Computerized Manufacturing & Machining

Degrees:

AAS	Computerized Manufacturing & Machining	65-68
Diploma(s)	CNC Machinist	56-59
	Machinist	41-47
Certificate(s)	Exploratory Machining I	12
	Machine Tool Operator I	15-20
	Machine Tool Operator II	23-31
	CNC Operator	26-31
	CNC Machining and Waterjet Technology	18
	Tool and Die Apprentice	29-34

Description:
Work activities in machine shop involve applying knowledge of machine capabilities, the properties of materials, and shop practices to set-up and operate various machines. The skills needed to position work pieces, adjust machines, and verify the accuracy of machine functions and finish products are taught by classroom instruction, demonstration, and hands on experience.

Students enrolled in the Machine Tool Technology program must achieve a minimum grade of "C" in each technical course.

Implementation: Fall 2012

Competencies:
Program Title: AAS Computerized Manufacturing & Machining
General Education Competencies:
Students should prepare for twenty-first century challenges by gaining:

A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.

B. Intellectual and practical skills, including
- inquiry and analysis
- critical and creative thinking
- written and oral communication
- quantitative literacy
- information literacy
- teamwork and problem solving

C. Personal and social responsibility, including
- civic knowledge and engagement (local and global)
- intercultural knowledge and competence
- ethical reasoning and action
- foundations and skills for lifelong learning

D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

Technical Competencies:

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment, conventional power equipment, CNC equipment, and hazardous materials and storage techniques.
2. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
3. Setup and operate drill press and sawing machines to perform operations and hold tolerances that are required by the curriculum and national standards set by NIMS.
4. Read and interpret prints to the satisfaction of part production and satisfaction of national standards set by NIMS.
5. Schedule job operations in chronological sequence in which parts would be produced in an industrial setting.
6. Identify metal shapes and metallurgical properties to properly identify uses of materials and machining specifications.
7. Perform time estimates on part production including machine cost, material consumption, employee allocation, and tooling consumption.
8. Perform cutting speed calculations for various materials to achieve optimum tool life and part production.
9. Produce manual written and computer aided manufacturing programs to utilize on CNC equipment.
10. Perform setup operations on CNC lathes and mills as well as sinker EDM machines to the satisfaction of national standards set by NIMS.

CNC Machinist Diploma

General Education Competencies:

Students should prepare for twenty-first century challenges by gaining:

A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.

B. Intellectual and practical skills, including
- inquiry and analysis
- critical and creative thinking
- written and oral communication
- quantitative literacy
- information literacy
- teamwork and problem solving

C. Personal and social responsibility, including
- civic knowledge and engagement (local and global)
- intercultural knowledge and competence
- ethical reasoning and action
- foundations and skills for lifelong learning

D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

Technical Competencies:

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment, conventional power equipment, CNC equipment, and hazardous materials and storage techniques.
2. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
3. Setup and operate drill press and sawing machines to perform operations and hold tolerances that are required by the curriculum and national standards set by NIMS.
4. Read and interpret prints to the satisfaction of part production and satisfaction of national standards set by NIMS.
5. Schedule job operations in chronological sequence in which parts would be produced in an industrial setting.
6. Identify metal shapes and metallurgical properties to properly identify uses of materials and machining specifications.

7. Perform time estimates on part production including machine cost, material consumption, employee allocation, and tooling consumption.
8. Perform cutting speed calculations for various materials to achieve optimum tool life and part production.
9. Produce manual written and computer aided manufacturing programs to utilize on CNC equipment.
10. Perform setup operations on CNC lathes and mills as well as sinker EDM machines to the satisfaction of national standards set by NIMS.

Machinist Diploma

General Education Competencies:

Students should prepare for twenty-first century challenges by gaining:

A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.

B. Intellectual and practical skills, including
- inquiry and analysis
- critical and creative thinking
- written and oral communication
- quantitative literacy
- information literacy
- teamwork and problem solving

C. Personal and social responsibility, including
- civic knowledge and engagement (local and global)
- intercultural knowledge and competence
- ethical reasoning and action
- foundations and skills for lifelong learning

D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

Technical Competencies:

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment, conventional power equipment, CNC equipment, and hazardous materials and storage techniques.
2. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
3. Setup and operate drill press and sawing machines to perform operations and hold tolerances that are required by the curriculum and national standards set by NIMS.
4. Read and interpret prints to the satisfaction of part production and satisfaction of national standards set by NIMS.
5. Schedule job operations in chronological sequence in which parts would be produced in an industrial setting.
6. Identify metal shapes and metallurgical properties to properly identify uses of materials and machining specifications.
7. Perform cutting speed calculations for various materials to achieve optimum tool life and part production.
8. Perform setup operations on CNC lathes, mills, waterjets as well as sinker EDM machines to the satisfaction of national standards set by NIMS.

Certificate: Exploratory Machining I

Technical Competencies:

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment, conventional power equipment, CNC equipment, and hazardous materials and storage techniques.

2. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
3. Setup and operate drill press and sawing machines to perform operations and hold tolerances that are required by the curriculum and national standards set by NIMS.
4. Perform setup, programming and editing operations on CNC equipment.

Certificate: Machine Tool Operator I

Technical Competencies

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment,
2. Conventional power equipment, CNC equipment, and hazardous materials and storage techniques.
3. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
4. Setup and operate drill press and sawing machines to perform operations and hold tolerances that are required by the curriculum and national standards set by NIMS.
5. Read and interpret prints to the satisfaction of part production and satisfaction of national standards set by NIMS.
6. Perform setup, programming and editing operations on CNC equipment.

Certificate: Machine Tool Operator II

General Education Competencies:

1. Demonstrate basic skills in computer operations and/or software applications.
2. Organize, analyze, and make information useful by employing mathematics.
3. Develop and perform basic search strategies and access information in a variety of formats, print and non-print.
4. Elaborate upon knowledge to create new thoughts, processes and/or products.

Technical Competencies:

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment, conventional power equipment, CNC equipment, and hazardous materials and storage techniques.
2. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
3. Setup and operate drill press and sawing machines to perform operations and hold tolerances that are required by the curriculum and national standards set by NIMS.
4. Read and interpret prints to the satisfaction of part production and satisfaction of national standards set by NIMS.
5. Schedule job operations in chronological sequence in which parts would be produced in an industrial setting.
6. Perform setup operations on CNC lathes, mills, waterjets as well as sinker EDM machines to the satisfaction of national standards set by NIMS.

Certificate: CNC Operator

Technical Competencies

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment, conventional power equipment, CNC equipment, and hazardous materials and storage techniques.
2. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
3. Setup and operate drill press and sawing machines to perform operations and hold tolerances that are required by the curriculum and national standards set by NIMS.
4. Read and interpret prints to the satisfaction of part production and satisfaction of national standards set by NIMS.
5. Schedule job operations in chronological sequence in which parts would be produced in an industrial setting.

6. Perform setup operations on CNC lathes, mills, waterjets as well as sinker EDM machines to the satisfaction of national standards set by NIMS.

Certificate: Tool and Die Apprenticeship

Technical Competencies:

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment, conventional power equipment, CNC equipment, and hazardous materials and storage techniques.
2. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
3. Setup and operate CNC equipment holding tolerances that are required by curriculum task list and national standards set by NIMS.
4. Read and interpret prints to the satisfaction of part production and satisfaction of national standards set by NIMS.
5. Schedule job operations in chronological sequence in which parts would be produced in an industrial setting.
6. Identify metal shapes and metallurgical properties to properly identify uses of materials and machining specifications.
7. Perform cutting speed calculations for various materials to achieve optimum tool life and part production.

Certificate: CNC Machining & Waterjet Technology

General Education Competencies:

1. Demonstrate basic skills in computer operations and/or software applications.
2. Organize, analyze, and make information useful by employing mathematics.

Technical Competencies:

1. Practice safe working conditions of personal dress, proper use of hand tools, metrology equipment, conventional power equipment, CNC equipment, and hazardous materials and storage techniques.
2. Setup and operate conventional lathes and mills performing machining operations and holding tolerances that are required by curriculum task lists in alignment with national standards set by NIMS (National Institute of Metalworking Skills).
3. Read and interpret prints to the satisfaction of part production and satisfaction of national standards set by NIMS.
4. Schedule job operations in chronological sequence in which parts would be produced in an industrial setting.
5. Perform time estimates on part production including machine cost, material consumption, employee allocation, and tooling consumption.
6. Perform cutting speed calculations for various materials to achieve optimum tool life and part production.
7. Produce manual written and computer aided manufacturing programs to utilize on CNC equipment.
8. Perform setup operations on CNC lathes, mills and waterjets as well as sinker EDM machines to the satisfaction of national standards set by NIMS.

Outlines

AAS Machine Tool (degree)

Course Prefix	Course Number	Course Title	Credit Hours
		General Education:	
ENG	101	Writing I	3
MAT	116	Technical Mathematics OR	3
MAT	126	Technical Algebra and Trigonometry or Higher	(3)
		Heritage/Humanities	3
		Natural Sciences	3
		Social/Behavioral Science	3
		Subtotal:	**15**
		Electives (Co-op or Practicum)	1

		Subtotal:	**1**
		Technical:	
		Computer/Digital Literacy*	0-3
CMM	110	Fundamentals of Machine Tools A and	3
CMM	112	Fundamentals of Machine Tools B or	4
CMM	114	Fundamentals of Machine Tools	(7)
CMM	118	Metrology/Control Charts	2
CMM	120	Applied Machining I and	3
CMM	122	Applied Machining II or	3
CMM	124	Applied Machining	(6)
CMM	130	Manual Programming and	3
CMM	132	CAD/CAM/CNC or	3
CMM	134	Manual Programming/CAD/CAM/CNC or	(6)
CMM	138	Intro to Programming & CNC Machines	(6)
CMM	210	Industrial Machining I and	3
CMM	212	Industrial Machining II or	3
CMM	214	Industrial Machining	(6)
CMM	220	Advanced Industrial Machining I and	4
CMM	222	Advanced Industrial Machining II or	2
CMM	224	Advanced Industrial Machining	(6)
CMM	2301	Intro to Conversational Programming and	3
CMM	2302	Conversational Editing and Subroutines or	3
CMM	230	Conversational Programming or	(6)
CMM	234	CNC Machines and Coding Practices	(6)
CMM	2401	Intro to 3-D Code Sequencing and Tool path Production and	3
CMM	2402	Advanced 3-D Code Sequencing and Macro Systems or	3
CMM	240	Intro to 3-D Programming or	(6)
CMM	244	Advanced Programming/Setup Practices	(6)
BRX	110	Basic Blueprint Reading for Machinist and	2
BRX	210	Mechanical Blueprint Reading for Machinist or	2
BRX	112	Blueprint Reading for Machinist	(4)
		Subtotal	**49-52**
		Total Credits	**65-68**

*Computer/Digital literacy must be demonstrated either by competency exam or by completing a computer/digital literacy course.

Program Title: CNC Machinist (diploma)

Course Prefix	Course Number	Course Title	Credit Hours
		General Education:	
Area 1:		Course from:	
		Written Communication, Oral Communications, Humanities/Heritage	3
Area 2:			
MAT	116	Technical Mathematics or	3
MAT	126	Technical Algebra and Trigonometry or Higher	(3)
		Subtotal:	**6**
		Electives (Co-op or Practicum)	1
		Subtotal:	**1**
		Technical:	

		Computer Literacy*	0-3
CMM	110	Fundamentals of Machine Tools A and	3
CMM	112	Fundamentals of Machine Tools B or	4
CMM	114	Fundamentals of Machine Tools	(7)
CMM	118	Metrology/Control Charts	2
CMM	120	Applied Machining I and	3
CMM	122	Applied Machining II or	3
CMM	124	Applied Machining	(6)
CMM	130	Manual Programming and	3
CMM	132	CAD/CAM/CNC or	3
CMM	134	Manual Programming/CAD/CAM/CNC or	(6)
CMM	138	Intro to Programming & CNC Machines	(6)
CMM	210	Industrial Machining I and	3
CMM	212	Industrial Machining II or	3
CMM	214	Industrial Machining	(6)
CMM	220	Advanced Industrial Machining I and	4
CMM	222	Advanced Industrial Machining II or	2
CMM	224	Advanced Industrial Machining	(6)
CMM	2301	Intro to Conversational Programming and	3
CMM	2302	Conversational Editing and Subroutines or	3
CMM	230	Conversational Programming or	(6)
CMM	234	CNC Machines and Coding Practices	(6)
CMM	2401	Intro to 3-D Code Sequencing and Tool path Production and	3
CMM	2402	Advanced 3-D Code Sequencing and Macro Systems or	3
CMM	240	Intro to 3-D Programming or	(6)
CMM	244	Advanced Programming/Setup Practices	(6)
BRX	110	Basic Blueprint Reading for Machinist and	2
BRX	210	Mechanical Blueprint Reading for Machinist or	2
BRX	112	Blueprint Reading for Machinist	(4)
		Subtotal:	**49-52**
		Total Credits:	**56-59**

<u>Program Title:</u> Machinist (diploma)

Course Prefix	**Course Number**	**Course Title**	**Credit Hours**
		General Education:	
Area 1:		Course from:	
		Writing/Accessing Information, Oral Communications, Humanities, or Heritage	3
Area 2:			
MAT	116	Technical Mathematics or	3
MAT	126	Technical Algebra and Trigonometry or Higher	(3)
		Subtotal:	**6**
		Electives (Co-op or Practicum)	1
		Subtotal:	**1**
		Technical:	
		Computer Literacy*	0-3
CMM	110	Fundamentals of Machine Tools A and	3
CMM	112	Fundamentals of Machine Tools B or	4
CMM	114	Fundamentals of Machine Tools	(7)
CMM	118	Metrology/Control Charts	2
CMM	120	Applied Machining I and	3

CMM	122	Applied Machining II or	3
CMM	124	Applied Machining	(6)
CMM	130	Manual Programming or	3
CMM	134	Manual Programming/CAD/CAM/CNC or	(6)
CMM	138	Intro to Programming & CNC Machines	(6)
CMM	210	Industrial Machining I and	3
CMM	212	Industrial Machining II or	3
CMM	214	Industrial Machining	(6)
CMM	220	Advanced Industrial Machining I and	4
CMM	222	Advanced Industrial Machining II or	2
CMM	224	Advanced Industrial Machining	(6)
BRX	110	Basic Blueprint Reading for Machinist and	2
BRX	210	Mechanical Blueprint Reading for Machinist or	2
BRX	112	Blueprint Reading for Machinist	(4)
		Subtotal:	**34-40**
		Total Credits:	**41-47**

Program Title: Exploratory Machining I (certificate)

Course Prefix	Course Number	Course Title	Credit Hours
CMM	110	Fundamentals of Machine Tools A and	3
CMM	112	Fundamentals of Machine Tools B and	4
		Electives (Technical or Gen Ed) or	5
CMM	114	Fundamentals of Machine Tools and	(7)
		Electives (Technical or Gen Ed) or	5
CMM	130	Manual Programming and	(3)
CMM	132	CAD/CAM/CNC and	(3)
		Elective (Technical or Gen Ed) or	6
CMM	134	Manual Programming/CAD/CAM/CNC and	(6)
		Elective (Technical or Gen Ed) or	6
CMM	138	Intro to Programming & CNC Machines or	(6)
		Elective (Technical or Gen Ed)	6
		Total Credits	**12**

Program Title: Machine Tool Operator I (certificate)

Course Prefix	Course Number	Course Title	Credit Hours
CMM	110	Fundamentals of Machine Tools A and	3
CMM	112	Fundamentals of Machine Tools B or	4
CMM	114	Fundamentals of Machine Tools	(7)
CMM	130	Manual Programming or	3
CMM	134	Manual Programming CAD/CAM/CNC or	(6)
CMM	138	Intro to Programming & CNC Machines	(6)
BRX	110	Basic Blueprint Reading for Machinist or	2
BRX	112	Blueprint Reading for Machinist	4
MAT	116	Technical Mathematics	3
		Total Credits:	**15-20**

Program Title: Machine Tool Operator II (certificate)

Course Prefix	Course Number	Course Title	Credit Hours
CMM	110	Fundamentals of Machine Tools A and	3
CMM	112	Fundamentals of Machine Tools B or	4
CMM	114	Fundamentals of Machine Tools	(7)
CMM	118	Metrology/Control Charts	2
CMM	120	Applied Machining I and	3
CMM	122	Applied Machining II or	3
CMM	124	Applied Machining	(6)
CMM	130	Manual Programming or	3
CMM	134	Manual Programming CAD/CAM/CNC or	(6)
CMM	138	Intro to Programming & CNC Machines	(6)
BRX	110	Basic Blueprint Reading for Machinist or	2
BRX	112	Blueprint Reading for Machinist	4
		Computer Literacy*	0 – 3
MAT	116	Technical Mathematics or	3
MAT	126	Technical Algebra and Trigonometry or Higher	(3)
		Total Credits	**23-31**

Program Title: CNC Operator (certificate)

Course Prefix	Course Number	Course Title	Credit Hours
CMM	110	Fundamentals of Machine Tools A and	3
CMM	112	Fundamentals of Machine Tools B or	4
CMM	114	Fundamentals of Machine Tools	(7)
CMM	118	Metrology/Control Charts	2
CMM	130	Manual Programming and	3
CMM	132	CAD/CAM/CNC or	3
CMM	134	Manual Programming CAD/CAM/CNC or	(6)
CMM	138	Intro to Programming & CNC Machines	(6)
CMM	2301	Intro to Conversational Programming and	3
CMM	2302	Conversational Editing and Subroutines or	3
CMM	230	Conversational Programming or	(6)
CMM	234	CNC Machines and Coding Practices	(6)
BRX	110	Basic Blueprint Reading for Machinist or	2
BRX	112	Blueprint Reading for Machinist	4
		Computer Literacy*	0- 3
MAT	116	Technical Mathematics or	3
MAT	126	Technical Algebra and Trigonometry or Higher	(3)
		Total Credits	**26-31**

Program Title: CNC Machining & Waterjet Technology (certificate)

Course Prefix	Course Number	Course Title	Credit Hours
CMM	138	Intro to Programming and CNC Machines	6
CMM	234	CNC Machines & Coding Practices	6
CMM	244	Advance Programming/Setup Practices	6
		Total Credits	**18**

Program Title: Tool & Die Apprentice (certificate)

Course	Course	Course Title	Credit

Prefix	Number			Hours
CMM	150	Shop Theory Or		2
CMM	110	Fundamentals of Machine Tools A		(3)
CMM	118	Metrology/Control Charts		2
CMM	151	Machinery's Handbook/Metallurgy OR		3
CMM	112	Fundamentals of Machine Tools B		(4)
CMM	152	Jigs, Fixtures and Gaging OR		3
CMM	120	Applied Machining I		(3)
CMM	153	Mold Theory		3
CMM	154	Die Theory		3
CMM	130	Manual Programming		3
CMM	132	CAD/CAM/CNC		3
BRX	110	Basic Blueprint Reading for Machinist		2
BRX	210	Mechanical Blueprint Reading		2
MAT	116	Technical Mathematics		3
WLD	151	Basic Welding A OR		2
		Computer Literacy* OR		(0-3)
IEX	295	Special Problems III		(3)
			Total Credits	**29-34**

Dates of Actions:

Approved: May 2005

Revised: May 2006, March 2009, January 2011, March 2012