cr.
MCH 115	Geometric Dimensioning & Tolerancing	3.5 cr.
MCH 120	Machine Shop Math	2.0 cr.
MCH 125	Speeds and Feeds	1.0 cr.
MCH 130	Machine Shop Trigonometry	2.5 cr.
MCH 135	Basic Measuring Tools	1.5 cr.
MCH 145	Layout Tools	1.5 cr.
MCH 150	Precision Measuring Tools	1.5 cr.
MCH 160	Drilling Machines & Operations	2.0 cr.
MCH 175	Band Saws	1.0 cr.
MCH 180	Turning Machines & Operations	4.0 cr.
MCH 190	Boring on the Lathe	1.0 cr.
MCH 195	Threading on the Lathe	3.0 cr.
MCH 205	Vertical Milling Machines & Operations	3.5 cr.
MCH 225	Surface Grinding Machines & Operations	2.0 cr.
MCH 259	CNC Programming-Lathe	5.0 cr.
MCH 268	CNC Programming-Mill	5.0 cr.
MCH 272	Mastercam Level I	5.0 cr.
MCH 273	Mastercam Level II	5.0 cr.
MCH 278	CNC Operation-Mill	4.0 cr.
MCH 279	CNC Operation-Lathe	4.0 cr.

Technical Electives

MCH 101	Occupational Health & Safety	3.0 cr.
MCH 102	Intro to Manufacturing	3.0 cr.
MCH 121	Manufacturing Processes I	4.0 cr.

MCH 123	Sheet Metal Fabrication	4.0 cr.
MCH 151	Metrology	2.0 cr.
MCH 157	Shop Project Machine Technology I	1.5 cr.
MCH 158	Shop Project Machine Technology II	3.0 cr.
MCH 159	Shop Project Machine Technology III	4.5 cr.
MCH 210	Shop Project Machine Technology IV	6.0 cr.
MCH 211	Shop Project Machine Technology V	7.5 cr.
MCH 212	Shop Project Machine Technology VI	9.0 cr.
MCH 213	Shop Project Machine Tech. VII	10.5 cr.
MCH 214	Shop Project Machine Tech. VIII	12.0 cr.
MCH 215	Horizontal Milling Machines & Operations	2.5 cr.
MCH 220	Manufacturing Processes II	4.0 cr.
MCH 222	Coordinate Measuring Machine Operation	2.0 cr.
MCH 227	CNC Grinder Operation	2.5 cr.
MCH 228	Abrasives	1.5 cr.
MCH 229	Rapid Prototyping	5.0 cr.
MCH 240	Cutting Tool Technology	2.0 cr.
MCH 245	Metallurgy	2.5 cr.
MCH 246	Metallurgy II	4.0 cr.
MCH 247	Manufacturing Processes III	4.0 cr.
MCH 248	Metallurgy III	4.0 cr.
MCH 262	CNC Conversational Controls	2.0 cr.
MCH 263	CNC Cycle Time Reduction	1.5 cr.
MCH 266	Advanced CNC Programming	3.5 cr.
MCH 276	Mastercam Solids	3.0 cr.
MCH 277	Mastercam CNC/CAM Project	3.0 cr.
MCH 280	Cooperative Education	1.0 to 8.0 cr.
MCH 282	CNC Router Operation	3.0 cr.
MCH 284	Computer Aided Manufacturing	3.0 cr.
MCH 285	Computer Integrated Manufacturing	3.0 cr.

One-Year Certificate: CNC Turning, 48.5 credit hours

MSD 115	Improving Work Relations	3.0cr.
MCH 100	Machine Tool Basics	1.0 cr.
MCH 105	Blueprint Reading I	1.5 cr.
MCH 110	Blueprint Reading II	1.5 cr.
MCH 115	Geometric Dimensioning & Tolerancing	3.5 cr.
MCH 120	Machine Shop Math	2.0 cr.
MCH 121	Manufacturing Processes I	4.0 cr.
MCH 125	Speeds and Feeds	1.0 cr.
MCH 130	Machine Shop Trigonometry	2.5 cr.
MCH 135	Basic Measuring Tools	1.5 cr.
MCH 145	Layout Tools	1.5 cr.
MCH 150	Precision Measuring Tools	1.5 cr.
MCH 158	Shop Project Machine Technology II	3.0 cr.
MCH 180	Turning Machines & Operations	4.0 cr.
MCH 190	Boring on the Lathe	1.0 cr.
MCH 195	Threading on the Lathe	3.0 cr.
MCH 259	CNC Programming-Lathe	5.0 cr.
MCH 279	CNC Operation-Lathe	4.0 cr.
MCH 280	Cooperative Education	4.0 cr.

One-Year Certificate: CNC Milling, 49 credit hours

MSD 115	Improving Work Relations	3.0cr.
MCH 100	Machine Tool Basics	1.0 cr.
MCH 105	Blueprint Reading I	1.5 cr.
MCH 110	Blueprint Reading II	1.5 cr.
MCH 115	Geometric Dimensioning & Tolerancing	3.5 cr.
MCH 120	Machine Shop Math	2.0 cr.
MCH 121	Manufacturing Processes I	4.0 cr.
MCH 125	Speeds and Feeds	1.0 cr.
MCH 130	Machine Shop Trigonometry	2.5 cr.
MCH 135	Basic Measuring Tools	1.5 cr.
MCH 145	Layout Tools	1.5 cr.
MCH 150	Precision Measuring Tools	1.5 cr.
MCH 158	Shop Project Machine Technology II	3.0 cr.
MCH 205	Vertical Milling Machines & Operations	3.5 cr.
MCH 268	CNC Programming-Mill	5.0 cr.
MCH 272	Mastercam Level I	5.0 cr.
MCH 278	CNC Operation-Mill	4.0 cr.
MCH 280	Cooperative Education	4.0 cr.

Certificate: Machine Technician, 25.5 credit hours

MCH 100	Machine Tool Basics	1.0 cr.
MCH 105	Blueprint Reading I	1.5 cr.
MCH 110	Blueprint Reading II	1.5 cr.
MCH 115	Geometric Dimensioning & Tolerancing	3.5 cr.
MCH 120	Machine Shop Math	2.0 cr.
MCH 121	Manufacturing Processes I	4.0 cr.
MCH 125	Speeds and Feeds	1.0 cr.
MCH 130	Machine Shop Trigonometry	2.5 cr.
MCH 135	Basic Measuring Tools	1.5 cr.
MCH 145	Layout Tools	1.5 cr.
MCH 150	Precision Measuring Tools	1.5 cr.
MCH 280	Cooperative Education	4.0 cr.

Machine Manufacturing Technology Course Descriptions

MCH 100 Machine Tool Basics 1.0 cr. - Covers using the Machinery's Handbook and Machine Tool Safety. An overview in utilizing the Machinery's Handbook, safe work practices, safe clothing for personal safety, fire prevention in the shop, and hand tool safety.

MCH 101 Occupational Health & Safety 3.0 cr. - Provides the student with an introduction to the concepts of industrial health and safety regulations, compensation laws, and profitability of safety management. Prerequisites: MCH 100

MCH 102 Introduction to Manufacturing 3.0 cr. - Covers an introduction to the manufacturing technology discipline. Prerequisites: MCH 100

MCH 105 Blueprint Reading I 1.5 cr. - Covers blueprints using multi-view projection, sectional & auxiliary views and title blocks & drawing format which are the basis for all graphical communication in industry today. Knowledge of the techniques used on blueprints is necessary in industry whenever descriptions of size, shape, and arrangement are used to produce, service, or sell a product. Introduces blueprints and drawing techniques which will be built upon

with further modules in the program. Prerequisite: MCH 100.

MCH 110 Blueprint Reading II 1.5 cr. - Covers dimensions, notes, gears, threads & fasteners which provide the technician with a complete description of size, shape, feature location special tolerances, finish treatments, and assembly instructions are included so that the product can be manufactured, inspected, assembled and tested to exact design specifications, and finishes on part drawings. Introduces the various types of dimensions, tolerances, notes, thread forms, representation, and specifications, finish specifications used in industry today to carry out these functions. Prerequisite: MCH 105.

MCH 115 Geometric Dimensioning and Tolerancing 3.5 cr. - Covers the use of geometric dimensioning and tolerancing as specified by the American National Standards Institute's 1982 publication. Introduces the symbols, concepts and basic use of these new techniques for dimensioning and tolerancing used in industry today. Prerequisites: MCH 110.

MCH 120 Machine Shop Math 2.0 cr. - Covers instruction and practice in working with whole numbers, fractions, decimals, formulas, inch and metric systems, formulas, calculating simple and direct indexing. Introduces how to apply the use of the inch/metric systems, dividing/index head and formulas as they pertain to thread calculations, gear calculations, speed and feed calculations, and taper calculations. Prerequisite: MCH 100.

MCH 121 Manufacturing Processes I 4.0 cr. - An introductory course in material removal operations emphasizing drilling, milling and lathe processes with emphasis on production speeds and feeds.

MCH 123 Sheet Metal Fabrication 4.0 cr. - an introductory course in the setup and operation of manual sheet metal machinery. Prerequisite: MCH 100

MCH 125 Speeds and Feeds 1.0 cr. – Covers how to calculate proper cutting speeds, revolutions per minute (RPM) and feeds for various machine tools and cutting conditions. Introduces how accurately calculating speeds and feeds prior to cutting on the work piece will save time, money, and avoid the waste of materials and tools. Prerequisite: MCH 120.

MCH 130 Machine Shop Trigonometry 2.50 cr. – Introduces the rules, methods and procedures for using trigonometry formulas that deal with both the sides and the angles of the right triangle and oblique triangle to solve for the unknown parts. Prerequisite: MCH 120.

MCH 135 Basic Measuring Tools 1.50 cr. - Covers use and applications associated with basic measuring tools including: the machinist's scale, dividers, telescoping gage, combination square, hermaphrodite caliper, surface gage, and surface finish gage. Introduces the proper techniques and applications of the basic transfer measurement and comparison tools in measuring holes accurately, scribing parallel lines, finding the center of round stock, determining the factors which contribute to the quality of surface finish, and practice in identifying surface finishes. Prerequisite: MCH 100.

MCH 145 Layout Tools 1.50 cr. - Covers instruction and practice in cutting, filing, layout, scribing, use of gage blocks, and utilizing the height gage to accurately layout lines, angles and the location of part features. Introduces the proper use and applications of the hacksaw, scribe, dividers, prick punch, ballpeen hammer, combination square set, and height gage to produce the accurate layout of part features. Prerequisite: MCH 135.

MCH 150 Precision Measuring Tools 1.50 cr. - Covers instruction and practice of precision

measurement with tools commonly used by the machinist to produce and measure part features. This course introduces the proper use, applications and parts of the outside, inside, and depth micrometers; the vernier caliper; dial indicators; and the dial bore gage commonly used by the machinist to verify and manufacture part features to print specifications. Prerequisite: MCH 145.

MCH 151 Metrology 2.0 cr. - An introduction to measurement by mechanical, electronic, and optical methods related to industrial dimensional conformance requirements. Drawing and part compliance methods, including geometric dimensioning verification techniques. Prerequisite: MCH 115 & MCH150

MCH 157 Project Machine Technology I 1.5 cr. - Designed to allow students the opportunity to customize or select various individual modules from within the Machine Manufacturing Technology program offerings. Instructor Approval

MCH 158 Project Machine Technology II 3.0 cr. - Designed to allow students the opportunity to customize or select various individual modules from within the Machine Manufacturing Technology program offerings. Instructor Approval

MCH 159 Project Machine Technology III 4.5 cr. - Designed to allow students the opportunity to customize or select various individual modules from within the Machine Manufacturing Technology program offerings. Instructor Approval

MCH 160 Drilling Machines & Operations 2.0 cr. - Covers setup, applications, parts and operation of the sensitive, upright and radial arm drill presses. This course introduces the commonly performed operations of drilling, reaming, counterboring, countersinking, spotfacing and tapping on the various types of drilling machines used to produce part features to print specifications. Prerequisites: MCH 125.

MCH 175 Band Saws 1.0 cr. - Covers setup, applications, parts and operation of the vertical, and horizontal band saws and the selection/ preparation of band saw blades. Introduces the skill of welding band saw blades and the common cutting operations performed on the vertical/horizontal to manufacture parts to print specifications. Prerequisite: MCH 100.

MCH 180 Turning Machines & Operations 4.0 cr. - Covers setup, applications, parts and operation of the various types of lathes. Introduces the commonly performed operations of drilling, reaming, counterboring, countersinking, spotfacing, tapping, maintaining/aligning, parallel turning, facing, filing, knurling, grooving, cutting radii, cutting tapers, and parting on the various types of turning machines used to produce part features to print specifications. Prerequisites: MCH 125.

MCH 190 Boring on the Lathe 1.0 cr. - Covers setup, applications and operation of boring on the lathe. Introduces the commonly performed operation of boring on the various types of turning machines used to produce part features to print specifications. Prerequisites: MCH 180.

MCH 195 Threading on the Lathe 3.0 cr. - Covers setup, applications and operation of single point threading and geometric forming heads for the production of single and multiple lead threads. Introduces cutting, chasing, rolling and forming production of single and multiple lead threads. Also covers cutting, chasing, rolling and forming of internal/external threads on the lathe and drill press by using a single point cutting tool, tap or geometric thread cutting/rolling head on nuts, bolts, fasteners, castings and machined parts to print specifications. Prerequisites: MCH 180.

MCH 205 Vertical Milling Machines & Operations 3.5 cr. - Covers setup, applications and operation of the vertical milling machine. Introduces the commonly performed operations and uses of a variety of cutters, accessories, indicators, center/edge finder, clamping methods, squaring a block of material on all 6 sides, find the edge of a work piece, drilling/threading a hole, performing circular cutting operations, using the boring head to bore holes on manufactured parts to print specifications. Prerequisites: MCH 125.

MCH 210 Project Machine Technology IV 6.0 cr. - Designed to allow students the opportunity to customize or select various individual modules from within the Machine Manufacturing Technology program offerings. Instructor Approval

MCH 211 Project Machine Technology V 7.5 cr. - Designed to allow students the opportunity to customize or select various individual modules from within the Machine Manufacturing Technology program offerings. Instructor Approval.

MCH 212 Project Machine Technology VI 9.0 cr. - Designed to allow students the opportunity to customize or select various individual modules from within the Machine Manufacturing Technology program offerings. Instructor Approval .

MCH 213 Project Machine Technology VII 10.5 cr. – Designed to allow students the opportunity to customize or select various individual modules from within the Machine Manufacturing Technology program offerings. Instructor Approval

MCH 214 Project Machine Technology VIII 12.0 cr. - Designed to allow students the opportunity to customize or select various individual modules from within the Machine Manufacturing Technology program offerings. Instructor Approval

MCH 215 Horizontal Milling Machines & Operations 2.5 cr. – Covers setup, applications and operation of the horizontal milling machine. Introduces how to set-up horizontal milling machine and saw a slot in a piece of steel, use the indexing head to cut keyways and keyseats, use the Dividing Head to cut a gear, the basic function and uses of a jig or fixture to produce machined parts to print specifications. Prerequisites: MCH 205.

MCH 220 Manufacturing Processes II 4.0 cr. - Covers the interaction of design with industrial materials and processes in connection with technical and economic feasibility, trade-offs and automation. Prerequisite: MCH 121

MCH 222 Coordinate Measuring Machine Operation 2.0 cr. - Covers the: roles and types of CMMs; modes of operation; types of probes; CMM software; Measuring Features; Alignments and Reverse Engineering (digitizing). Prerequisite: MCH 115

MCH 225 Surface Grinding Machines & Operations 2.0 cr. - Covers the setup, applications and operation of the horizontal spindle/reciprocating table surface grinder to produce parts to extremely close tolerances with improved surface finishes and accuracy. Introduces automatic grinder operation by grinding a block square/parallel and perpendicular by applying the required setups and operational sequencing, and grinding of angular surfaces on a work piece to print specifications. Also introduces grinding wheels and abrasives, selecting, balancing and mounting the grinding wheel and the methods/machines of surface grinding. Prerequisite: MCH 205.

MCH 227 CNC Grinder Operation 2.5 cr. – Covers the operation of the Computer Numerical Controlled Surface Grinder including proper setups, uses and operations associated with the CNC surface grinding machine and its accessory devices. Prerequisite: MCH 225

MCH 228 Abrasives 1.5 cr. - covers the different types of abrasives available, selection and their applications. Prerequisite: MCH 225

MCH 229 Rapid Prototyping 5.0 cr. – Introduces the student to the proper setups, uses and operations associated with additive and rapid manufacturing processes including but not limited to the Dimension BST Rapid Prototyping machine and its accessory devices. Prerequisite: MCH 276 or Instructor Approval

MCH 240 Cutting Tool Technology 2.0 cr. - Covers types, setup, applications and specifications of cutting fluids and cutting tools. Introduces why the selection of the appropriate cutting tools and cutting fluids are essential in metal cutting operations to reduce the heat and friction produced during material removal operations and how the selection, setup and applications effect the quality, accuracy, efficiency and productivity of the work piece produced. Prerequisite: MCH 100.

MCH 245 Metallurgy 2.5 cr. - Covers the manufacture, types, heat treatment, testing, machinability, properties and the physics of materials and material removal of ferrous and non-ferrous materials. Introduces the processing of materials to obtain the desired changes in its physical properties, the non-destructive and destructive testing of materials, the machinability of materials and the efficiently/required knowledge of the metal to be cut, but also how the cutting tool material and its shape will perform under various machining conditions. Prerequisite: MCH 100.

MCH 246 Metallurgy II 4.0 cr. – covers the selection of materials for modern engineering and technology applications; Structure and properties of materials starting with fundamental atomic arrangements; Microstructure control through thermal and mechanical processing and effects of service environment. Prerequisite: MCH 245 & calculus

MCH 247 Manufacturing Processes III 3.0 cr. – Covers less conventional and non-traditional manufacturing processes and materials. Prerequisite: MCH 220

MCH 248 Metallurgy III 4.0 cr. - Covers the selection of materials for modern engineering and technology applications; structure and properties of Ceramics, Polymers, Composites; the materials properties of Electrical, Thermal, Magnetic; and the Economic, Environmental and Societal Issues in Materials Science and Engineering. Prerequisite: MCH 246 & calculus

MCH 259 CNC Programming-Lathe 5.0 cr. - Introduces the basic programming skills used with Fanuc (G&M compatible) controlled CNC turning centers. Prerequisites: MCH 180.

MCH 262 CNC Conversational Controls 2.0 cr. - Covers basics of CNC Conversational Controls. Introduces the student to CNC conversational controls and the flow of CNC conversational programming. Prerequisite: MCH 278.

MCH 263 CNC Cycle Time Reduction 1.5 cr. - Covers concepts associated with CNC cycle time reduction. Covers proven methods for CNC setup time reduction, and CNC cycle time reduction Prerequisite: MCH 259, 268.

MCH 266 Advanced CNC Programming 3.50 cr. - Presented by means of audio visual presentations, demonstrations, lab experiences, and research activities. Emphasizes the development of skills and knowledge competencies prescribed by business and industry performance standards. Prerequisite: MCH 259, 268.

MCH 268 CNC Programming-Mill 5.0 cr. - Introduces basic programming skills used with Fanuc (G&M compatible) controlled CNC machining centers. Prerequisites: MCH 205.

MCH 272 Mastercam Level I 5.0 cr. - Introduces personal computing and Mastercam operational basics. Includes terminology relevant to PC-based CAD/CAM work. Covers hardware familiarity, system operation, folders, file types and structure, Mastercam menu structure and system management, and 2 1/2 axis toolpaths for milling. Emphasis on proper geometry creation, manipulation and management, relevant utilities and C-hooks, terminology, toolbar and menu functions. Prerequisite: CNC Programming Experience or coursework.

MCH 273 Mastercam Level II 5.0 cr. - Construct advanced geometric models using geometric, free form, and derived surface types. Emphasis on surface creation and mathematical category, applicability, association, Open-GL, shading and curves, C-hooks, terminology and analyzing. All aspects of roughing and finishing are covered with focus on correct application and use of parameters. Includes mill/turn machining conventions, C-axis programming, tool libraries and solid tool path verification. Prerequisite: MCH 272.

MCH 276 Mastercam Solids 3.0 cr. - A continuation of the CAD/CAM curriculum and explores the solids application of Mastercam as it pertains to model design and tool path generation. Prerequisite: MCH 273.

MCH 277 Mastercam CNC/CAM Project 3.0 cr. - A continuation of the CAD/CAM curriculum. Purpose of course is to solidify the connection between Mastercam and the CNC Machine through the physical manufacturing of projects. Prerequisite: MCH 273

MCH 278 CNC Operation - Mill 4.0 cr. - Introduces basic operation and setup skill used with Fanuc (G&M compatible) controlled CNC machining centers. Prerequisite: MCH 268.

MCH 279 CNC Operation - Lathe 4.0 cr. - Introduces basic operation and setup skill used with Fanuc (G&M compatible) controlled CNC turning centers. Prerequisite: MCH 259.

MCH 280 CE: Machine Technology 1-8 cr. - This work occurs outside the classroom at a work site performing machine tool setup and operation under the supervision of a professional machinist technician or supervisor. Department permission is required. Offered for one to eight credits based upon the number of clock hours completed at the work site. Prerequisite: Students must complete at least 24 credits of machining (MCH) classes.

MCH 282 CNC Router Operation 3.0 cr. – Covers basic operation and setup skill used with Techno (G & M compatible) controlled CNC Router. Prerequisite: MCH 272

MCH 284 Computer Aided Manufacturing 3.0 cr. - An introduction to the development of NC machine tool manufacturing processes using computer aided process planning and advanced CAD/CAM software. Emphasis on analysis and planning required for successful NC production, development of CAD drawings and solid models for CAM program development, tool path simulation software, and manufacturing engineering issues associated with NC based production. Prerequisite: MCH 273

MCH 285 Computer Integrated Manufacturing 3.0 cr. – Covers the concepts and technologies of Computer Integrated Manufacturing. Prerequisite: MCH 284