

Machine Tool Technology Program Review Report 2015

1. Description of the Program

The Machine Tool Technology program provides the diverse student body in the surrounding regional community with advanced education in machine tool technologies and serves as a bridge between students who seek job skills, industry certifications or an Associate Degree for employment or university transfer. The Program provides a high quality of instruction to achieve its objectives.

The Department aims to provide basic to advanced training in manual or conventional machining, computer numerical programming and operation, advanced multi-axis programming and operation. These form the fundamental skills necessary for the average and expected workload in the machining industry. Enrolled students are strongly positioned for employment in the machining industry throughout the course of the Program.

a. Course and Program Content:

Courses are updated to match an evolving Machine Tool Technology industry as further skills and certifications are required. The Department's curriculum is adjusted as needed through the recommendations of its Industry Advisory Committee. The Department also considers the council of industry contacts as well as feedback from the Department's part-time instructors who are employed full-time in the industry. Learning is facilitated through mediums such as: classroom instruction, practical applications in a laboratory setting, and corresponding assignments in the laboratory. For a complete list of courses, see Appendix (1).

- The Machine Tool Technology Program offers an Associate of Arts degree in Machine Tool Technology. The degree is conferred upon student completion of Cerritos College's general education, electives requirements, and completion of at least one Certification specialization within the Program, which currently include:
 - Machinist
 - CNC Tool Programmer
 - Tool and Die Maker
 - CNC Machine Operator

Furthermore, the Department is a pioneer in the field by offering curriculum and certifications unique to Cerritos College and cannot be found anywhere else in the region: Courses in Advanced Multi Axis Operation and Programming are exclusive to the Department along with the introduction of the new Coordinate Metrology Certificate Program coming to Cerritos College in Spring 2016.

b. Student Demographics:

- The student body population of the Machine Tool Technology Program 99% male and looking to expand non-traditional student participation within the program.
- (Goal #5) The Department will continue to promote diversity through high school recruitment and non-traditional career days for women.

- The many of new students entering the Machine Tool Technology Program are unfamiliar with the field. These students progress from introductory courses and proceed to advanced classes that teach further skills needed to remain competitive in the industry.
- The Program faces a barrier to overall student academic completion of the major due to the strong supply and variety of available industry jobs within the region. Students who have taken a few classes often end up in entry-level industry jobs and do not finish their degrees. Instead, former students often return in subsequent semesters for further additional education as needed to advance within their careers.
- Students' interest in the program is high and classes are filled before the semester begins.

c. Faculty, Staff and Management Resources:

The Machine Tool Technology Program has an accomplished and dedicated core faculty. The Machine Tool Technology Program has one full-time instructor, four-part time instructors. Part-time instructors are hired based their industry experience, qualifications, performance, and effectiveness as an instructor. Full-time instructors provide extensive knowledge and experience of the industry and subject in order to instruct the Department's most challenging classes. Part-time instructors, while highly qualified in most areas of their field, only teach courses specific to their area of expertise within the industry. All current part-time faculty have extensive experience maintaining full-time careers as machinists concurrent to their teaching. Full time instructor has Certifications from Society of Manufacturing Engineers, Manufacturing Skill Standards Council and National Institute for Metal Working Skills.

Since the machine tool technology industry is constantly changing, the main objective of each instructor in the program is to be involved in professional development; attending trade shows to learn new industry machining techniques, programming methods, new cutting tools and work materials to transfer that knowledge to students. This mindset has allowed the Department and its students to stay on the cutting edge of instruction.

d. Scheduling Patterns:

The Department Chair and the Dean of Instruction organize instructors and the semester's classes. The Department Chair assigns instructors to classes based on their area of expertise. Courses are offered weeknights and Saturday as well as online to accommodate as many students' schedules as possible.

e. Advisory Boards:

The Machine Tool Technology Department's Advisory Committee consists of members hailing from the regional machining industry. Committee members represent companies such as API Metrology Services, Nanoscreen LLC, Fagor Automation, Haas CNC, and Verisurf 3D Measurement Solutions. These committee members provide the Program with continued and relevant feedback regarding the developing needs of the industry. Recommendations are discussed, put to a vote, and then executed as needed within the curriculum and laboratory instruction. The Department organizes an advisory meeting once per academic term.

f. Facilities:

The Department's facilities consist of: two classrooms fully equipped with computers of which one was upgraded into a smart classroom with the other still in transition. The Department also has an inside laboratory with student access from 5:30pm to 10:30pm Monday through Thursday.

(Goal #4) The Department is currently reallocating space in the laboratory in order to improve Robotics instruction availability to address students' needs for additional opportunities for robotics assembly and practice.

g. Equipment:

The industrial grade equipment procured and used by the Department is crucial for student learning and is a core component of the Machine Tool Technology Program's strength. The Program has fourteen CNC machines allowing for ample student-machine interaction. Students learn how to understand blueprint information specific to machining, calculate the appropriate speeds and feeds, create their toolpaths using software, and setup their parts on the machines. The three software packages taught in the department: GibbsCam, MasterCam, and Verisurf are regularly updated to ensure students are continually trained with the latest software versions paired with the latest machines.

h. Technology:

Active technology use in the courses trains students for a fundamental and scientific understanding of the major processes and techniques behind Machine Tool Technology by combining theoretical knowledge and hands-on experience to simulate typical assignments and tasks found in the industry. Students are expected to attain a level of basic computer skills necessary to learn industrial CNC machining and programming software necessary to both produce and inspect machining parts. Students also need to access TalonNet frequently in order to check and receive assignments.

i. External Agencies:

The Machine Tool Technology Program is currently applying for accreditation with the National Institute for Metal Working Skills in order to acquire the credentials necessary to provide four additional Certifications for the Program's Students. These Certifications are: Measurement & Safety, Drill Press, CNC lathe, and CNC Mill.

2. Instructional Improvement

a. Evaluation of Teaching Effectiveness

The Machine Tool Technology Department conducts mandatory instructor evaluations that assess course outlines, assignment sheets, quizzes, midterms and final exams, Peer faculty, the Department Chair and the Dean of the Technology Division conduct these evaluations.

Faculty also solicit feedback during regular office hours in addition to assisting students with their regular coursework.

b. Assessment of Student Learning Outcomes:

Student learning outcomes are assessed via E-Lumen. This allows for reliable methods of determining whether students have achieved the machining skills necessary for proficiency with specific machining processes. Quizzes, performance tests, midterms and final exams are standard and effective methods in measuring student comprehension of subject material. The Department receives and assesses these student learning outcomes for every course after every Fall Semester since Fall 2014.

c. Course Grading and Retention Patterns:

Grading is standardized between all instructors and laboratory assignments. This objective grading minimizes confusion. All labs and lectures have quizzes, tests, midterms, and final exams.

The Department's retention rates mirror the rates seen in other career technical education departments. Students tend to "job out" prior to course completion due to the employment friendly nature of the machining industry and its robust economy. This makes analysis of Department's retention rates obscure as they might seem mistakenly negative even as the Department on the aggregate is successful in the sense that its students are by and large finding frequent and welcoming employment.

d. Course and Program Completion:

- Over the past five years the Department has awarded 12 Associate's Degrees.
- In the same period the Department also awarded 81 Certificates.
- (Goal #1) The Department is making efforts to increase the number of Certificates and Degrees rewarded by monitoring student feedback and progress. The Department will also review and revise future class scheduling to reintroduce or reposition as many classes as possible so students may finish in a timely manner instead of leaving for jobs or have their progress comes to a standstill due to an unavailable class.

e. Program Outcomes:

- The Department makes every effort to advise and assess students of their academic progress towards meeting certificate and degree completion requirements.
- The Department makes every effort to assist students with employment opportunities by maintaining an active job board and mailing list of forwarded jobs from the industry to current and previous students.

f. Core Indicators of the Program:

All data for the Core Indicators were taken from Perkins IV Program Core Indicator Report 2014-2015 Fiscal Year.

Core Indicator One – Skill Attainment:

- Skill attainment for the program has maintained an average of 100%.
- The State has maintained an average over the same time period of 89.5%.

Core Indicator Two – Total Completions – Certifications – Degrees and Transfer:

- Total Completions for the Department indicates an average of 66.67%.
- The State indicates an average of 81.5%.
- This is 14.88% lower than the State Average.
- The Department's completion averages are low due to the trend of students to "job out" due to plentiful job opportunities in the industry.

Core Indicator Three – Persistence and Transfer:

- Persistence and Transfer within the Program indicates an average of 92.65%.
- The State indicates and average of 86.5%.
- The Program is 6.15% higher than the State.

- The Persistence percentage is high due to returning students acquiring relevant skills as needed by their employment without continuous attendance and transfer.

Core Indicator Four – Employment:

- The Program’s total employment rate indicates an average of 90.91%.
- The State over the same period had an average of 80.85%.
- The Machine Tool Technology program has a 10.06% higher rate than the State.
- This is positive for the Program’s image, but it has negative impacts on the Program’s completion rates being low.
- Even with low completion rates, the Department’s high employment rate indicates that students are suitably trained and skilled to ultimately become successful in finding work in the industry.

Core Indicator Five A – Non-Traditional Participation:

- The Program has an average Non-Traditional Participation rate of 2.94%.
- The State has a rate of 22.6%.
- The Department will continue to make efforts in recruiting and encouraging female students.

Core Indicator Five B – Non-Traditional Completion

- The Non-Traditional average completion rate for the Program is 0%.
- The State’s average completion rate is at 26.5%.
- As of Fall 2015, the Department currently only has one female student enrolled in introductory courses.

g. Student Feedback

The Department conducted a survey for the purposes of this report. It determined student satisfaction with both course offerings and the Department. All students filled out one survey regardless of enrollment in one or multiple classes. The data indicates that students are highly satisfied with the materials and quality of instruction as well as the Department at large.

The following represents notable survey results:

- 100% of students agree that the Department properly trains them in machining.
- 95% of students agree that the courses fulfill their career needs.
- 98% of students agree the Department manages to prepare them for their future career needs.
- 90% of students currently and are willing to continue attending weeknight class offerings.
- 40% of students would be willing to take classes on Saturday.
- 73% of students agree there are sufficient classes offered during the semester.
- 75% of students would prefer the option of hybrid classes. (e.g.) Online instruction with physical laboratory attendance if available.

Institutional Data

Semester	FTEs
2009-2010	64.37
2010-2011	68.52
2011-2012	62.91
2012-2013	64.75
2013-2014	74.65
2014-2015	62.79

School Year	WSCH	WSCH/FTEF
2013	14580	379.03
2014	10752	345.14

MTT Headcount

School Year	2009	2010	2011	2012	2013	2014
Headcount	216	232	212	201	251	175

Course Success Rates (5 year average)

Course Type	Low	High
Introductory Course	70%	70%
Online	43%	71%
All Other Courses	70%	97%

Program Awards in Machine Tool Technology

School Year	Degrees	Certificates
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2008-2009	0	6
2009-2010	1	8
2010-2011	2	27
2011-2012	3	8
2012-2013	4	13
2013-2014	2	19

Conclusions and Analysis of the Institutional Data:

The above spreadsheet data does not express the Program’s greatest accomplishment, which is the employability of its students. In the machining industry, machinists are valued and compensated not by their college degrees, but by their skillset, industry experience, and certifications.

3. Strengths:

- Students report a high satisfaction rating with the Department.
- The Department managed to survive a 2.5 year period without a full-time instructor while experiencing no significant decline in its performance metrics.
- The Department has kept on the leading edge of machining education and technology thanks to an emphasis on automated machining, numerical programming, and software simulation. We are the first regional institution to teach five axis machining and computer assisted inspection.
- We maintain strong involvement with grants due to exceptional faculty efforts and are in the process of acquiring additional equipment to expand the robotics lab.
- Students of the program are in a strong position to find employment in a high demand industry. Local visitors periodically enter the campus to learn about the program to advertise job openings. The Department also maintains a job bulletin board with multiple postings from local companies that contact the Department directly. Career Coach recently indicated that there were 21,247 employed “machinists” in a 50 mile radius from Cerritos College, there were 837 job openings, and 8,073 machinists approaching retirement. This set of data includes jobs in all categories the MTT program offers such as machinist, programmer, operator, and tool and die maker.
- Students who complete the multi-axis machining courses are strongly positioned for the highest paying machinist jobs in the industry.
- The Department is introducing the region’s first Coordinate Metrology Certificate Program in the Spring 2016 semester.
- The Department’s two recently acquired Haas CNC machines: CNC Turning Center with milling capability and High Speed Five Axis CNC Milling Center are exclusive to Cerritos College’s Machine Tool Technology and are region’s first such machines amongst college technical programs.
- (Goal #3) The Department is looking to redevelop MTT 71 and 96L course content to ensure compatibility with the two new Haas Multi-Axis CNC machines. This is an anticipatory move to account for the courses’ relevance in the future.
- The Department’s recent acquisition of five conventional mill machines and two conventional lathes brings the Department’s overall machine inventory to: Fourteen specialized CNC machines, six lathes,

eight mills, and fourteen computerized portable inspection arms. This makes Cerritos College's Machine Tool Technology Program the most robust program in the region by yet another characteristic.

Weaknesses:

- Classes continue to be at max capacity and cannot accommodate student demand.
- Like many other CTE programs, the Department suffers from low retention rates due to employment offers for students during and after enrollment.
- It is exceptionally rare for the Department to issue an Associate's Degree due to the previous point.
- Department has difficulty attracting women to a program that has been historically male-dominated.
- The Department's large inventory of equipment requires an extensive maintenance and continual upgrades to meet evolving industry standards.

4. Opportunities:

- The Department's new Coordinate Metrology Certificate Program is slated to relieve emerging industry demand for professionals with this certification in the region.
- The Department is seeking to acquire accreditation from the National Institute for Metal Working Skills as well as prepare students for additional industrial certifications in Measurement & Safety, Drill Press, CNC lathe, and CNC Mill.
- (Goal #5) The Department's full time instructor completed Summer 2015 Project Lead The Way (PLTW) training at Cal Poly Pomona, and seeks to cultivate student interest with career technical education and for the first time offer instruction in Computer Integrated Manufacturing (CIM) to traditional, non-traditional, and female high school students. This is an effort to recruit female students and additionally address an aging workforce shortage trend in the industry.
- (Goal #6) The Department is looking to maintain develop and implement an alumni employment tracking database for continued contact with alumni. This is so that the Department has a better reaction to changing trends within the industry as well as provide students with a stronger awareness for industry health.

Threats:

- The Machine Tool Technology Program only has one single full-time faculty member which puts a strain on the overall Program as the amount of advanced courses is limited by the physical limitations of having one faculty member for the entire category of such classes.
- In addition to the previous point, there is a lack of qualified candidates in the region for part-time faculty teaching positions. This will eventually put a strain on the Program as instructors retire over time alongside the immediate problem of max capacity class sizes and minimal course availability.
- (Goal #2) The Department will consult its Advisory Committee to create a current and ongoing list of interested individuals should a position become available for additional part-time instructors.
- While the overall inventory of machines the Program provides to its students is the most robust within the region, the inventory requires extensive maintenance to adequately upkeep every machine in the best possible condition after usage during the academic term.
- Additionally to the previous point, the Program's budget is strained if/when a shortage of grant funding occurs.

- (Goal #7) The Department is looking to maintain an active role in grant applications for equipment, maintenance, and upgrades. Budgets and economies continually fluctuate so it is prudent for the Department to proactively seek grant funding at all times.
- The Program has a historically low completion rate due to early workforce recruitment as previously mentioned.

5. Accomplishment of Previous Goals

- The most noticeable goal accomplished by the Program since the last Program Review has been the completion of requirements prior to introducing the Coordinate Metrology Certification to the curriculum come Spring 2016. With this additional certification offered, the Machine Tool Technology Program maintains its position as the lead pioneer in its field within the region. Coordinate Metrology is slated to address the emerging human capital shortage within the region and the Program is positioned to ready our students to pursue relevant job opportunities with Coordinate Metrology upon successful certification.
- Another major goal that has been accomplished is the recent acquisition of additional machines to the Department's total inventory. With a grand total of fourteen specialized CNC machines, six lathes, eight mills, and fourteen portable inspection arms, the Department maintains the most robust inventory of machines available to students within the region. The quantity and variety of machines enables the students to hone the ideas and lessons learned in the classroom in a practical application. Additionally, the state of the art nature of most of these machines ensures that students will remain on the leading edge of learning during their enrollment and will best prepare them for future employment within the field.
- As mentioned before, the Coordinate Metrology Certificate provides students additional employment viability in an already understaffed industry. However, this is merely the start as the Program endeavors to acquire additional accreditation from the National Institute for Metalworking Skills so that students of the Program will have even more class flexibility as NIMS accreditation provides students the choice of an additional four Certificates to pursue: Measurement & Safety, Drill press, CNC lathe, and CNC Mill. The accomplishments of this Program as well as the initiatives currently in place make Cerritos College's Machine Tool Technology Program makes it one of the best programs of its kind in the region.

Cerritos College

Instructional Program Review

Instructional Review Goal Establishment Form

Goals	Actions To Be Taken	Time Frame	Person Assigned
Mid-Range Goals			
Goal #1, Pg. 4 Improve Program Enrollment and Increase Certificates of Achievement and Degrees	Reevaluate course offerings to determine necessary courses to reopen and /or open new courses in subsequent terms.	Spring 2016	Chuong Vo
Goal #2, Pg. 8 Develop a pool of qualified candidates for part-time instructor positions	Consult with Advisory Board Members to compile and update a list of interested individuals.	Spring 2016	Chuong Vo
Goal #3, Pg. 7 Revise and update multi-axis curriculum	Redevelop MTT 71 and 96L course content to ensure compatibility with the two new Haas Multi-Axis CNC machines.	Summer 2016	Chuong Vo
Goal #4, Pg. 2 Improve Robotics instruction availability	Allocate a dedicated lab area for robotics assembly and practice.	Fall 2015	Chuong Vo
Long-Term Goals			
Goal #5, Pg. 1,8 Expand student body diversity within the Department	Investigate and survey recruiting methods from other colleges in the surrounding area, Continue to promote diversity through high school recruitment and women organizations.	Summer 2017	Chuong Vo
Goal #6, Pg. 8 Develop and implement an alumni employment tracking database	Develop tracking documentation for continued contact with alumni.	Spring 2016	Chuong Vo
Goal #7, Pg. 8 Seek additional funding for high tech equipment: Shrink Fit Toolings and Laser machine	Submit grant applications for new advance equipment and upgrades.	Summer 2017	Chuong Vo

Appendix (1)**Machine Tool Technology Course Listings**

MTT 50	CNC Shop Math	3 Units
MTT 51	MasterCAM Milling	3.5 Units
MTT 52	Setup and Operation of CNC Milling Machines	2.5 Units
MTT 54	CNC Blueprint Reading	2.5 Units
MTT 56	CNC Shop Inspection	2 Units
MTT 57	Setup and Operation of CNC Lathes	2.5 Units
MTT 59	MasterCAM Turning	2.5 Units
MTT 60	Advanced Machine Tool Concepts	2 Units
MTT 62	Fixture Tooling	2 Units
MTT 68	Computer Assisted Inspection Using Verisurf	2 Units
MTT 71	MasterCAM Multi-Axis Milling	2 Units
MTT 76	GibbsCAM Milling	2.5 Units
MTT 77	GibbsCam Turning	2.5 Units
MTT 78	Tool Building Using Verisurf	1.5 Units
MTT 91L	CNC Mill Machining Laboratory	1 Unit
MTT 92L	MasterCAM Laboratory	1 Unit
MTT 94L	Manual Machining Laboratory	1 Unit
MTT 95L	CNC Lathe Machining Laboratory	1 Unit
MTT 96L	CNC Multi-Axis Mill Machining Laboratory	1 Unit
MTT 100	Machine Tool Introduction	2 Units
MTT 168	Advanced Computer-Assisted Inspection Using Verisurf	2 Units
MTT 170	Computer Numerical Control Programming	2 Units
MTT 177	Advanced GibbsCAM	2.5 Units
MTT 180	Robotics for Computer Numerically Controlled Machines	3 Units
MTT 278	MasterCAM Advanced	3.5 Units