

LEVEL I APPROVAL MEMORANDUM

Compiled here is the Level I memorandum containing items approved since the July 19, 2016 Board of Regents Meeting. This memorandum from June contain items for which approval authority has been designated by the Board of Regents to the individual institutions or the Commissioner of Higher Education. The items before you have been approved and are now being shared with you for your notification.

- June 2016 Level I Memorandum

LEVEL I APPROVAL MEMORANDUM

DATE: July 5, 2016

TO: Chief Academic Officers, Montana University System

FROM: John Cech, Deputy Commissioner for Academic and Student Affairs

RE: June 2016 Level I Approvals

Contained within this memorandum are Level I proposals submitted by the institutions of the Montana University System in June 2016. These proposals include items for which approval authority has been designated by the Board of Regents to the individual institutions or the Commissioner of Higher Education. These Level I items are being sent to you for your review. If you have concerns about a particular proposal, you should share those concerns with your colleagues at that institution and try to come to some understanding. If you cannot resolve your concerns, raise them at the Level I Chief Academic Officer's conference call on July 19. Issues not resolved at that meeting should be submitted in writing to OCHE by noon on Friday, July 22. You will be notified of approved proposals by July 26. The Board of Regents will be notified of the approved proposals at the September 2016 meeting of the Board.

1. OCHE Approvals

University of Montana:

- Request for authorization to retitle the Ecological Sciences & Restoration minor to Ecological Restoration
[Item #171-1001-LI0616](#) | [Academic Proposal Request Form](#)

Helena College:

- Request for authorization to change A.A.S. degree in combination with Sheet Metal Apprenticeship program to C.A.S.
[Item #171-1902-LI0616](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#)

Montana State University Northern

- Request for authorization to offer the Electronics Technician A.A.S.
[Item #171-2802-LI0616](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Attachment #1](#) | [Attachment #2](#)
- Request for authorization to offer the Machinist Technician A.A.S.
[Item #171-2803-LI0616](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Attachment #1](#) | [Attachment #2](#)

Great Falls College:

- Request for authorization to offer Welding & Fabrication A.A.S. & Tier 4 C.T.S.
[Item #171-2912-LI0616](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Attachment #1](#) | [Attachment #2](#)

June 2016

ITEM 171-1001-LI0616

Request for authorization to retitle the Ecological Sciences & Restoration minor to Ecological Restoration

THAT

The Board of Regents of Higher Education authorizes the University of Montana to retitle the Ecological Sciences and Restoration minor to Ecological Restoration.

EXPLANATION

The Ecological Sciences and Restoration program offers both a bachelor of science and minor. In March 2016, a request to change the titles of the program, including both degrees was approved. The program faculty did not intend to change the name of the minor, only the bachelor of science degree. Therefore, we request to change the name of the minor back to Ecological Restoration.

ATTACHMENTS

Academic Proposal Request Form

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

ITEM 171-1001-LI0616 Submission Month or Meeting: June 2016

Institution: University of Montana-Missoula CIP Code: 03.0104

Program/Center/Institute Title: Ecological Sciences and Restoration minor

Includes (please specify below): Online Offering _____ Options _____

Please mark the appropriate type of request and submit with an Item Template and any additional materials, including those listed in parentheses following the type of request. For more information pertaining to the types of requests listed below, how to complete an item request, or additional forms please visit <http://mus.edu/che/arsa/preparingacademicproposals.asp>.

x **A. Level I:**

Campus Approvals

- _____ **1a. Placing a postsecondary educational program into moratorium** (Program Termination and Moratorium Form)
- _____ **1b. Withdrawing a postsecondary educational program from moratorium**
- _____ **2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less**
- _____ **3. Establishing a B.A.S./A.A./A.S. area of study**
- _____ **4. Offering an existing postsecondary educational program via distance or online delivery**

OCHE Approvals

- x _____ **5. Re-titling an existing postsecondary educational program**
- _____ **6. Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)
- _____ **7. Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)
- _____ **8. Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)
- _____ **9. Revising a postsecondary educational program** (Curriculum Proposal Form)
- _____ **10. Establishing a temporary C.A.S. or A.A.S. degree program** *Approval limited to 2 years*

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

B. Level II:

1. **Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Intent to Plan Form)
2. **Exceeding the 120 credit maximum for baccalaureate degrees** *Exception to policy 301.11*
3. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and Completed Intent to Plan Form, except when eliminating or consolidating)
4. **Re-titling an academic, administrative, or research unit**

Specify Request:

The Ecological Sciences and Restoration program offers both a bachelor of science and minor. In March 2016, a request to change the titles of the program, including both degrees was approved. The program faculty did not intend to change the name of the minor, only the bachelor of science degree. Therefore, we request to change the name of the minor back to Ecological Restoration.

June 2016

ITEM 171-1902-LI0616

Request for authorization to change A.A.S. degree in combination with Sheet Metal Apprenticeship program to C.A.S.

THAT

Helena College University of Montana requests authorization from the Montana Board of Regents of Higher Education to change the Sheet Metal Apprenticeship program at from an associate of applied science to a certificate of applied science.

EXPLANATION

After the first year of offering this program (2014-2015 academic year) it was determined by the instructors, industry, and advisory boards that this program would be better offered as a C.A.S. rather than an A.A.S. This was also supported by industry as students can complete the educational portion of the apprenticeship in a two-year timeframe versus a four-year timeframe which is preferable. Industry also asked for some program course modification to include HVAC and refrigeration courses to meet industry needs as well as less on site time due to issues with students having to travel to the campus for specific training. The program now includes a stronger online component with quarterly meetings to address skills training and assessment. This program revision has been approved by our campus' Academic Standards and Curriculum Revision Committee and by Helena College Leadership. Please see attached program revision document below.

ATTACHMENTS

Academic Proposal Request Form
Curriculum Proposal

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

ITEM 171-1902-LI0616 Submission Month or Meeting: June 2016

Institution: Helena College CIP Code: 48.0506

Program/Center/Institute Title: Sheet Metal Apprenticeship C.A.S.

Includes (please specify below): Online Offering _____ Options _____

Please mark the appropriate type of request and submit with an Item Template and any additional materials, including those listed in parentheses following the type of request. For more information pertaining to the types of requests listed below, how to complete an item request, or additional forms please visit <http://mus.edu/che/arsa/preparingacademicproposals.asp>.

X **A. Level I:**

Campus Approvals

- 1a. Placing a program into moratorium** (Program Termination and Moratorium Form)
- 1b. Withdrawing a program from moratorium**
- 2. Adding, re-titling, terminating or revising a campus certificate of 29 credits or less**
- 3. Adding a BAS/AA/AS area of study**
- 4. Offering an existing program via distance or online delivery**

OCHE Approvals

- 5. Re-titling an existing program**
- 6. Terminating an existing program** (Program Termination and Moratorium Form)
- 7. Consolidating existing programs** (Curriculum Proposal Form)
- 8. Adding a new minor where there is a major or an option in a major** (Curriculum Proposal Form)
- 9. Revising a program** (Curriculum Proposal Form)
- X **10. Adding a temporary certificate or AAS degree program** *Approval limited to 2 years*

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

B. Level II:

1. **Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Intent to Plan Form)
2. **Exceeding the 120 credit maximum for baccalaureate degrees** *Exception to policy 301.11*
3. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and Completed Intent to Plan Form, except when eliminating or consolidating)
4. **Re-titling an academic, administrative, or research unit**

Specify Request:

After the first year of offering this program (2014-2015 academic year) it was determined by the instructors, industry, and advisory boards that this program would be better offered as a C.A.S. rather than an A.A.S. This was also supported by industry as students can complete the educational portion of the apprenticeship in a two-year timeframe versus a four-year timeframe which is preferable. Industry also asked for some program course modification to include HVAC and refrigeration courses to meet industry needs as well as less on site time due to issues with students having to travel to the campus for specific training. The program now includes a stronger online component with quarterly meetings to address skills training and assessment. This program revision has been approved by our campus' Academic Standards and Curriculum Revision Committee and by Helena College Leadership. Please see attached program revision document below.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

1. Overview

A. Provide a one paragraph description of the proposed program. Be specific about what degree, major, minor or option is sought.

The current Sheet Metal Apprenticeship Program at Helena College University of Montana was approved by the BOR in 2014 and is currently being offered as an A.A.S. program. Based upon faculty recommendations, advisory board recommendations and industry partner recommendations, this proposal is to change the current program to offer a Certificate of Applied Science (C.A.S.) rather than the previously-approved Associate of Applied Science (A.A.S.).

2. Institutional and System Fit

A. What is the connection between the proposed program and existing programs at the institution?

The Sheet Metal Apprenticeship Program is currently being offered as an A.A.S. It complements other existing design, fabrication/manufacturing, and maintenance programs, and represents Helena College's primary support of the construction industry at this time.

B. Will approval of the proposed program require changes to any existing programs at the institution? If so, please describe.

This change will result in a reduction of credit hours in the current A.A.S. program from 60 to 30, as well as decreasing the face-to-face instructional time. More courses will be provided in the online/hybrid format to provide greater access to students who are working full-time in diverse geographic locations.

C. Describe what differentiates this program from other, closely related programs at the institution (if appropriate).

There are currently no closely related programs at Helena College.

D. How does the proposed program serve to advance the strategic goals of the institution?

A chief strategic goal of Helena College is workforce development. After analysis of the HVAC/Sheet Metal industry, reports from the Department of Labor and Industry, and requests from industry partners through advisory boards, it was noted that formal education and training were required to support the workforce needs of this industry. The revision of the current program will make the apprenticeship program more responsive to the needs of employers, as well as more accessible to potential students/apprentices. The College anticipates improved student retention and completion in this program as a result of the proposed refinements. Another goal at Helena College is community engagement. As an educational program tied to registered apprenticeship, this program reinforces a robust working relationship between the State of Montana Department of Labor & Industry, multiple industry partners and advisory board members, and Helena College. Finally, this program directly supports Governor Bullock's Main Street Montana initiative.

E. Describe the relationship between the proposed program and any similar programs within the Montana University System. In cases of substantial duplication, explain the need for the proposed program at an additional institution. Describe any efforts that were made to collaborate with these similar programs; and if no efforts were made, explain why. If articulation or transfer agreements have been developed for the substantially duplicated programs, please include the agreement(s) as part of the documentation.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

This is the only true sheet metal apprenticeship style program offered in the State. MSU-Northern offers some correspondence courses in sheet metal but has no actual credential associated with those courses.

3. Program Details

A. Provide a detailed description of the proposed curriculum. Where possible, present the information in the form intended to appear in the catalog or other publications. NOTE: In the case of two-year degree programs and certificates of applied science, the curriculum should include enough detail to determine if the characteristics set out in Regents’ Policy 301.12 have been met.

SHEET METAL APPRENTICESHIP PROGRAM REVISION

The Sheet Metal Apprenticeship program has been revised to more closely model the correspondence model without having to sacrifice instructor supervision. The program has changed in the following ways:

1. Program will go from an A.A.S. to a C.A.S. (Associate Degree to Certificate which will still be recognized by the College’s accrediting body and by the State of Montana). Program will consist of 30 credits total selected from the courses below.
2. Program courses will be recommended to be completed in a **two-year** timeframe versus a four-year timeframe, so all academic coursework will be completed in two years and the remainder of the apprenticeship will be acquiring OJT hours.
3. Program will require less face to face shop time and competencies will be evaluated in the field during OJT by qualified personnel (paid by college).
4. Program will have three start times each year which will include January, May, and August so students can enroll in the program at these three times.
5. Students will be required to report to designated site (Helena College or other) for face to face training approximately **four times per year** or eight times in two years (once quarterly) and all other material will be covered online or through distance education but students will have access to an instructor five days per week for questions either by online platform, email, etc.
6. All coursework will be monitored and turned in to the State Apprenticeship Director by Helena College and at the end of four years the student will have completed all the requirements to be a journeyman sheet metal worker.

Updated curriculum will follow the following guidelines	Credits
Safety and Health in the Workplace with OSHA 10 training included	2
Sheet Metal Orientation	2
Materials, Hand Tools, and Rigging	2
Technical Mathematics (Sheet Metal Specific)	3
Drafting and Layout Tools/Basic Fabrication	2
Blueprint Reading and Uniform Building Codes	2
Basic Ductwork Installation/Hangers, Supports, Insulation	2
Installation of Air Distribution Accessories	1
Welding for Sheet Metal**	2
Advanced Layout and Fabrication/Plasma Cutting	3
Heating, Ventilating, Air Conditioning (HVAC) Basics	2
Refrigeration and Air Conditioning Basics	3
Architectural Sheet Metal**	2
Stainless Steel Orientation**	2
Technical Writing (Sheet metal specific)***	3
Human Resources *** (Includes professionalism, resume and cover letter writing, etc.)	2

** Program Alternatives- Students/Private Shops may choose preferred courses

*** Only required for CAS from Helena College (all other courses required for apprenticeship)

Montana Board of Regents
CURRICULUM PROPOSAL FORM

**Revised Sheet Metal Program
Outline**

Sheet Metal CAS	Course	Credits	Lecture	Lab	Hours	Offered	Contact Hours
Safety and Health in Construction (includes OSHA 10)	SHML 100	2	2	0	30	online/distance	OSHA 10
Materials, Hand Tools, Rigging Sheet Metal Orientation/Shop Practices	SHML 120	2	1	1	45	online/shop	30
Technical Math	M111T	3	3	0	45	online/distance	
Drafting and Layout Tools/Basic Fabrication	SHML 170	2	1	1	45	online/shop	30
Basic Blueprint Reading/Building Codes	SHML 200	2	2	0	30	online/distance	
Basic Ductwork Installation/Hangers, Supports, Insulation	SHML 160	2	1	1	45	online/shop	30
Welding for Sheet Metal	SHML 265	2	1	1	45	online/shop	30
Advanced Layout/Plasma Cutting	SHML 270	3	2	1	60	online/shop	30
Installation of Air Distribution Accessories	SHML 225	1	0.5	0.5	30	online/shop	15
Heating, Ventilating, and Air Conditioning	SHML 220	2	2	0	30	online/distance	
Refrigeration and Air Conditioning	SHML 230	2	2	0	30	online/distance	
Technical Writing	WRIT 121	3	3	0	45	online/distance	
Human Resources	HR 110	2	2	0	30	online/distance	
Total Credits		30	23.5	6.5	555		
***Alternate Courses							
Architectural Sheet Metal or Welding	SHML 290	2	1	1		online/shop	30
Stainless Steel Orientation or Refrigeration	SHML 250	2	1	1		online/shop	30

B. Describe the planned implementation of the proposed program, including estimates of numbers of students at each stage.

This program will begin in the Fall of 2016 with an approximate cohort of 8-10 students. There will be three admission times for this program, fall, summer, and spring which could allow for 30 students per year and up to 60 students if first and second year are being offered simultaneously.

4. Need

A. To what specific need is the institution responding in developing the proposed program?

The Governor’s initiative of the Main Street Montana project as well as the Department of Labor and Industry have expressed needs in the area of workforce development as the workforce in Montana is aging and there is an increased need for skilled workers. This need has been expressed by our area industry partners as well as our advisory board and we are being proactive in trying to meet workforce demands in an apprenticeship style format so that workers can be working full-time while still receiving quality education.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

B. How will students and any other affected constituencies be served by the proposed program?

This program will allow students to work full-time and obtain on the job training while also getting their educational component required by the State apprenticeship program. This will allow students, and in some cases their employers, to pay for their education while in the program to avoid large amounts of debt upon completing the program. The average wage for a sheet metal worker is \$25.09 and the mean annual is \$52,190. This program will also assist with workforce development in the State of Montana serving the sheet metal industry statewide.

C. What is the anticipated demand for the program? How was this determined?

According to statistics from the Department of Labor and Industry as well as the Bureau of Labor statistics the sheet metal industry will grow by 7% over the next ten years (<http://www.bls.gov/oes/current/oes472211.htm>) Governor Bullock's Main Street Montana Project report in 2015 stated that construction has been one of Montana's fastest growing industries with employment growth at 5.3% over the year and 1,300 jobs added. As the workforce is aging this trend should continue to support this program as well as other construction programs.

5. Process Leading to Submission

A. Describe the process of developing and approving the proposed program. Indicate, where appropriate, involvement by faculty, students, community members, potential employers, accrediting agencies, etc.

This program was already in place and being offered as an AAS and due to faculty, industry, and advisory board recommendation is it being changed from an A.A.S. to a C.A.S.

6. Resources

A. Will additional faculty resources be required to implement this program? If yes, please describe the need and indicate the plan for meeting this need.

This program will currently only require one adjunct faculty who will have support from the Administrative Assistant of the Trades Division and support from the Trades Division Chair. As the program grows it may require additional faculty.

B. Are other, additional resources required to ensure the success of the proposed program? If yes, please describe the need and indicate the plan for meeting this need.

For the initial implementation of the program two pieces of equipment were purchased with Perkins funding and in order to complete the program equipment needs two more pieces of equipment will be purchased again with Perkins funding.

7. Assessment

A. How will the success of the program be measured?

The success of this program will be measured by student retention and completion as well as growth of the program, job placement, and growth of the program.

June 2016

ITEM 171-2802-LI0616

Request for authorization to offer the Electronics Technician A.A.S.

THAT

Montana State University Northern requests authorization from the Montana Board of Regents to offer the Electronics Technician associate of applied science degree program to facilitate course sharing agreement with Flathead Valley Community College (FVCC).

EXPLANATION

This request is to duplicate the Electronics Technician A.A.S. as implemented by FVCC. FVCC will provide online instruction of lecture portions of the program. MSU Northern will provide hands-on laboratory instruction in support of the online program in accordance with course sharing policies established by OCHE and the BOR and as formalized in MOU documentation between MSUN and FVCC.

ATTACHMENTS

Academic Proposal Request Form
Curriculum Proposal Form
Attachment #1 - MSU Northern program proposal
Attachment #2 – Memorandum of Understanding

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

ITEM 171-2802-LI0616 Submission Month or Meeting: June 2016

Institution: Montana State University Northern CIP Code: 15.0399

Program/Center/Institute Title: Electronics Technician A.A.S.

Includes (please specify below): Online Offering X Options _____

Please mark the appropriate type of request and submit with an Item Template and any additional materials, including those listed in parentheses following the type of request. For more information pertaining to the types of requests listed below, how to complete an item request, or additional forms please visit <http://mus.edu/che/arsa/preparingacademicproposals.asp>.

X **A. Level I:**

Campus Approvals

- 1a. **Placing a postsecondary educational program into moratorium** (Program Termination and Moratorium Form)
- 1b. **Withdrawing a postsecondary educational program from moratorium**
- 2. **Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less**
- 3. **Establishing a B.A.S./A.A./A.S. area of study**
- 4. **Offering an existing postsecondary educational program via distance or online delivery**

OCHE Approvals

- 5. **Re-titling an existing postsecondary educational program**
- 6. **Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)
- 7. **Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)
- 8. **Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)
- 9. **Revising a postsecondary educational program** (Curriculum Proposal Form)
- X 10. **Establishing a temporary C.A.S. or A.A.S. degree program** *Approval limited to 2 years*

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

B. Level II:

1. **Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Intent to Plan Form)
2. **Exceeding the 120 credit maximum for baccalaureate degrees** *Exception to policy 301.11*
3. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and Completed Intent to Plan Form, except when eliminating or consolidating)
4. **Re-titling an academic, administrative, or research unit**

Specify Request:

MSU Northern requests permission to offer degree programs to facilitate a course sharing agreement with Flathead Valley Community College (FVCC). This request is to duplicate the Electronics Technician A.A.S. as implemented at FVCC. FVCC will provide online instruction of lecture portions of the program. MSU Northern will provide hands-on laboratory instruction in support of the online program in accordance with course sharing policies established by OCHE and the BOR and as formalized in MOU documentation between MSUN and FVCC.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

1. Overview

A. Provide a one paragraph description of the proposed program. Be specific about what degree, major, minor or option is sought.

This proposal will establish the Electronics Technician program currently approved for Flathead Valley Community College. Based on course sharing policies developed as part of the RevUP grant, MSU Northern will participate as an assessment center/training center for FVCC courses by providing the hands-on laboratory portions of the degree program. Students will enroll with MSU Northern and will simultaneously be enrolled in distance delivered (D2L) courses instructed by FVCC. The laboratory portions will be scheduled in cooperation and coordination with the programs at FVCC (Attachment A2) and offered in labs at Northern using instructors on the MSUN campus.

2. Institutional and System Fit

A. What is the connection between the proposed program and existing programs at the institution?

Currently MSU Northern offers electronics instruction as part of Automotive and Diesel Technology AAS and BS programs as well as part of the Secondary Ed. Industrial Technology degree and the Electrical Technology AAS degree program. Some coursework in electronics is included in the current Design Drafting program at Northern.

B. Will approval of the proposed program require changes to any existing programs at the institution? If so, please describe.

None anticipated. Instructors will include lab experiences as part of existing course load or receive overload/adjunct contracts to offer the lab instruction.

C. Describe what differentiates this program from other, closely related programs at the institution (if appropriate).

N/A

D. How does the proposed program serve to advance the strategic goals of the institution?

This program reinforces the commitment of MSU Northern to offer technical education programs and to cooperate with colleagues throughout the system in offering instruction.

E. Describe the relationship between the proposed program and any similar programs within the Montana University System. In cases of substantial duplication, explain the need for the proposed program at an additional institution. Describe any efforts that were made to collaborate with these similar programs; and if no efforts were made, explain why. If articulation or transfer agreements have been developed for the substantially duplicated programs, please include the agreement(s) as part of the documentation.

As indicated, this is a course-sharing program established through the RevUP course sharing initiative. A copy of the MOU with FVCC is attached. (Attachment A2)

Montana Board of Regents
CURRICULUM PROPOSAL FORM

3. Program Details

- A. Provide a detailed description of the proposed curriculum. Where possible, present the information in the form intended to appear in the catalog or other publications. NOTE: In the case of two-year degree programs and certificates of applied science, the curriculum should include enough detail to determine if the characteristics set out in Regents' Policy 301.12 have been met.**

See program proposal. (Attachment A1)

- B. Describe the planned implementation of the proposed program, including estimates of numbers of students at each stage.**

This program was incorporated to take advantage of existing labs used for Electronics Engineering Technology instruction that has been eliminated due to lack of enrollment. Since that time employers in the MSU Northern service region, particularly Triangle communications, Nemont and other companies in the telecommunications and energy sector have identified a need to replace significant numbers of technicians to replace a graying workforce. This program is viewed as a cost effective, innovative solution to that need. If approved, promotion of this innovative program will begin Fall 2016 with the goal of enrolling 5 students during the 2016/17 academic year. Capacity of the program is roughly 20 total students, spread across the two-year program.

4. Need

- A. To what specific need is the institution responding in developing the proposed program?**

FVCC and the RevUP grant has identified a statewide demand for trained electronics technicians. This program seeks to expand the audience and ability to deliver instruction to that audience.

- B. How will students and any other affected constituencies be served by the proposed program?**

Graduates will be qualified to fill good-paying jobs in a growing career field.

- C. What is the anticipated demand for the program? How was this determined?**

Estimates from FVCC indicate a demand of over 10 students per year using this course-sharing model.

5. Process Leading to Submission

- A. Describe the process of developing and approving the proposed program. Indicate, where appropriate, involvement by faculty, students, community members, potential employers, accrediting agencies, etc.**

The program of course sharing was developed as part of the Two-Year leadership council using the RevUP grant as impetus. The program itself echoes the successful program offered by FVCC, and as implemented at Northern has been reviewed and approved by COTS faculty, the MSUN Academic Senate and by the MSUN administration.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

6. Resources

- A. Will additional faculty resources be required to implement this program? If yes, please describe the need and indicate the plan for meeting this need.**

Faculty currently on staff will provide support for this program with the availability for adjunct instructors from the local community as the program expands.

- B. Are other, additional resources required to ensure the success of the proposed program? If yes, please describe the need and indicate the plan for meeting this need.**

FVCC has provided substantial equipment and material support through the RevUP grant. No additional resources are required at this time.

7. Assessment

- A. How will the success of the program be measured?**

Success will be gauged based on continued progress of enrolled students with successful completion within three years.

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steve Don Dean [Signature] Date 1/29/12
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ECP 104

Course Title: Workplace Safety
Credits: 1

Required by: Machinist Technician AAS
Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: .5
Contact hours lab: 1

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course incorporates the Related Instruction requirement for Interactions into the study of policies, compliance, enforcement, and reporting of work site safety issues. In addition, the American Red Cross Standards for First Aid and CPR training are presented to provide the skills necessary to efficiently respond to workplace emergencies. Coursework will focus on personal ability to act and interact ethically and effectively in both self-practice and co-worker enforcement of safety policies. The ethical responsibility to report safety violations and means of coping with accidents that involve the death of a team member or mass casualties within a workplace will also be studied. Students will employ hands-on practices to demonstrate skills in first aid and CPR. Real life scenarios will be presented to enable students in gaining an understanding of one's self and co-workers in relationship to responding, treating, and coping with workplace safety practices and medical emergencies.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Recognize one's personal strength and weakness in relationship to workplace safety and emergency care.
- Set goals and work in a self-directed manner to ensure a safe and efficient physical workplace.
- Demonstrate responsibility/accountability for personal actions/thoughts/emotions in responding to a work site emergency.
- Collaborate effectively with others in providing support medical treatment of mass casualties, including nature of injuries, treatment, and priority of evacuation.
- Demonstrate the interpersonal skills necessary to tactfully correct workplace safety violations by co-workers.
- Assess the moral issues and principles involved in reporting work site safety violations.
- Recognize that conflict is natural in the stages of grief associated to co-workers experiencing a death related to a workplace accident and demonstrate methods of successful conflict management.
- Recognize and then act using the skills needed in a situation requiring first aid and/or CPR.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: EELE 101

Course Title: Introduction to Electrical Fundamentals
Credits: 2

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab: 2

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an introductory course, in a lecture + lab format, in electrical fundamentals including Kirchhoff's Laws, power and energy in resistive circuits, use of meters and oscilloscopes, time-varying signals in electric circuits, inductors and capacitors, series and parallel resonance circuits, and digital circuits. The primary objective of this course is to introduce students, in a hands-on setting, to the proper use of basic electrical instruments, including multi-meters, DC power supplies, function generators, and oscilloscopes in the measurement, testing, construction, and analysis of basic electrical and electronic components, circuits, and devices.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Read and interpret basic electrical circuit diagrams.

- Identify and use in basic electrical circuits components such as resistors, capacitors, inductors, and diodes.
- Use ohmmeters, ammeters, voltmeters, multi-meters, signal generators, and oscilloscopes to make measurements of electrical quantities in a laboratory setting.
- Collect, analyze, and interpret experimental results and draw logical conclusions.
- Present experimental results in accepted written scientific form, including tables and graphics.
- Design basic circuits and experiments to test theoretical predictions by experiment.
- Demonstrate a working knowledge of accepted electrical laboratory procedures, methods, and safety practices.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 100x

Course Title: Introduction to Electricity
Credits: 2

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 2
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an introductory class in electrical fundamentals. A practical approach will be used for the study of electricity including Ohm's Law; power; series and parallel circuits; direct and alternating current. A strong emphasis will be placed on diagrams and troubleshooting. Co-requisite: ELCT 100y.

Course Outcome Objectives:

- **Upon successful completion of this course, the student should be able to:**
- Understand and use Ohm's Law in practical situations
- Understand series and parallel circuits
- Solve problems using Kirchhoff's Laws
- Read simple wiring diagrams

- Read the National Electrical Code ampere capacity (ampacity) tables and apply them, with Ohm's and Kirchhoff's Laws, to determine proper wire sizes
 - Describe the features associated with static electricity
- Understand alternating and direct current and how they are produced

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter: Steve Don Dean: [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 100y

Course Title: Introduction to Electricity Lab
Credits: 1

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 2

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an introductory class in electrical fundamentals. A practical approach will be used for the study of electricity including Ohm's Law; power; series and parallel circuits; direct and alternating current. A strong emphasis will be placed on diagrams and troubleshooting. Course Fee: \$35. Co-requisite: ELCT 100x.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Understand and use Ohm's Law in practical situations
- Understand series and parallel circuits
- Solve problems using Kirchhoff's Laws
- Read simple wiring diagrams
- Demonstrate the use of test equipment to troubleshoot

- Read the National Electrical Code ampere capacity (ampacity) tables and apply them, with Ohm's and Kirchoff's Laws, to determine proper wire sizes
 - Describe the features associated with static electricity
- Understand alternating and direct current and how they are produced

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Alven Dan Signature _____ Dean [Signature] Signature (indicates "college" level approval) _____ Date 1/29/16

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 110x

Course Title: Basic Electricity I
Credits: 4

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 4
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will introduce the student to the various electrical properties and the equipment which produces those properties. Basic circuitry will be examined, utilizing algebraic skills to perform the calculations. Pre-requisite: ELCT 100x, ELCT 100y or consent of instructor. Co-requisite: ELCT 110y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Understand and apply the first three chapters of the National Electrical Code
- Demonstrate an advanced understanding of Ohm's and Kirchhoff's Laws
- Demonstrate an understanding of electrical measuring instruments
- Understand magnetic induction, capacitive reactance and resistance, and their relevance in series and parallel circuits

- Use basic trigonometry and vector algebra in the solution of electrical problems

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 110y

Course Title: Basic Electricity I Lab
Credits: 1

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 2

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will introduce the student to the various electrical properties and the equipment which produces those properties. Basic circuitry will be examined, utilizing algebraic skills to perform the calculations. Course Fee: \$50.00. Pre-requisite: ELCT 100x and ELCT 100y or consent of instructor. Co-requisite: ELCT 110x.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Understand and apply the first three chapters of the National Electrical Code
- Demonstrate an advanced understanding of Ohm's and Kirchhoff's Laws
- Demonstrate an understanding of electrical measuring instruments
- Understand magnetic induction, capacitive reactance and resistance, and their relevance in series and parallel circuits

- Use basic trigonometry and vector algebra in the solution of electrical problems

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steve Don Signature _____ Dean [Signature] Signature (indicates "college" level approval) _____ Date 1/29/16

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 137x

Course Title: Electrical Drafting Lecture
Credits: 1

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1 per week
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will have students develop techniques of communicating through the use of mechanical drawings. Electrical drawings; heating; ventilation and air condition drawings. Basic blueprint reading and sketching are included.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Understand residential and some commercial blueprints and how to install a complete wiring system including an electrical service
- Produce a complete wiring system for residential and some commercial blueprints that do not ordinarily include such systems
- Identify and use the proper symbols on a blueprint
- Demonstrate how to translate the symbols on a blueprint to what must be done on an actual job

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steven Don Signature _____ Dean [Signature] Signature (indicates "college" level approval) Date 1/29/16

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 137y

Course Title: Electrical Drafting Lab
Credits: 1

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 2 per week

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will have students develop techniques of communicating through the use of mechanical drawings. Electrical drawings; heating; ventilation and air condition drawings. Basic blueprint reading and sketching are included.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Understand residential and some commercial blueprints and how to install a complete wiring system including an electrical service
- Produce a complete wiring system for residential and some commercial blueprints that do not ordinarily include such systems
- Identify and use the proper symbols on a blueprint
- Demonstrate how to translate the symbols on a blueprint to what must be done on an actual job

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Stevea Dem Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 102x

Course Title: Electrical Fundamentals II - Lecture
Credits: 3

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3 per week
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will introduce the student to alternating current. The electrical properties and their effects on the circuit will be examined. Basic trigonometric skills will be utilized to perform calculations for analyzing various electrical circuits. Pre-requisite: ELCT 110x, ELCT 110y, BMGT 205c and M 114

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Understand residential and some commercial blueprints and how to install a complete wiring system including an electrical service
- Produce a complete wiring system for residential and some commercial blueprints that do not ordinarily include such systems
- Identify and use the proper symbols on a blueprint
- Demonstrate how to translate the symbols on a blueprint to what must be done on an actual job

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steve Don Dean [Signature] Date 2/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 102y

Course Title: Electrical Fundamentals II - Lab
Credits: 1

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 2 per week
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will introduce the student to alternating current. The electrical properties and their effects on the circuit will be examined. Basic trigonometric skills will be utilized to perform calculations for analyzing various electrical circuits. Pre-requisite: ELCT 110x, ELCT 110y, BMGT 205c and M 114

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Understand residential and some commercial blueprints and how to install a complete wiring system including an electrical service
- Produce a complete wiring system for residential and some commercial blueprints that do not ordinarily include such systems
- Identify and use the proper symbols on a blueprint
- Demonstrate how to translate the symbols on a blueprint to what must be done on an

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELEC 111

Course Title: Electric Meters & Motors
Credits: 3

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1 per week
Contact hours lab: 4 per week

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course is a practical hands-on course using ammeters, voltmeters, watt meters, and multi-meters in testing and troubleshooting electric motors, components and wiring systems. This course includes a study of single and three-phase AC motors, their construction features and operating characteristics. This lecture/lab class emphasizes electric motor terminology, identification of motor types, enclosures, mounts, motor selection, connections, maintenance, testing and troubleshooting. Students are also introduced to motor loads, protection, controls, and devices used to connect motors to their loads such as pulleys, V-belts, gear boxes and couplings

Course Outcome Objectives:
Upon successful completion of this course, the student should be able to:

Course Outcome Objectives:

The student will become:

- Proficient in the use of basic hand-held electrical test equipment including
 - Ammeters
 - Voltmeters
 - Multimeters

- **Wattmeters**
- **Familiar with basic electrical rotating machinery including**
 - **Electric motors**
 - **Generators**
 - **Protective switching equipment**
 - **Thermal overloads**
 - **Magnetic motor starters**
- **Familiar with both single and three-phase electrical circuits including motors, switching equipment, electrical protection equipment and circuit fault interrupter circuits.**
- **Able to identify the various types of electric motors, starters and control circuits.**
- **Familiar with typical mechanical components of electric motor installations including**
 - **Fans**
 - **pulleys**
 - **V-belts**
 - **Gears**
 - **Mounting hardware**
 - **Conductor sizing**
 - **Overload sizing**
 - **Overcurrent protection sizing**

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steven Don Dean [Signature] Date 1/29/12
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 130x

Course Title: Panel Wiring and Soldering - lecture
Credits: 0.8

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1 per week
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will introduce the student to the physical assembly and wiring of electrical/industrial control panels. The course will teach the fundamentals of torque and soldered connections for complete installation of wires, cables, and components. The basics of electrical schematics and wiring diagrams will be taught in relation to wiring control panels.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

Course Outcome Objectives:

- Read electrical schematics and wiring diagrams used in control panel fabrication
- Apply solder at the correct melting temperature and amount by using color visual techniques to assure a quality electrical connection
- Lay down and terminate electrical control wiring in a logical and clean presentation
- Terminate electrical control wiring with the proper amount of torque for safety and reliability

- Understand how to resistance check each soldered or pressured termination
- Perform proper cleaning techniques on soldering tools
- Identify ergonomic position and posture for all-day assembly work
- Use wire identification and labelling tools

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college"-level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 130y

Course Title: Panel Wiring and Soldering - lab
Credits: 1.2

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 3 per week

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will introduce the student to the physical assembly and wiring of electrical/industrial control panels. The course will teach the fundamentals of torque and soldered connections for compliant installation of wires, cables, and components. The basics of electrical schematics and wiring diagrams will be taught in relation to wiring control panels.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Read electrical schematics and wiring diagrams used in control panel fabrication
- Apply solder at the correct melting temperature and amount by using color visual techniques to assure a quality electrical connection
- Lay down and terminate electrical control wiring in a logical and clean presentation
- Terminate electrical control wiring with the proper amount of torque for safety and reliability

- Understand how to resistance check each soldered or pressured termination
- Perform proper cleaning techniques on soldering tools
- Identify ergonomic position and posture for all-day assembly work
- Use wire identification and labeling tools

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steven Dem Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 245x
Course Title: Digital Electronics
Credits: 3
Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course explores digital electronic circuits and devices that make up a computer system. Topics include binary and hexadecimal number systems, Boolean algebra and digital logic theory, simple logic circuits, combinatorial logic, and sequential logic. Analog-to-digital and digital-to-analog interfaces are covered. Includes lab exercises. Pre-requisite: ELCT 110x and ELCT 110y. Co-requisite: ETEC 245y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Identify analog and digital electrical signals
- Convert among decimal, binary, octal, and hexadecimal number systems
- Explain the operation of digital logic gates

- Identify and explain combinatorial, sequential, and other logic circuits
- Name and describe the function of various data conversion devices
- Troubleshoot digital circuits using standard and specialized test equipment

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____
Submitter Steve Don Dean [Signature] Date 1/29/16
Signature (indicates college level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 245y
Course Title: Digital Electronics Lab
Credits: 1
Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 2

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course explores digital electronic circuits and devices that make up a computer system. Topics include binary and hexadecimal number systems, Boolean algebra and digital logic theory, simple logic circuits, combinatorial logic, and sequential logic. Analog-to-digital and digital-to-analog interfaces are covered. Includes lab exercises. Course Fee: \$50. Pre-requisite: ELCT 110x and ELCT 110y. Co-requisite: ETEC 245x.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Identify analog and digital electrical signals
- Convert among decimal, binary, octal, and hexadecimal number systems
- Explain the operation of digital logic gates

06/2016 Submission Use Boolean algebra to express logic operations as equations

- Identify and explain combinatorial, sequential, and other logic circuits
- Name and describe the function of various data conversion devices
- Troubleshoot digital circuits using standard and specialized test equipment

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature Signature (indicates college level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 250x

Course Title: Solid State Electronics
Credits: 1

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an introduction to semiconductor technologies used in solid state electronics with an emphasis on diodes and transistors. Lab exercises reinforce and illustrate lecture topics. Pre-requisite: ELCT 110x and ELCT 110y. Co-requisite: 250y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Describe semiconductors and how current is produced in a semiconductor
- Describe n-type and p-type semiconductors and a pn junction
- Explain and analyze diode circuits with applications
- Describe the characteristics of bipolar junction transistors and analyze their operation

- Determine the dc operating point of a linear amplifier
- Analyze transistor bias circuits
- Describe JFET and MOSFET transistors and their circuits

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 250y

Course Title: Solid State Electronics Lab
Credits: 3

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 6

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an introduction to semiconductor technologies used in solid state electronics with an emphasis on diodes and transistors. Lab exercises reinforce and illustrate lecture topics. Course Fee: \$50. Pre-requisites: ELCT 110x and ELCT 110y. Co-requisites: ETEC 250x.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Describe semiconductors and how current is produced in a semiconductor
- Describe n-type and p-type semiconductors and a pn junction
- Explain and analyze diode circuits with applications
- Describe the characteristics of bipolar junction transistors and analyze their operation
- Describe and analyze the operation of different types of amplifiers

- Determine the dc operating point of a linear amplifier
- Analyze transistor bias circuits
- Describe JFET and MOSFET transistors and their circuits

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 210x
Course Title: Advanced Current Theory
Credits: 4
Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 4
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course is a study of three phase alternating current circuits and single and three phase transformers and machines. The theory and operation of three phase wye and delta circuits and the relationship of voltage, current and power in these circuits. The use of phasor algebra in the solution of alternating current problems is stresses as are the characteristics and use of electrical instruments such as voltmeters, ammeters, ohmmeters, and watt meters. Students learn the theory and operation of transformers with single and three phase connections and are introduced to alternating current machines. Pre-requisites: ELCT 102x and ELCT 102y. Co-requisites: ELCT 210y.

Course Outcome Objectives:
Upon successful completion of this course, the student should be able to:

- Synthesize the theory and operation of three phase wye and delta circuits and the relationship of voltage, current and power in these circuits.
- Employ the use of phasor algebra in calculating the solution of alternating current problems.
- Safely and accurately employ electrical instruments such as voltmeters, ammeters, ohmmeters, and watt meters in relationship to electrical exercises.
- Synthesize the theory and operation of transformers with single and three phase connections and alternating current machines.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____
Submitter Steve Don Dean [Signature] Date 6/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 210y
Course Title: Advanced Current Theory Lab
Credits: 1
Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 2

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course is a study of three phase alternating current circuits and single and three phase transformers and machines. The theory and operation of three phase wye and delta circuits and the relationship of voltage, current and power in these circuits. The use of phasor algebra in the solution of alternating current problems is stresses as are the characteristics and use of electrical instruments such as voltmeters, ammeters, ohmmeters, and watt meters. Students learn the theory and operation of transformers with single and three phase connections and are introduced to alternating current machines. Course Fee: \$35. Pre-requisites: ELCT 102x and ELCT 102y. Co-requisites: ELCT 210x.

Course Outcome Objectives:
Upon successful completion of this course, the student should be able to:

- Synthesize the theory and operation of three phase wye and delta circuits and the relationship of voltage, current and power in these circuits.
- Employ the use of phasor algebra in calculating the solution of alternating current problems.
- Safely and accurately employ electrical instruments such as voltmeters, ammeters, ohmmeters, and watt meters in relationship to electrical exercises.
- Synthesize the theory and operation of transformers with single and three phase connections and alternating current machines.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 280

Course Title: Advanced Electronics
Credits: 4

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 4
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will involve the study of how various industrial processes are coalesced using advanced PLC techniques. The course will illustrate the use of electrical, electronic solid state, digital, and pneumatic transmitters in practical process control instrumentation. There will be an emphasis on application of principles. Prerequisites: ETEC 245, ETEC 250. Course Fee: \$25

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Describe how various industrial processes are coalesced using advanced PLC techniques
- Demonstrate the use of electrical, electronic solid state, digital, and pneumatic transmitters in practical process control instrumentation

- Successfully use techniques to trouble shoot electromechanical and solid state problems

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____
Submitter Steven Don Signature _____ Dean [Signature] Date 1/29/16
Signature (Indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 285
Course Title: Advanced Programmable Controllers
Credits: 3
Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an advanced course in programmable controllers that emphasizes programming circuits using relay type instructions, timers, counters, data manipulation, arithmetic functions, and other advanced techniques. Prerequisites: ELCT 250. Course Fee: \$50

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Demonstrate the ability to program a variety of timers
- Operate analog input/output devices
- Apply programmable controller networking basics
- Install and configure PLC programming software
- Program a human machine interface (HMI) used in machine control

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____

Submitter Steve Dem Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ELCT 211

Course Title: AC Measurements
Credits: 3

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 2
Contact hours lab: 2

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This lecture/lab course consists of a series of experiments to investigate the characteristics of single-phase and three-phase electrical circuits. The connections and testing of transformers in both single-phase and three-phase configurations are stressed. Students also learn the operation of three phase motors from conventional sources and phase converters, with an emphasis on efficiency, operating characteristics and connections. Pre-requisite ELCT 102

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Synthesize the theory and operation of three phase wye and delta circuits and the relationship of voltage, current and power in these circuits.
- Employ the use of phasor algebra in calculating the solution of alternating current problems.

- Safely and accurately employ electrical instruments such as voltmeters, ammeters, ohmmeters, and watt meters in relationship to electrical exercises.
- Synthesize the theory and operation of transformers with single and three phase connections and alternating current machines.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Electronics Technician Date _____
Submitter Steven Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Electronics Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Electronics Technician
Date:
Course Prefix & No.: ETEC 299

Course Title: Capstone: Electronics
Credits: 3

Required by: Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course provides opportunities for the student to arrange to complete special projects using knowledge gained in previous course work. All projects must be approved by the instructor. Prerequisites: Enrollment in Electronics Technician Level IV. Course Fee: \$50

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Use knowledge gained from the program to identify an appropriate project
- Produce all necessary paperwork and documentation for the project
- Synthesize knowledge gained from the program to complete the project
- Communicate the results in a written and/or oral report

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

DRAFT 9/14/15

Memorandum of Understanding

This Agreement is made between Flathead Valley Community College ("FVCC") and _____, (the Enrolling Institution or "EI"); collectively the "Parties." This Agreement shall be deemed executed and agreed to by both Parties as of the date it has been signed by both Parties.

RECITALS

WHEREAS, FVCC and the Enrolling Institution wish to establish a course sharing agreement between them, for the purpose of enabling students enrolled at the EI to take certain online courses through FVCC; and

WHEREAS, both FVCC and the EI are Montana 2-year colleges that are participating as consortium members in the Trade Adjustment Assistance Community College and Career Training Grant #TC-25034-13-60-A-30 ("RevUp"); and

WHEREAS, RevUp establishes a mechanism to offer students across the State of Montana the opportunity to take advanced manufacturing online courses developed by FVCC at their Enrolling Institution, which also functions as an "Assessment Center" by offering the lab portions of such online courses to students; and

WHEREAS, this Course Sharing Memorandum of Understanding is necessary to establish the responsibilities of the EI and FVCC and to apportion funding and student counts between the colleges;

NOW, THEREFORE it is mutually agreed as follows:

1. Term of MOU. This MOU shall be effective January 1, 2016 and shall be in effect through the end of the RevUp grant.

2. Academic Calendar. FVCC's academic calendar governs this MOU.

3. Academic Catalog. The EI agrees to put the FVCC programs and associated courses listed on the attached Exhibit A in their academic catalog (except those courses not offered online), including FVCC's pre-requisites, co-requisites, course sequencing and placement guidelines (see Course Profiles, Exhibit B), and will secure any necessary approvals for such action, including approvals required by the Montana Board of Regents.

All of FVCC's programs require: one quantitative (math) course, one or two communication courses, an interactions course and one basic computer course. If one of the EI's students would like to substitute a different course than specified in Exhibit A, the student must secure approval for such substitution from the EI.

4. Course Schedule. FVCC will offer the online courses set forth below in the spring 2016 semester (See Exhibit A for details), and will add additional sections of these courses, subject to instructor availability, should demand and enrollment exceed existing class capacity.

Industrial Maintenance: Tier II

Machinist Technician: Tier II and Tier IV

Electronics Technician: Tier II and Tier IV

Following the spring 2016 semester, FVCC will collaborate with the EI on scheduling, and will determine the sequence of courses and course schedule, including labs, by mutual agreement.

5. Course Content. The EI agrees to the course syllabi prepared by FVCC instructors for the lecture component of FVCC's online courses for the spring 2016 semester, copies of which will be provided to the instructors teaching the lab portion of FVCC's online courses. EI lab instructors will prepare a syllabus for the lab portion of these courses that is integrated into the lecture portion of the course and that is consistent with the course profiles attached as Exhibit B. The EI lab instructors will be added as students to the online lecture courses, which access shall serve as the primary source of course content and course progress for the instructors.

The lab schedule will be determined by the FVCC online instructor and the EI lab instructor with sufficient flexibility to ensure student success while achieving course outcomes. FVCC will provide its own lab course schedule to the EI to assist in developing the EI's lab schedule. The lab schedule at the EI must be available to students when the EI course schedule is published.

In addition, the EI agrees to ensure qualified instructors teach the same learning outcomes in the labs as FVCC, per the Course Profiles and Common Course Numbering Guidelines, and that such instructors will confer as needed with FVCC's instructors to assure student success in the online courses. Course profiles for all FVCC online courses are attached on Exhibit B.

After the spring 2016 semester, FVCC and the EI will collaborate on the curriculum and any changes thereto will be mutually agreed upon.

6. Class Size. Current enrollments in FVCC's online courses are displayed in the Course Schedule located on FVCC's web site.

7. Learning Management System. FVCC will provide students secure access to FVCC's learning management system – Eagle Online. Each student will have a user name and password to access the system. FVCC will provide technical support to the students throughout their enrollment in online FVCC courses.

8. Class Rules and Policies. Unless otherwise mutually agreed to by the Parties, FVCC's class rules and policies regarding attendance, performance and behavior will be the applicable standard for FVCC's online courses. Any student misconduct will be reported to the EI, who assumes responsibility for addressing such misconduct.

9. Grades. Grades for the lecture portion of FVCC's courses will be sent to the EI no later than 5:00 p.m. five (5) business days following the end of the semester. Any grade appeals will be made by a student first to the FVCC instructor and then through the EI's academic appeals process. The EI will award and hold all student transcripts for students taking any FVCC online courses.

10. Tuition and Fees. The EI will remit tuition compensation (based on the lowest credit hour cost amongst RevUp consortium member colleges) and FVCC's Distance Education (DE) fees to FVCC as of the 15th class day by no later than the 35th class day. FVCC will determine the tuition amount each year and

will convey this information to the EI prior to the beginning of the fall semester. FVCC's current DE fees are posted in its academic catalog and on its website. Any other fees the EI may charge its students are kept by the EI.

FVCC student withdrawal dates will govern with respect to refunds, and in the event of a withdrawal, the EI will coordinate any such refunds with FVCC according to the EI's established practices.

11. Student Enrollment Full Time Equivalency. The EI is entitled to maintain and report all student FTEs for those students affected by this course sharing MOU.

12. Advising. All student advising will be the responsibility of the EI. The EI will include information for its students about FVCC's online advanced manufacturing courses as part of its student advising.

13. Registration. The EI will be responsible for student registration. The EI shall provide FVCC's Registrar and Instructional Technology Specialist a list of EI students enrolling in FVCC online courses in an Excel spreadsheet (including student contact information), plus the fully executed Student Information and Consent Agreement (Exhibit C), no less than five (5) days prior to the start of class.

14. Financial Aid. The EI is responsible for student financial aid. The EI will allow FVCC's online courses to be included in a student's course load for financial aid purposes.

15. Family Educational Rights and Privacy Act (FERPA). The Parties agree to abide by the provisions of FERPA. Students affected by this Course Sharing MOU will be required by the EI to sign the Student Information and Consent Agreement attached as Exhibit C, and an executed copy of the consent agreement will be provided to FVCC prior to the start of the class for which the student is registered. FVCC and the EI agree that they shall only communicate about matters directly related to students only through FERPA-compliant means, such as the use of encrypted email that is password protected.

16. Termination of MOU. Either party may terminate this MOU, with or without cause, with 30 days' prior written notice delivered to the non-terminating college's CEO.

17. Indemnification. The EI, on behalf of itself, its directors, trustees, partners, employees, affiliates, agents, guests, and each of their agents, affiliates, successors and assigns, hereby releases and shall defend FVCC and each of its officers, agents, employees, assigns and successors in interest from and against, any and all liability, damages, losses, claims, demands, actions, causes of action, costs (including attorney's fees and expenses), or any of them, past, present or future, known or unknown, arising out of or in connection with this MOU, and shall indemnify and hold FVCC harmless to the extent allowed by law.

FVCC, on behalf of itself, its directors, trustees, partners, employees, affiliates, agents, guests, and each of their agents, affiliates, successors and assigns, hereby releases and shall defend the EI and each of its officers, agents, employees, assigns and successors in interest from and against, any and all liability, damages, losses, claims, demands, actions, causes of action, costs (including attorney's fees and expenses), or any of them, past, present or future, known or unknown, arising out of or in connection with this MOU, and shall indemnify and hold the EI harmless to the extent allowed by law.

18. Entire Agreement. This Agreement contains the entire agreement and understanding between the Parties regarding course sharing of FVCC online advanced manufacturing courses, and merges and supersedes all prior representations and discussions pertaining to the subject matter herein.

19. Amendment. Any changes, exceptions, or different terms and conditions shall be only by written amendments to this Agreement, mutually agreed to and executed by the Parties.

20. Severability. The invalidity or unenforceability of any provisions of this course sharing MOU shall not affect the validity or enforceability of any other provision of this MOU, which shall remain in full force and effect.

21. Interpretation and Jurisdiction. This Agreement shall be interpreted, governed, and construed under the laws of the State of Montana.

22. Binding Authority. The person signing this Agreement represents that he or she is duly authorized to execute this Agreement on behalf of the Party for whom he or she signs, and to fully bind such Party to this Agreement.

Flathead Valley Community College:

By: _____

Date: _____

Jane A. Karas, Ph.D., President

_____, Enrolling Institution:

By: _____

Date: _____

Name and Title

EXHIBIT A

FVCC ONLINE ADVANCED MANUFACTURING PROGRAMS

{Italicized courses are not offered online}

Electronics Technician, CT, CAS, AAS

Fall Semester (Tier I)

Course#	Title	Credits
CAPP 106*	Short Courses: Computer Applications	1
or		
CAPP 114	Short Courses: MS Word	1
or		
CAPP 116	Short Courses: MS Excel	1
ECP 104	Workplace Safety	1
ELCT 100	Introduction to Electricity	3
ELCT 110	Basic Electricity I	5
ELCT 137	Electrical Drafting	2
M 114*	Extended Technical Mathematics	3
MCH 101	Intro to Manufacturing Processes	1
	Semester Total	16

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier II)

Course#	Title	Credits
BMGT 205C	Professional Business Communication	
or		
COMX 115C	Intro. to Interpersonal Communications	3
ELCT 102*	Electrical Fundamentals II	4
ELCT 111	Electric Meters and Motors	3
ETEC 130	Panel Wiring and Soldering	2
PHSX 110*	Applied Physics	4
	Semester Total	16
	CAS Total Credits	32

**Indicates prerequisite and/or corequisite required; check course description.*

Fall Semester (Tier III)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
ELCT 210*	Advanced Current Theory	5
ELCT 250	Programmable Logic Controllers	4
ETEC 245*	Digital Electronics	4
ETEC 250*	Solid State Electronics I	4
	Semester Total	17

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier IV)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
BMGT 205C*	Professional Business Communication	
	or	
COMX 115C	Intro to Interpersonal Communication	3
ELCT 211*	AC Measurements	3
ETEC 280*	Advanced Electronics	4
ETEC 285*	Adv. Programmable Controllers	4
ETEC 299*	Capstone: Electronics	3
	Semester Total	17
	AAS Degree Total Credits	66

**Indicates prerequisite and/or corequisite required; check course description.*

Industrial Maintenance, CT

Fall Semester (Tier I)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
ECP 104	Workplace Safety	1
ELCT 100	Introduction to Electricity	3
M 111*	Technical Mathematics	3
MCH 101	Intro. to Manufacturing Processes	1
MCH 120	Blueprint Reading & Int. Mach.	3
MCH 129	Machine Quality Control and Precision Measurements	3
MCH 132*	Introduction to Engine Lathes	4
	Semester Total	18

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier II)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
BMGT 205C	Professional Business Communication	
	or	
COMX 115C	Intro to Interpersonal Communication	3
CAPP 106*	Short Courses: Computer Applications	
	or	
CAPP 114	Short Courses: MS Word	
	or	
CAPP 116	Short Courses: MS Excel	1
CSTN 125	Basic Cabinetry and Furniture Making	3
ELCT 111	Electric Meters and Motors	3
MCH 102	Intro to Manufacturing Materials	2
WLDG 111*	Welding Theory I Practical	4
	Semester Total	16
	CAS Total Credits	34

Industrial Machine Technology, AAS, CAS, CT

Fall Semester (Tier I)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
ECP 104	Workplace Safety	1
M 111*	Technical Mathematics	3
MCH 101	Intro to Manufacturing Processes	1
MCH 120	Blueprint Reading & Int. Mach.	3
MCH 129	Machine Quality Control and Precision Measurements	3
MCH 132	Introduction to Engine Lathes	4
MCH 134	Introduction to Mills	4
	Semester Total	19

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier II)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
BMGT 205C	Professional Business Communication	
	or	
COMX 115C	Intro to Interpersonal Communication	3
DDSN 135	Solidworks	2

MCH 102	Intro. to Manufacturing Materials	2
MCH 122	Introduction to CAM	3
MCH 125*	Intro to CNC Lathe Operations	3
MCH 127*	Intro to CNC Mill Operations	3
MFGT 115	Machine Shop Fundamentals	2
	Semester Total	18
	CAS Total Credits	37

Fall Semester (Tier III)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
MCH 220*	Geometric Dimensioning and Tolerancing	3
MCH 221*	Advanced Manual Mill	3
MCH 222*	Advanced CNC Mill Operations	3
MCH 225	Machinery's Handbook	3
MCH 226*	Advanced CAD/CAM	4
	Semester Total	16

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier IV)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
BMGT 205C*	Professional Business Communication	
or		
COMX 115C	Intro to Interpersonal Communication	3
MCH 227*	Swiss CNC and Mill-Turn Systems	4
MCH 223*	Advanced Manual Lathe	3
MCH 224*	Advanced CNC Lathe Operations	3
MCH 299*	Capstone: Machinist	3
	Semester Total	16
	AAS Degree Total Credits	69

**Indicates prerequisite and/or corequisite required; check course description.*

Note: Although M111 and M114 are offered fully online, students are required to schedule a 1 hour conference with their instructor each week.

EXHIBIT B: COURSE PROFILES

Proposed Course Splits			
ELCT	100	Introduction to Electricity	ELCT 107 – Lecture Only
			ELCT 108 – Lab Only
ELCT	110	Basic Electricity I	ELCT 112 – Lecture Only
			ELCT 113 – Lab Only
ELCT	137	Electrical Drafting	ELCT 135 – Lecture Only
			ELCT 136 – Lab Only
ELCT	210	Advanced Current Theory	ELCT 208 – Lecture Only
			ELCT 209 – Lab Only
ELCT	250	Programmable Logic Controllers	ELCT 248 – Lecture Only
			ELCT 249 – Lab Only
ETEC	245	Digital Electronics	ETEC 243 – Lecture Only
			ETEC 244 – Lab Only
ETEC	250	Solid State Electronics	ETEC 248 – Lecture Only
			ETEC 249 – Lab Only
MCH	101	Introduction to Manufacturing Processes	MCH 105 – Lecture Only
			MCH 106 – Lab Only
MCH	120	Blueprint Reading and Interpretations for Machining	MCH 118 – Lecture Only
			MCH 119 – Lab Only
MCH	129	Machine Quality Control and Precision Measurements	MCH 126 – Lecture Only
			MCH 128 – Lab Only
MCH	132	Introduction to Engine Lathes	MCH 131 – Lecture Only
			MCH 133 – Lab Only
MCH	134	Introduction to Mills	MCH 135 – Lecture Only
			MCH 138 – Lab Only
MCH	221	Advanced Manual Mill	MCH 216 – Lecture Only
			MCH 217 – Lab Only
MCH	222	Advanced CNC Mill Operations	MCH 218 – Lecture Only
			MCH 219 – Lab Only
MCH	226	Advanced CAD-CAM	MCH 228 – Lecture Only
			MCH 229 – Lab Only

EXHIBIT C

STUDENT INFORMATION AND CONSENT AGREEMENT

For students enrolling in courses offered through the RevUp Consortium

*To be posted on the Enrolling Institution's website with requirement that student read and execute prior to registration in FVCC online courses.

1. Course Information. Insert name of Enrolling Institution entered into a Course Sharing Memorandum of Understanding with Flathead Valley Community College (FVCC) which will expand your opportunity to select and access high-quality online courses from FVCC. Even though the online lecture courses are taught by FVCC faculty or instructors, credits earned count toward your degree/program here, your financial aid will not be affected, and you will not need to transfer credits. If there is a lab portion associated with the course you choose, it will be taught by our faculty or instructors on this campus. If you elect to register for one of these courses, you must be aware of the following information and agree to the policies that govern the course delivery.

2. Registration. Courses offered through FVCC will be listed in our academic catalog. You may register for the course through our usual registration process, paying all tuition and fees in the process. Since you will be enrolling as our student, you are responsible for adhering to the established policies and procedures found in our catalog and student handbook, including the refund policy. In addition, you are responsible for adhering to established academic policies and procedures of FVCC when enrolled in an FVCC online course.

Please note: Special discounts and tuition waivers may not apply to this course. Also, registration and enrollment deadlines at FVCC may differ from ours.

3. Delivery. FVCC is accredited by the Northwest Commission on Colleges and Universities. FVCC's course instructor will supply the syllabus via email or via a link in their learning management system. It is your responsibility to contact the course instructor and comply with the requirements and the schedule of the course. It is also your responsibility to comply with the academic policies of FVCC in areas such as academic integrity, course performance, and behavioral standards. Evaluation of your performance and computation of the grade in the lecture portion of your course is the responsibility of the instructor at FVCC. Any dispute regarding process or content of that evaluation is subject to the review policies of FVCC.

This course will be completed online and there will be no in-person meeting requirements for the lecture component of the course; however, some courses may require occasional conference calls between the student and instructor and the course may contain a lab component which you will take at Insert name of Enrolling Institution. The online instructor may require a proctored exam and will give you guidelines to follow. Course materials may be provided through FVCC's learning management system which may or may not be the same as ours. The course instructor or a representative from FVCC will contact you with information regarding how to enter its learning management system. It is your responsibility to remember the unique username and password for this course. Keep a record of this information and who to contact at FVCC in case there is an issue.

4. Start/End Dates. It is your responsibility to review the course syllabus and know when the course begins and ends. These dates may differ from a majority of the courses offered by our institution.

5. Financial Aid. If you are eligible for federal financial aid programs, this course will not affect your eligibility. Even though the online lecture instructor does not work for our institution, this course has been approved by the appropriate academic department at Insert name of Enrolling Institution.

6. Records. Data from your academic record at Insert name of Enrolling Institution will be shared with appropriate persons from FVCC including, but not limited to, name, address, phone number, email address, and student ID. This data will be used by the online course instructor to help maintain a record of your performance on the assignments and activities of the course. Furthermore, the online course instructor and the lab instructor at this college will confer about your progress in the course, in order to assure your success in the course.

7. Course Grade. The online course instructor will submit the final grade earned in the online lecture portion of the course to the Insert name of Enrolling Institution registrar. The grade will be posted on your Insert name of Enrolling Institution transcript and used in the calculation of your GPA. Grade appeals for this course will be addressed to the online course instructor first and then to the Insert name of Enrolling Institution through its academic appeals process. Please note that the course grade used by the instructor may be translated to fit Insert name of Enrolling Institution's grading system.

Agreement

By registering for an FVCC online course, you have chosen to agree and accept the information provided above and to consent to the sharing of data and information as described above.

Student Name

Date

June 2016

ITEM 171-2803-LI0616

Request for authorization to offer the Machinist Technician A.A.S.

THAT

Montana State University Northern requests authorization from the Montana Board of Regents to offer the Machinist Technician associate of applied science degree program to facilitate course sharing agreement with Flathead Community College (FVCC).

EXPLANATION

This request is to duplicate the Machinist Technician A.A.S. as implemented at FVCC. FVCC will provide online instruction of lecture portions of the program. MSU Northern will provide hands-on laboratory instruction in support of the online program in accordance with course sharing policies established by OCHE and the BOR as formalized in MOU documentation between MSUN and FVCC.

ATTACHMENTS

Academic Proposal Request Form
Curriculum Proposal Form
Attachment #1 - MSU Northern program proposal
Attachment #2 – Memorandum of Understanding

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

ITEM 171-2803-LI0616 Submission Month or Meeting: June 2016

Institution: Montana State University Northern CIP Code: 15.0613

Program/Center/Institute Title: Machinist Technician A.A.S.

Includes (please specify below): Online Offering X Options _____

Please mark the appropriate type of request and submit with an Item Template and any additional materials, including those listed in parentheses following the type of request. For more information pertaining to the types of requests listed below, how to complete an item request, or additional forms please visit <http://mus.edu/che/arsa/preparingacademicproposals.asp>.

X **A. Level I:**

Campus Approvals

- 1a. Placing a postsecondary educational program into moratorium (Program Termination and Moratorium Form)
- 1b. Withdrawing a postsecondary educational program from moratorium
- 2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less
- 3. Establishing a B.A.S./A.A./A.S. area of study
- 4. Offering an existing postsecondary educational program via distance or online delivery

OCHE Approvals

- 5. Re-titling an existing postsecondary educational program
- 6. Terminating an existing postsecondary educational program (Program Termination and Moratorium Form)
- 7. Consolidating existing postsecondary educational programs (Curriculum Proposal Form)
- 8. Establishing a new minor where there is a major or an option in a major (Curriculum Proposal Form)
- 9. Revising a postsecondary educational program (Curriculum Proposal Form)
- X 10. Establishing a temporary C.A.S. or A.A.S. degree program *Approval limited to 2 years*

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

B. Level II:

1. **Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Intent to Plan Form)
2. **Exceeding the 120 credit maximum for baccalaureate degrees** *Exception to policy 301.11*
3. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and Completed Intent to Plan Form, except when eliminating or consolidating)
4. **Re-titling an academic, administrative, or research unit**

Specify Request:

MSU Northern requests permission to offer degree programs to facilitate a course sharing agreement with Flathead Valley Community College (FVCC). This request is to duplicate the Machinist Technician A.A.S. as implemented at FVCC. FVCC will provide online instruction of the lecture portions of the program. MSU Northern will provide hands-on laboratory instruction in support of the online program in accordance with course sharing policies established by OCHE and the BOR and as formalized in MOU documentation between MSUN and FVCC.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

1. Overview

- A. Provide a one paragraph description of the proposed program. Be specific about what degree, major, minor or option is sought.**

This proposal will establish the Machinist Technician program currently approved for Flathead Valley Community College. Based on course sharing policies developed as part of the RevUP grant, MSU Northern will participate as an assessment center/training center for FVCC courses by providing the hands-on laboratory portions of the degree program. Students will enroll with MSU Northern and will simultaneously be enrolled in distance delivered (D2L) courses instructed by FVCC. The laboratory portions will be scheduled in cooperation and coordination with the programs at FVCC (Attachment #2-A2) and offered in labs at Northern using instructors on the MSUN campus.

2. Institutional and System Fit

- A. What is the connection between the proposed program and existing programs at the institution?**

Currently MSU Northern offers machining instruction as part of Automotive and Diesel Technology AAS and BS programs as well as part of the Secondary Ed Industrial Technology degree. Some coursework in machining/ manufacturing and CNC operations are included in the current Design Drafting program at Northern.

- B. Will approval of the proposed program require changes to any existing programs at the institution? If so, please describe.**

None anticipated. Instructors will include lab experiences as part of existing course load or receive overload/adjunct contracts to offer the lab instruction.

- C. Describe what differentiates this program from other, closely related programs at the institution (if appropriate).**

N/A

- D. How does the proposed program serve to advance the strategic goals of the institution?**

This program reinforces the commitment of MSU Northern to offer technical education programs and to cooperate with colleagues throughout the system in offering instruction.

- E. Describe the relationship between the proposed program and any similar programs within the Montana University System. In cases of substantial duplication, explain the need for the proposed program at an additional institution. Describe any efforts that were made to collaborate with these similar programs; and if no efforts were made, explain why. If articulation or transfer agreements have been developed for the substantially duplicated programs, please include the agreement(s) as part of the documentation.**

As indicated, this is a course-sharing program established through the RevUP course sharing initiative. A copy of the MOU with FVCC is attached. (Attachment #2-A2)

Montana Board of Regents
CURRICULUM PROPOSAL FORM

3. Program Details

- A. Provide a detailed description of the proposed curriculum. Where possible, present the information in the form intended to appear in the catalog or other publications. NOTE: In the case of two-year degree programs and certificates of applied science, the curriculum should include enough detail to determine if the characteristics set out in Regents' Policy 301.12 have been met.**

See program details. (Attachment #1-A1)

- B. Describe the planned implementation of the proposed program, including estimates of numbers of students at each stage.**

A test run using a single student was undertaken in Spring 2016 for two course-shared offerings. If approved, FVCC courses will be implemented as part of the existing Design Drafting degree programs and promotion of this innovative program will begin Fall 2016 with the goal of enrolling 5 students during the 2016/17 academic year. Capacity of the program is roughly 20 total students, spread across the two-year program.

4. Need

- A. To what specific need is the institution responding in developing the proposed program?**

FVCC and the RevUP grant has identified a statewide demand for trained machinists. This program seeks to expand the audience and ability to deliver instruction to that audience.

- B. How will students and any other affected constituencies be served by the proposed program?**

Graduates will be qualified to fill good-paying jobs in a growing career field.

- C. What is the anticipated demand for the program? How was this determined?**

Estimates from FVCC indicate a demand of over 10 students per year using this course-sharing model.

5. Process Leading to Submission

- A. Describe the process of developing and approving the proposed program. Indicate, where appropriate, involvement by faculty, students, community members, potential employers, accrediting agencies, etc.**

The program of course sharing was developed as part of the Two-Year leadership council using the RevUP grant as impetus. The program itself echoes the successful program offered by FVCC (Attachment #2-A2), and as implemented at Northern has been reviewed and approved by COTS faculty, the MSUN Academic Senate and by the MSUN administration.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

6. Resources

- A. Will additional faculty resources be required to implement this program? If yes, please describe the need and indicate the plan for meeting this need.**

Faculty currently on staff will provide support for this program with the availability for adjunct instructors from the local community as the program expands.

- B. Are other, additional resources required to ensure the success of the proposed program? If yes, please describe the need and indicate the plan for meeting this need.**

FVCC has provided substantial equipment and material support through the RevUP grant. No additional resources are required at this time.

7. Assessment

- A. How will the success of the program be measured?**

Success will be gauged based on continued progress of enrolled students with successful completion within three years.

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: ECP 104

Course Title: Workplace Safety
Credits: 1

Required by: Machinist Technician AAS
Electronics Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: .5
Contact hours lab: 1

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course incorporates the Related Instruction requirement for Interactions into the study of policies, compliance, enforcement, and reporting of work site safety issues. In addition, the American Red Cross Standards for First Aid and CPR training are presented to provide the skills necessary to efficiently respond to workplace emergencies. Coursework will focus on personal ability to act and interact ethically and effectively in both self-practice and co-worker enforcement of safety policies. The ethical responsibility to report safety violations and means of coping with accidents that involve the death of a team member or mass casualties within a workplace will also be studied. Students will employ hands-on practices to demonstrate skills in first aid and CPR. Real life scenarios will be presented to enable students in gaining an understanding of one's self and co-workers in relationship to responding, treating, and coping with workplace safety practices and medical emergencies.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Recognize one's personal strength and weakness in relationship to workplace safety and emergency care.
- Set goals and work in a self-directed manner to ensure a safe and efficient physical workplace.
- Demonstrate responsibility/accountability for personal actions/thoughts/emotions in responding to a work site emergency.
- Collaborate effectively with others in providing support medical treatment of mass casualties, including nature of injuries, treatment, and priority of evacuation.
- Demonstrate the interpersonal skills necessary to tactfully correct workplace safety violations by co-workers.
- Assess the moral issues and principles involved in reporting work site safety violations.
- Recognize that conflict is natural in the stages of grief associated to co-workers experiencing a death related to a workplace accident and demonstrate methods of successful conflict management.
- Recognize and then act using the skills needed in a situation requiring first aid and/or CPR.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Signature _____ Dean [Signature] Signature (indicates "college" level approval) _____ Date 1/29/16

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 101x

Course Title: Intro to Manufacturing Processes
Credits: .5

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: .5
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course is designed to provide the student a learning experience with the basic tools, equipment, and operations of manufacturing industries. The goal is for the student to understand the relationship among a manufacturing need, a design, the materials and processes used, as well as the tools and equipment necessary to manufacture a product. Corequisites: MCH 101y

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Use tools and equipment to form and shape various materials in a manufacturing laboratory environment;

- Discuss processes necessary to cast and mold materials in a manufacturing laboratory environment;
- Use tools and equipment to machine various materials;
- Safely operate basic machinery and equipment.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/17
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 101y
Course Title: Intro to Manufacturing Processes Lab
Credits: .5
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 1

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course is designed to provide the student a learning experience with the basic tools, equipment, and operations of manufacturing industries. The goal is for the student to understand the relationship among a manufacturing need, a design, the materials and processes used, as well as the tools and equipment necessary to manufacture a product. Course Fee: \$45. Corequisites: MCH 101y

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Use tools and equipment to form and shape various materials in a manufacturing laboratory environment;

- Discuss processes necessary to cast and mold materials in a manufacturing laboratory environment;
- Use tools and equipment to machine various materials;
- Safely operate basic machinery and equipment.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature Signature (Indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 120x

Course Title: Blueprint Reading & Interpretation for Machining
Credits: 1.5

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1.5
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course introduces the fundamental concepts necessary to interpret drawings and produce sketches for machine tool applications as applied to Machine Tool Technology. Topics include: advanced sectioning, geometric dimensioning, geometric tolerance, and assembly drawings/sketching. Interpretation of specifications and determination of acceptable tolerance requirements to ensure quality control measures for design parts will also be stressed. Corequisites: MCH 120y

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

Apply the blueprint reading and interpretations to the following learning objectives:

- distinguish between various views represented on typical manufacturing blueprints to include auxiliary views
- locate materials list and identify the material call-outs on lists of materials
- locate title blocks on various blueprint drawings
- read and interpret information on various manufacturing blueprint drawings
- Use sketching technique to record dimensions and shape of parts or assemblies in a manufacturing setting
- identify features contained on a blueprint in relation to actual work piece and identify features of the design part in relation to CNC production methods
- identify features of a sectional view in manufacturing blueprints
- identify and apply quality control procedures to ensure product integrity

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____
Submitter Steve Don Dean [Signature] Date 1/29/16
Signature (indicates college level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 120y

Course Title: Blueprint Reading & Interpretation for Machining Lab
Credits: 1.5

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 3

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course introduces the fundamental concepts necessary to interpret drawings and produce sketches for machine tool applications as applied to Machine Tool Technology. Topics include: advanced sectioning, geometric dimensioning, geometric tolerance, and assembly drawings/sketching. Interpretation of specifications and determination of acceptable tolerance requirements to ensure quality control measures for design parts will also be stressed. Course Fee: \$15 Corequisites: MCH 120x

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

Apply the blueprint reading and interpretations to the following learning objectives:

- o identify lines and symbols used in blueprints

- distinguish between various views represented on typical manufacturing blueprints to include auxiliary views
- locate materials list and identify the material call-outs on lists of materials
- locate title blocks on various blueprint drawings
- read and interpret information on various manufacturing blueprint drawings
- Use sketching technique to record dimensions and shape of parts or assemblies in a manufacturing setting
- identify features contained on a blueprint in relation to actual work piece and identify features of the design part in relation to CNC production methods
- identify features of a sectional view in manufacturing blueprints
- identify and apply quality control procedures to ensure product integrity

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 129x

Course Title: Machine Quality Control and Precision Measurements
Credits: 1.5

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1.5
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

Students will develop the knowledge and skills to prepare them to analyze and evaluate the processes and methodology required in an industrial production environment to determine if quality control standard are being met. Topics include: use of non-precision measuring tools, use of precision measuring tools, use of comparison gauges, and analysis of measurements in a CNC environment. Corequisites: MCH 129y

Course Outcome Objectives:

- Upon successful completion of this course, the student should be able to:
Apply the following CNC concepts and functions employing the HAAS TM1 Mill:
- Demonstrate a knowledge and understanding of Precision Measurement and Quality Control Procedures.

- Accurately measure and record the outside diameters of a test piece with the Micrometer
- Accurately measure and record the outside diameters of a test piece with the Veneer Caliper
- Accurately measure and record the depth dimensions of a test piece with the Depth Micrometer
- Accurately index a part on the CNC Lathe and indicate the table and a vise on a CNC Milling Machine within .0001” with dial indicator
- Accurately index a part on the lathe and indicate the table and a vise on a CNC Milling Machine within .001” with the control console
- Define quality and the precision requirements associated with a CNC produced part
- Demonstrate quality assurance and quality management techniques.
- Describe a reporting and responsibility structure for production facility quality control
- Accurately measure the inside diameter of a test piece using inside micrometers and telescoping gages
- Accurately measure and identify threads, national coarse, national fine, acme and metric
- The student will be able to convert metric measurements to inch , and inch to metric

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 129y

Course Title: Machine Quality Control and Precision Measurements Lab
Credits: 1.5

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 3

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

Students will develop the knowledge and skills to prepare them to analyze and evaluate the processes and methodology required in an industrial production environment to determine if quality control standard are being met. Topics include: use of non-precision measuring tools, use of precision measuring tools, use of comparison gauges, and analysis of measurements in a CNC environment. Course Fee: \$75 Corequisites: MCH 129x

Course Outcome Objectives:

- Upon successful completion of this course, the student should be able to:
Apply the following CNC concepts and functions employing the HAAS TM1 Mill:
- Demonstrate a knowledge and understanding of Precision Measurement and Quality Control Procedures.

- Accurately measure and record the outside diameters of a test piece with the Micrometer
- Accurately measure and record the outside diameters of a test piece with the Veneer Caliper
- Accurately measure and record the depth dimensions of a test piece with the Depth Micrometer
- Accurately index a part on the CNC Lathe and indicate the table and a vise on a CNC Milling Machine within .0001" with dial indicator
- Accurately index a part on the lathe and indicate the table and a vise on a CNC Milling Machine within .001" with the control console
- Define quality and the precision requirements associated with a CNC produced part
- Demonstrate quality assurance and quality management techniques.
- Describe a reporting and responsibility structure for production facility quality control
- Accurately measure the inside diameter of a test piece using inside micrometers and telescoping gages
- Accurately measure and identify threads, national coarse, national fine, acme and metric
- The student will be able to convert metric measurements to inch , and inch to metric

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Signature _____ Dean [Signature] Signature (indicates "college" level approval) Date 1/29/16

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 132x

Course Title: Introduction to Engine Lathes
Credits: 1

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course is the study of basic machine tool operations and forming processes. Topics include lathe work, drilling operations, tooling, and fixture work. Corequisites: MCH 120y, and MCH 120 & MCH 129 or Instructors Consent.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Properly set up and operate metal lathes
- Understand and demonstrate safety protocol associated with lathes and other equipment
- Correctly grind a lathe tool bit
- Complete projects utilizing all the machining and tooling techniques of lathes

- Demonstrate proper use and care of precision measuring equipment such as micrometers, calipers, etc.
- Make required projects utilizing facing, turning, boring, and parting-off procedures
- Identify basic thread systems and demonstrate how to make each on a metal lathe
- Demonstrate proper use and care of dial indicators
- Demonstrate grinding of turning, facing, boring, threading, and radius tool bits
- Set up and demonstrate proper use of a tool post grinder
- Demonstrate the set up and use of a steady rest

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____
Submitter Steven Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 132y

Course Title: Introduction to Engine Lathes Lab
Credits: 3

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 6

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course is the study of basic machine tool operations and forming processes. Topics include lathe work, drilling operations, tooling, and fixture work. Course Fee: \$75 . Corequisites: MCH 120x, and MCH 120 & MCH 129 or Instructors Consent.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Properly set up and operate metal lathes
- Understand and demonstrate safety protocol associated with lathes and other equipment
- Correctly grind a lathe tool bit
- Complete projects utilizing all the machining and tooling techniques of lathes

- Demonstrate proper use and care of precision measuring equipment such as micrometers, calipers, etc.
- Make required projects utilizing facing, turning, boring, and parting-off procedures
- Identify basic thread systems and demonstrate how to make each on a metal lathe
- Demonstrate proper use and care of dial indicators
- Demonstrate grinding of turning, facing, boring, threading, and radius tool bits
- Set up and demonstrate proper use of a tool post grinder
- Demonstrate the set up and use of a steady rest

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 134x
Course Title: Introduction to Mills
Credits: 1
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

The student will perform advanced hands-on machine shop operations: set up and operation of manual milling machines, drill presses, band saws, grinders, and other equipment commonly found in manufacturing facilities. The student will use precision measuring tools and methods, utilize blueprints, and perform project process planning. Various types of steel and aluminum are used. Co-requisite: MCH 134y

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Properly set up and operate horizontal and vertical mills, including use and care for all accessories
- Demonstrate the proper use of a digital read-out
- Demonstrate the basics of running a milling machine such as facing, slotting, slitting, boring, and fly cutting

- Identify and demonstrate the different styles of cutters that are used
- Describe and demonstrate correct safety procedures and maintenance of mills
- Describe and demonstrate use of precision instruments associated with mills
- Demonstrate correct use of the criterion boring head

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/12
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 134y

Course Title: Introduction to Mills Lab
Credits: 3

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 6

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

The student will perform advanced hands-on machine shop operations: set up and operation of manual milling machines, drill presses, band saws, grinders, and other equipment commonly found in manufacturing facilities. The student will use precision measuring tools and methods, utilize blueprints, and perform project process planning. Various types of steel and aluminum are used. Course Fee: \$75 Co-requisite: MCH 134x

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Properly set up and operate horizontal and vertical mills, including use and care for all accessories
- Demonstrate the proper use of a digital read-out
- Demonstrate the basics of running a milling machine such as facing, slotting, slitting, boring, and fly cutting

- Identify and demonstrate the different styles of cutters that are used
- Describe and demonstrate correct safety procedures and maintenance of mills
- Describe and demonstrate use of precision instruments associated with mills
- Demonstrate correct use of the criterion boring head

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature (Indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: DDSN 135x
Course Title: Solidworks
Credits: .5
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: .5
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course presents the fundamental skills and concepts to build parametric model parts and assemblies and how to make simple drawings of those parts and assemblies. This course is designed around a process-based training approach emphasizing the processes and procedures necessary to complete a particular task. By utilizing case studies to illustrate these processes, the student learns the necessary commands, options, and menus in the context of completing a design task within SOLIDWORKS. An introduction to the transferability and compatibility of SOLIDWORKS, MASTERCAM, GIBSCAM, and Pro-Engineer software is provided. Co-requisite DDSN 135y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Explain the fundamentals and interfaces of Solidworks
- Explain the design philosophy of Solidworks

- Create and modify parts in Solidworks
- Apply dimensions and relations
- Create datum features, apply feature duplication forms, and break down feature sequences
- Create drawings and generate cross sections
- Create assemblies
- Demonstrate an understanding of the transition and interface of related CAD/CAM programs including MASTERCAM, GIBSCAM, and PRO-ENGINEER

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: DDSN 135y
Course Title: Solidworks Lab
Credits: 1.5
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 3

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course presents the fundamental skills and concepts to build parametric model parts and assemblies and how to make simple drawings of those parts and assemblies. This course is designed around a process-based training approach emphasizing the processes and procedures necessary to complete a particular task. By utilizing case studies to illustrate these processes, the student learns the necessary commands, options, and menus in the context of completing a design task within SOLIDWORKS. An introduction to the transferability and compatibility of SOLIDWORKS, MASTERCAM, GIBSCAM, and Pro-Engineer software is provided. Course Fee: \$25 Co-requisite: DDSN 135x

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Explain the fundamentals and interfaces of Solidworks
- Explain the design philosophy of Solidworks

- Create and modify parts in Solidworks
- Apply dimensions and relations
- Create datum features, apply feature duplication forms, and break down feature sequences
- Create drawings and generate cross sections
- Create assemblies
- Demonstrate an understanding of the transition and interface of related CAD/CAM programs including MASTERCAM, GIBSCAM, and PRO-ENGINEER

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature (indicates college level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 102x

Course Title: Introduction to Manufacturing Materials
Credits: 1

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an introductory course in the study of materials used in the manufacturing industry. Topics include selection and identification of steels, selection and identification of nonferrous metals, mechanical behavior of various plastics, hardening, case hardening, tempering, annealing, normalizing, stress relieving, and the use of the Rockwell and Brinell hardness testers. Pre-requisite: ELCT 110. Co-requisite: M 114, ELCT 102y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Describe the mechanical and chemical properties of materials used in the manufacturing industry for the production of engineered and designed components or systems.
- Describe the properties of steel alloys and the effects of those properties on machining operations.

- Describe the properties and characteristics of nonferrous metals as those apply to the manufacturing environment.
- Describe the characteristics of plastics that impact machinability.
- Understand material composition in order to select appropriate materials for various applications.
- Demonstrate the proper setup and use of machine shop instrumentation for the testing of material properties including, but not limited to, hardness testing.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 102y

Course Title: Introduction to Manufacturing Materials Lab
Credits: 1

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 2

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an introductory course in the study of materials used in the manufacturing industry. Topics include selection and identification of steels, selection and identification of nonferrous metals, mechanical behavior of various plastics, hardening, case hardening, tempering, annealing, normalizing, stress relieving, and the use of the Rockwell and Brinell hardness testers. Course Fee: \$35. Pre-requisite: ELCT 110. Co-requisite: M 114, ELCT 102x

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Describe the mechanical and chemical properties of materials used in the manufacturing industry for the production of engineered and designed components or systems.
- Describe the properties of steel alloys and the effects of those properties on machining operations.

- Describe the properties and characteristics of nonferrous metals as those apply to the manufacturing environment.
- Describe the characteristics of plastics that impact machinability.
- Understand material composition in order to select appropriate materials for various applications.
- Demonstrate the proper setup and use of machine shop instrumentation for the testing of material properties including, but not limited to, hardness testing.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steven Don Dean [Signature] Date 1/29/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 122

Course Title: Introduction to CAM
Credits: 3

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course introduces CAM operational basics for both mill and lathe programming using current software. The course includes terminology relevant to PC-based CAD/CAM work, hardware familiarity, system operation and management, folders, file type and structure, menu structure and use, and 2 ½ axis (milling machines) and 2 axis (lathes) tool paths. Emphasis is placed on proper geometric creation, management, relevant utilities, C-hooks, and toolbar and menu functions. Course Fee: \$25

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Design and construct 2D (wireframe) and 3D models for both mill and lathe machine tools
- Create, edit, and verify mill and lathe tool paths
- Understand tool definitions and tool libraries for both mill and lathe

- Select tools and produce tool paths with constructed and imported geometry
- Verify tool paths and create word address programs (G-code) for CNC machines
Apply and edit G-code transfer to CNC machines

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 125x

Course Title: HAAS CNC TM1 Lathe Operations
Credits: 1

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course provides opportunities for students to develop skills in the set-up and operation of the HAAS TL1 Metal Cutting Lathe. Topics include: safety, lathe parts and controls, lathe tooling and tool bit grinding, lathe calculations, lathe set-up and operations. This is a performance-based course that requires the production of assigned tool projects. Pre-requisite: MCH 132, or MCH 132x & MCH 132y. Co-requisite: MCH 125y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:
Apply the following CNC concepts and functions employing the HAAS TM1 Lathe:

- Identify and practice safety rules
- Calculate and adjust speeds and feeds
- Identify lathe accessories
- Identify steady rest and follow rest

- Identify thread cutting procedures
- Identify knurling tools and their uses
- Calculate and adjust lathe for taper turning
- Turn between centers
- Perform steady-rest and follow-rest set-up
- Bore, counter-bore, and recess hole to size
- Perform filing and polishing operations
- Perform knurling operations
- Turn tapers
- Cut external and internal threads

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/110
Signature Signature (indicates "college"-level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 125y

Course Title: HAAS CNC TM1 Lathe Operations Lab
Credits: 2

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 4

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course provides opportunities for students to develop skills in the set-up and operation of the HAAS TL1 Metal Cutting Lathe. Topics include: safety, lathe parts and controls, lathe tooling and tool bit grinding, lathe calculations, lathe set-up and operations. This is a performance-based course that requires the production of assigned tool projects. Course Fee: \$75. Pre-requisite: MCH 132 or MCH 132x & MCH 132y. Co-requisite: MCH 125x.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:
Apply the following CNC concepts and functions employing the HAAS TM1 Lathe:

- Identify and practice safety rules
- Calculate and adjust speeds and feeds
- Identify lathe accessories
- Identify steady rest and follow rest

- Identify thread cutting procedures
- Identify knurling tools and their uses
- Calculate and adjust lathe for taper turning
- Turn between centers
- Perform steady-rest and follow-rest set-up
- Bore, counter-bore, and recess hole to size
- Perform filing and polishing operations
- Perform knurling operations
- Turn tapers
- Cut external and internal threads

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/29/16
Signature (indicates college-level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 127x

Course Title: HAAS CNC TM1 Vertical Mill Operations
Credits: 1

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course provides instruction in the set-up and operation of the HAAS TM1 Vertical Mill. Student projects include specialty tooling and multi-axis machining. Students will also gain experience in process control. Topics include: specialty tooling, EDM/ECM, multi-axis machining, process control, and laboratory exercises in part production. Pre-requisite: MCH 134, or MCH 134x & MCH 134y. Co-requisite: MCH 127y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:
Apply the following CNC concepts and functions employing the HAAS TM1 Mill:

- Identify and practice safety rules
- Calculate and adjust speeds and feeds
- Identify the uses of an indexing head

- Identify the uses of carbide and indexable carbide cutters
- Perform indexing procedures
- Perform slot cutting
- Perform indexing procedures using a dividing head
- Perform pocket milling
- Perform angular milling set-ups

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____
Submitter Steve Don Dean [Signature] Date 1/29/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 127y

Course Title: HAAS CNC TM1 Vertical Mill Operations Lab
Credits: 2

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 4

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course provides instruction in the set-up and operation of the HAAS TM1 Vertical Mill. Student projects include specialty tooling and multi-axis machining. Students will also gain experience in process control. Topics include: specialty tooling, EDM/ECM, multi-axis machining, process control, and laboratory exercises in part production. Course Fee: \$75. Prerequisite: MCH 134, or MCH 134x and MCH 134y. Co-requisite: MCH 127x.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:
Apply the following CNC concepts and functions employing the HAAS TM1 Mill:

- Identify and practice safety rules
- Calculate and adjust speeds and feeds
- Identify the uses of an indexing head

- Identify the uses of carbide and indexable carbide cutters
- Perform indexing procedures
- Perform slot cutting
- Perform indexing procedures using a dividing head
- Perform pocket milling
- Perform angular milling set-ups

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MFGT 115
Course Title: Machine Shop Fundamentals
Credits: 2
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 2
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):
The content and sample programs cover a broad range of manual and CNC machining using the software and flexible internet based learning content supported by a classroom instructor to deliver an innovative learning experience. Course Fee: \$150

- Course Outcome Objectives:**
Upon successful completion of this course, the student should be able to:
- Understand and control machine motion
 - Use the CNC panel interface
 - Perform machine start-up safely
 - Perform manual operations
 - Perform job set-up

- Use the software to perform program entry
- Use the software to perform a program run
- Use G Code programming to control the machine
- Create and understand program structure
- Use and understand the Cartesian coordinate system
- Use and understand cutter compensation
- Use and understand tool nose radius compensation
- Use and understand circular interpolation

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/28/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 220

Course Title: Geometric Dimensioning and Tolerancing
Credits: 3

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course provides the basics of how to apply GD & T in metrology and CAD, including knowledge of the symbols, hands on measurement of parts, and the use of CMMs. Students will learn the types and causes of measurement error, perform measurement setups. They will also learn about flatness, straightness, circularity, parallelism, angularity, concentricity, total run outs, position tolerancing, and gauge design for both soft and hard gauges. Course Fee: \$25. Prerequisites: DDSN 135, or MCH 122, MCH 129.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Identify and use the common GD & T industry symbols
- Understand and use fixturing for checking parts
- Understand and use common gauges for checking parts
- Identify and use different types of gauging methods in industry

- Identify proper “Datum” usage
- Use precision measuring tools to check GD & T
- Use a CMM to check GD & T

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____
Submitter Steven Don Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 221x

Course Title: Advanced Manual Mill
Credits: 1

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will cover the use and care of rotary tables, indexing heads, tilting vices, sine bar setup, gear cutting, and line boring utilizing horizontal and vertical mills. The course will also cover various work holding methods, jig and fixture work, location methods, and process planning. Pre-requisites: MCH 134x, MCH 134y. Co-requisites: MCH 221y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Demonstrate the safe operation of horizontal and vertical mills
- Demonstrate the proper use of various types of cutting tools and calculate their rpm and feed rate
- Describe the various uses of rotary heads and index heads
- Demonstrate the use of dial indicators, edge finders, and sine bars

- Demonstrate various types of boring operations
- Demonstrate safe work holding, and jig and fixture work

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____
Submitter Steven Don Dean [Signature] Date 1/28/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 221y
Course Title: Advanced Manual Mill Lab
Credits: 2
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 4

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will cover the use and care of rotary tables, indexing heads, tilting vices, sine bar setup, gear cutting, and line boring utilizing horizontal and vertical mills. The course will also cover various work holding methods, jig and fixture work, location methods, and process planning. Course Fee: \$75. Pre-requisites: MCH 134x, MCH 134y. Co-requisites: MCH 221x.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Demonstrate the safe operation of horizontal and vertical mills
- Demonstrate the proper use of various types of cutting tools and calculate their rpm and feed rate
- Describe the various uses of rotary heads and index heads
- Demonstrate the use of dial indicators, edge finders, and sine bars

- Demonstrate various types of boring operations
- Demonstrate safe work holding, and jig and fixture work

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 222x
Course Title: Advanced CNC Mill Operations
Credits: 1
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):
This course provides advanced instruction in the setup and operation of the HAAS TM1 mill. Projects will include specialty tooling and automatic machining. Students will gain experience in process and quality control of part production. Other topics include specialty tooling, multi-axis machining, process control, and parts production. Pre-requisites: MCH 127x, MCH 127y. Co-requisites: MCH 222y.

Course Outcome Objectives:
Upon successful completion of this course, the student should be able to:

- Identify and practice safety rules
- Perform advanced machine set using vises and fixturing
- Demonstrate the use of the advanced program editor on the machine controller
- Demonstrate the use of the machine controller to adjust feeds/speeds/tool offsets

- Identify and use insert type cutting tools
- Produce advanced programs using G code format
- Demonstrate the use of the IPS system
- Demonstrate the use of precision measuring tools to check all work
- Trouble shoot program or machining problems

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 222y

Course Title: Advanced CNC Mill Operations Lab
Credits: 2

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 4

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):
This course provides advanced instruction in the setup and operation of the HAAS TM1 mill. Projects will include specialty tooling and automatic machining. Students will gain experience in process and quality control of part production. Other topics include specialty tooling, multi-axis machining, process control, and parts production. Course Fee: \$75. Pre-requisites: MCH 127x, MCH 127y. Co-requisites: MCH 222x.

- Course Outcome Objectives:**
Upon successful completion of this course, the student should be able to:
- Identify and practice safety rules
 - Perform advanced machine set using vises and fixturing
 - Demonstrate the use of the advanced program editor on the machine controller
 - Demonstrate the use of the machine controller to adjust feeds/speeds/tool offsets

- Identify and use insert type cutting tools
- Produce advanced programs using G code format
- Demonstrate the use of the IPS system
- Demonstrate the use of precision measuring tools to check all work
- Trouble shoot program or machining problems

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 225

Course Title: Machinery's Handbook
Credits: 3

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course is an introduction to the basic trade handbook: Machinery's Handbook. The subjects that are covered include solving manufacturing problems using the various charts, formulas, and calculations. This course will also educate the student about how to find information quickly in this reference book, and how to apply the information to their specific applications. Course Fee: \$15

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Demonstrate the ability to quickly find information in the book and CD-ROM version
- Demonstrate how to use a trade reference book for real situation problem solving
- Recognize and describe various design principles in the manufacturing field
- Design a simple tool for a particular application

- Describe how to solve problems that relate to gears, shafts, bearings, and bushings

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steven Don Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 226x
Course Title: Advanced CAD/CAM
Credits: 1
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 1
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an advanced course in the study of computer aided manufacturing through the implementation of computer software for the design and creation of machine codes used in operating computer numerical control systems. Topics include 3D component and surface creation, development of advanced tool paths for machining advanced 3D components and surfaces, interface with advanced manufacturing systems with 4 axis or more , as well as Swiss CNC and Mill/Turn systems, simulation of tool paths, and instruction on live tooling synchronization. This course leads to an advanced understanding in design and programming for higher level machine tools. Pre-requisites: MCH 122x, MCH 122y. Co-requisites: MCH 226y.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Demonstrate advanced concepts and techniques associated with MASTERCAM CAD/CAM or comparable software for 3D wireframe and solids design.

- Demonstrate advanced machining operations performed on CNC machining centers in 4-axis and higher environment, turning centers, Swiss CNC, and Mill/Turn systems.
- Describe the advanced graphics environment of a Computer Assisted Machining Software for 3D surfaces and component design
- Generate advanced tool paths for surface or complex 3D components using advanced MASTERCAM or comparable CAM software tools
- Demonstrate concepts and techniques of modifying existing geometric designs using MASTERCAM Computer Assisted Machining or comparable software
- Demonstrate the use of MASTERCAM Computer Assisted Machining software material and tool library files
- Create advanced or new tool/holder configurations
- Generate tool paths with existing geometric designs utilizing MASTERCAM Computer Assisted Machining software
- Describe concepts of live tooling synchronization and scheduling for manufacture of designed components.
- Demonstrate use of simulation tools for validation of toolpaths for creation of designed components.
- Demonstrate use of simulation tools for verification of tool collision avoidance.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 226y

Course Title: Advanced CAD/CAM Lab
Credits: 3

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture:
Contact hours lab: 6

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This is an advanced course in the study of computer aided manufacturing through the implementation of computer software for the design and creation of machine codes used in operating computer numerical control systems. Topics include 3D component and surface creation, development of advanced tool paths for machining advanced 3D components and surfaces, interface with advanced manufacturing systems with 4 axis or more , as well as Swiss CNC and Mill/Turn systems, simulation of tool paths, and instruction on live tooling synchronization. This course leads to an advanced understanding in design and programming for higher level machine tools. Course Fee: \$35. Pre-requisites: MCH 122x, MCH 122y. Co-requisites: MCH 226x.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

06/2016 Submission 135 of 172
Demonstrate advanced concepts and techniques associated with MASTERCAM CAD/CAM or comparable software for 3D wireframe and solids design.

- Demonstrate advanced machining operations performed on CNC machining centers in 4-axis and higher environment, turning centers, Swiss CNC, and Mill/Turn systems.
- Describe the advanced graphics environment of a Computer Assisted Machining Software for 3D surfaces and component design
- Generate advanced tool paths for surface or complex 3D components using advanced MASTERCAM or comparable CAM software tools
- Demonstrate concepts and techniques of modifying existing geometric designs using MASTERCAM Computer Assisted Machining or comparable software
- Demonstrate the use of MASTERCAM Computer Assisted Machining software material and tool library files
- Create advanced or new tool/holder configurations
- Generate tool paths with existing geometric designs utilizing MASTERCAM Computer Assisted Machining software
- Describe concepts of live tooling synchronization and scheduling for manufacture of designed components.
- Demonstrate use of simulation tools for validation of toolpaths for creation of designed components.
- Demonstrate use of simulation tools for verification of tool collision avoidance.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steven Don Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 227

Course Title: Swiss CNC and Mill-Turn Systems
Credits: 4

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 4
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):
This is a course for the study and hands-on operation of advanced machine tools, specifically Swiss CNC or Mill/Turn systems. Topics include set-up, "at system" programming, tooling and operation of advanced Swiss or Mill/Turn systems. The course will also emphasize system maintenance and service for these advanced machine tool categories. Course Fee: \$75. Prerequisites: MCH 286 (Advanced CAD/CAM) or MCH 226x and MCH 226y

- Course Outcome Objectives:**
Upon successful completion of this course, the student should be able to:
- Describe Swiss CNC and Mill/Turn system components and general operational theory.
 - Demonstrate proper set-up and breakdown of Swiss CNC and Mill/Turn systems.
 - Describe methods for "at system" modification of machine code.
 - Demonstrate proper project set up including work piece holding and tool zeroing.

- Demonstrate how to machine a specified component to defined specifications as designed using advanced CAM tools
- Describe general maintenance and service for Swiss CNC and Mill/Turn systems.

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____
Submitter Steve Dan Dean [Signature] Date 1/28/16
Signature Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 223

Course Title: Advanced Manual Lathe
Credits: 3

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course will cover carbide cutters and tool holders, spindle collets and drawbars, taper attachments, and digital readouts. Students will use advanced tooling attachments. There will be set up and cutting for simple cam, acme, and buttress threads. The course will emphasize that close tolerances are required. Course Fee: \$75. Pre-requisites: MCH 132.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Identify and list types of carbide cutters and their uses
- Demonstrate set up and use of a taper attachment
- Describe and demonstrate the use of digital readouts
- Demonstrate the use of dial indicators for set up of concentric and eccentric work
- Demonstrate how to cut acme, buttress, and left hand threads

- Demonstrate boring and bushing

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____

Submitter Steve Don Dean [Signature] Date 1/28/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 224
Course Title: Advanced CNC Lathe Operations
Credits: 3
Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course provides advanced instruction in the setup and operation of the HAAS TM1 lathe. Projects will include specialty tooling and automatic machining. Students will gain experience in process and quality control of part production. Other topics include specialty tooling, process control, and parts production. Course Fee: \$75. Pre-requisites: MCH 125.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Identify and practice safety rules
- Perform advanced machine set using vises and fixturing
- Demonstrate the use of the advanced program editor on the machine controller
- Demonstrate the use of the machine controller to adjust feeds/speeds/tool offsets
- Identify and use insert type cutting tools

- Produce advanced programs using G code format
- Demonstrate the use of the IPS system
- Demonstrate the use of precision measuring tools to check all work
- Trouble shoot program or machining problems

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

COURSE REVISION FORM

NEW X DROPPED _____ MAJOR REVISION _____ FOR INFORMATION ONLY _____

College COTS Program Area Advanced Manufacturing Date _____
Submitter Steve Dem Dean [Signature] Date 1/28/16
Signature (indicates "college" level approval)

Please provide a brief explanation & rationale for the proposed revision(s): As a part of the course-sharing arrangement with FVCC this is a new course for the Machinist Technician AAS degree.

Please provide the following information:

College: COTS
Program Area: Advanced Manufacturing
Date:
Course Prefix & No.: MCH 299

Course Title: Capstone: Machinist
Credits: 3

Required by: Machinist Technician AAS

Selective in:
Elective in:
General Education:

Lecture:
Lecture/Lab: X
Gradable Lab:
Contact hours lecture: 3
Contact hours lab:

Current Catalog Description (include all prerequisites):

Proposed or New Catalog Description (include all prerequisites):

This course provides opportunities for the student to arrange to complete special projects using knowledge gained in previous course work. All projects must be approved by the instructor. Course Fee: \$75. Enrollment in Machinist Technician Level IV.

Course Outcome Objectives:

Upon successful completion of this course, the student should be able to:

- Use knowledge gained from the program to identify an appropriate project
- Produce all necessary paperwork and documentation for the project
- Synthesize knowledge gained from the program to complete the project
- Communicate the results in a written or oral report

Additional instructional resources needed (including library materials, special equipment, and facilities). Please note: approval does not indicate support for new faculty or additional resources.

Updated 09/29/05

DRAFT 9/14/15

Memorandum of Understanding

This Agreement is made between Flathead Valley Community College ("FVCC") and _____, (the Enrolling Institution or "EI"); collectively the "Parties." This Agreement shall be deemed executed and agreed to by both Parties as of the date it has been signed by both Parties.

RECITALS

WHEREAS, FVCC and the Enrolling Institution wish to establish a course sharing agreement between them, for the purpose of enabling students enrolled at the EI to take certain online courses through FVCC; and

WHEREAS, both FVCC and the EI are Montana 2-year colleges that are participating as consortium members in the Trade Adjustment Assistance Community College and Career Training Grant #TC-25034-13-60-A-30 ("RevUp"); and

WHEREAS, RevUp establishes a mechanism to offer students across the State of Montana the opportunity to take advanced manufacturing online courses developed by FVCC at their Enrolling Institution, which also functions as an "Assessment Center" by offering the lab portions of such online courses to students; and

WHEREAS, this Course Sharing Memorandum of Understanding is necessary to establish the responsibilities of the EI and FVCC and to apportion funding and student counts between the colleges;

NOW, THEREFORE it is mutually agreed as follows:

1. Term of MOU. This MOU shall be effective January 1, 2016 and shall be in effect through the end of the RevUp grant.

2. Academic Calendar. FVCC's academic calendar governs this MOU.

3. Academic Catalog. The EI agrees to put the FVCC programs and associated courses listed on the attached Exhibit A in their academic catalog (except those courses not offered online), including FVCC's pre-requisites, co-requisites, course sequencing and placement guidelines (see Course Profiles, Exhibit B), and will secure any necessary approvals for such action, including approvals required by the Montana Board of Regents.

All of FVCC's programs require: one quantitative (math) course, one or two communication courses, an interactions course and one basic computer course. If one of the EI's students would like to substitute a different course than specified in Exhibit A, the student must secure approval for such substitution from the EI.

4. Course Schedule. FVCC will offer the online courses set forth below in the spring 2016 semester (See Exhibit A for details), and will add additional sections of these courses, subject to instructor availability, should demand and enrollment exceed existing class capacity.

Industrial Maintenance: Tier II

Machinist Technician: Tier II and Tier IV

Electronics Technician: Tier II and Tier IV

Following the spring 2016 semester, FVCC will collaborate with the EI on scheduling, and will determine the sequence of courses and course schedule, including labs, by mutual agreement.

5. Course Content. The EI agrees to the course syllabi prepared by FVCC instructors for the lecture component of FVCC's online courses for the spring 2016 semester, copies of which will be provided to the instructors teaching the lab portion of FVCC's online courses. EI lab instructors will prepare a syllabus for the lab portion of these courses that is integrated into the lecture portion of the course and that is consistent with the course profiles attached as Exhibit B. The EI lab instructors will be added as students to the online lecture courses, which access shall serve as the primary source of course content and course progress for the instructors.

The lab schedule will be determined by the FVCC online instructor and the EI lab instructor with sufficient flexibility to ensure student success while achieving course outcomes. FVCC will provide its own lab course schedule to the EI to assist in developing the EI's lab schedule. The lab schedule at the EI must be available to students when the EI course schedule is published.

In addition, the EI agrees to ensure qualified instructors teach the same learning outcomes in the labs as FVCC, per the Course Profiles and Common Course Numbering Guidelines, and that such instructors will confer as needed with FVCC's instructors to assure student success in the online courses. Course profiles for all FVCC online courses are attached on Exhibit B.

After the spring 2016 semester, FVCC and the EI will collaborate on the curriculum and any changes thereto will be mutually agreed upon.

6. Class Size. Current enrollments in FVCC's online courses are displayed in the Course Schedule located on FVCC's web site.

7. Learning Management System. FVCC will provide students secure access to FVCC's learning management system – Eagle Online. Each student will have a user name and password to access the system. FVCC will provide technical support to the students throughout their enrollment in online FVCC courses.

8. Class Rules and Policies. Unless otherwise mutually agreed to by the Parties, FVCC's class rules and policies regarding attendance, performance and behavior will be the applicable standard for FVCC's online courses. Any student misconduct will be reported to the EI, who assumes responsibility for addressing such misconduct.

9. Grades. Grades for the lecture portion of FVCC's courses will be sent to the EI no later than 5:00 p.m. five (5) business days following the end of the semester. Any grade appeals will be made by a student first to the FVCC instructor and then through the EI's academic appeals process. The EI will award and hold all student transcripts for students taking any FVCC online courses.

10. Tuition and Fees. The EI will remit tuition compensation (based on the lowest credit hour cost amongst RevUp consortium member colleges) and FVCC's Distance Education (DE) fees to FVCC as of the 15th class day by no later than the 35th class day. FVCC will determine the tuition amount each year and

will convey this information to the EI prior to the beginning of the fall semester. FVCC's current DE fees are posted in its academic catalog and on its website. Any other fees the EI may charge its students are kept by the EI.

FVCC student withdrawal dates will govern with respect to refunds, and in the event of a withdrawal, the EI will coordinate any such refunds with FVCC according to the EI's established practices.

11. Student Enrollment Full Time Equivalency. The EI is entitled to maintain and report all student FTEs for those students affected by this course sharing MOU.

12. Advising. All student advising will be the responsibility of the EI. The EI will include information for its students about FVCC's online advanced manufacturing courses as part of its student advising.

13. Registration. The EI will be responsible for student registration. The EI shall provide FVCC's Registrar and Instructional Technology Specialist a list of EI students enrolling in FVCC online courses in an Excel spreadsheet (including student contact information), plus the fully executed Student Information and Consent Agreement (Exhibit C), no less than five (5) days prior to the start of class.

14. Financial Aid. The EI is responsible for student financial aid. The EI will allow FVCC's online courses to be included in a student's course load for financial aid purposes.

15. Family Educational Rights and Privacy Act (FERPA). The Parties agree to abide by the provisions of FERPA. Students affected by this Course Sharing MOU will be required by the EI to sign the Student Information and Consent Agreement attached as Exhibit C, and an executed copy of the consent agreement will be provided to FVCC prior to the start of the class for which the student is registered. FVCC and the EI agree that they shall only communicate about matters directly related to students only through FERPA-compliant means, such as the use of encrypted email that is password protected.

16. Termination of MOU. Either party may terminate this MOU, with or without cause, with 30 days' prior written notice delivered to the non-terminating college's CEO.

17. Indemnification. The EI, on behalf of itself, its directors, trustees, partners, employees, affiliates, agents, guests, and each of their agents, affiliates, successors and assigns, hereby releases and shall defend FVCC and each of its officers, agents, employees, assigns and successors in interest from and against, any and all liability, damages, losses, claims, demands, actions, causes of action, costs (including attorney's fees and expenses), or any of them, past, present or future, known or unknown, arising out of or in connection with this MOU, and shall indemnify and hold FVCC harmless to the extent allowed by law.

FVCC, on behalf of itself, its directors, trustees, partners, employees, affiliates, agents, guests, and each of their agents, affiliates, successors and assigns, hereby releases and shall defend the EI and each of its officers, agents, employees, assigns and successors in interest from and against, any and all liability, damages, losses, claims, demands, actions, causes of action, costs (including attorney's fees and expenses), or any of them, past, present or future, known or unknown, arising out of or in connection with this MOU, and shall indemnify and hold the EI harmless to the extent allowed by law.

18. Entire Agreement. This Agreement contains the entire agreement and understanding between the Parties regarding course sharing of FVCC online advanced manufacturing courses, and merges and supersedes all prior representations and discussions pertaining to the subject matter herein.

19. Amendment. Any changes, exceptions, or different terms and conditions shall be only by written amendments to this Agreement, mutually agreed to and executed by the Parties.

20. Severability. The invalidity or unenforceability of any provisions of this course sharing MOU shall not affect the validity or enforceability of any other provision of this MOU, which shall remain in full force and effect.

21. Interpretation and Jurisdiction. This Agreement shall be interpreted, governed, and construed under the laws of the State of Montana.

22. Binding Authority. The person signing this Agreement represents that he or she is duly authorized to execute this Agreement on behalf of the Party for whom he or she signs, and to fully bind such Party to this Agreement.

Flathead Valley Community College:

By: _____

Date: _____

Jane A. Karas, Ph.D., President

_____, Enrolling Institution:

By: _____

Date: _____

Name and Title

EXHIBIT A

FVCC ONLINE ADVANCED MANUFACTURING PROGRAMS

{Italicized courses are not offered online}

Electronics Technician, CT, CAS, AAS

Fall Semester (Tier I)

Course#	Title	Credits
<i>CAPP 106*</i>	<i>Short Courses: Computer Applications</i>	<i>1</i>
or		
CAPP 114	Short Courses: MS Word	1
or		
CAPP 116	Short Courses: MS Excel	1
ECP 104	Workplace Safety	1
ELCT 100	Introduction to Electricity	3
ELCT 110	Basic Electricity I	5
ELCT 137	Electrical Drafting	2
M 114*	Extended Technical Mathematics	3
MCH 101	Intro to Manufacturing Processes	1
	Semester Total	16

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier II)

Course#	Title	Credits
BMGT 205C	Professional Business Communication	
or		
<i>COMX 115C</i>	<i>Intro. to Interpersonal Communications</i>	<i>3</i>
ELCT 102*	Electrical Fundamentals II	4
ELCT 111	Electric Meters and Motors	3
ETEC 130	Panel Wiring and Soldering	2
PHSX 110*	Applied Physics	4
	Semester Total	16
	CAS Total Credits	32

**Indicates prerequisite and/or corequisite required; check course description.*

Fall Semester (Tier III)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
ELCT 210*	Advanced Current Theory	5
ELCT 250	Programmable Logic Controllers	4
ETEC 245*	Digital Electronics	4
ETEC 250*	Solid State Electronics I	4
Semester Total		17

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier IV)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
BMGT 205C*	Professional Business Communication	
or		
COMX 115C	Intro to Interpersonal Communication	3
ELCT 211*	AC Measurements	3
ETEC 280*	Advanced Electronics	4
ETEC 285*	Adv. Programmable Controllers	4
ETEC 299*	Capstone: Electronics	3
Semester Total		17
AAS Degree Total Credits		66

**Indicates prerequisite and/or corequisite required; check course description.*

Industrial Maintenance, CT

Fall Semester (Tier I)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
ECP 104	Workplace Safety	1
ELCT 100	Introduction to Electricity	3
M 111*	Technical Mathematics	3
MCH 101	Intro. to Manufacturing Processes	1
MCH 120	Blueprint Reading & Int. Mach.	3
MCH 129	Machine Quality Control and Precision Measurements	3
MCH 132*	Introduction to Engine Lathes	4
Semester Total		18

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier II)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
BMGT 205C	Professional Business Communication	
or		
COMX 115C	Intro to Interpersonal Communication	3
CAPP 106*	Short Courses: Computer Applications	
or		
CAPP 114	Short Courses: MS Word	
or		
CAPP 116	Short Courses: MS Excel	1
CSTN 125	Basic Cabinetry and Furniture Making	3
ELCT 111	Electric Meters and Motors	3
MCH 102	Intro to Manufacturing Materials	2
WLDG 111*	Welding Theory I Practical	4
	Semester Total	16
	CAS Total Credits	34

Industrial Machine Technology, AAS, CAS, CT

Fall Semester (Tier I)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
ECP 104	Workplace Safety	1
M 111*	Technical Mathematics	3
MCH 101	Intro to Manufacturing Processes	1
MCH 120	Blueprint Reading & Int. Mach.	3
MCH 129	Machine Quality Control and Precision Measurements	3
MCH 132	Introduction to Engine Lathes	4
MCH 134	Introduction to Mills	4
	Semester Total	19

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier II)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
BMGT 205C	Professional Business Communication	
or		
COMX 115C	Intro to Interpersonal Communication	3
DDSN 135	Solidworks	2

MCH 102	Intro. to Manufacturing Materials	2
MCH 122	Introduction to CAM	3
MCH 125*	Intro to CNC Lathe Operations	3
MCH 127*	Intro to CNC Mill Operations	3
MFGT 115	Machine Shop Fundamentals	2
	Semester Total	18
	CAS Total Credits	37

Fall Semester (Tier III)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
MCH 220*	Geometric Dimensioning and Tolerancing	3
MCH 221*	Advanced Manual Mill	3
MCH 222*	Advanced CNC Mill Operations	3
MCH 225	Machinery's Handbook	3
MCH 226*	Advanced CAD/CAM	4
	Semester Total	16

**Indicates prerequisite and/or corequisite required; check course description.*

Spring Semester (Tier IV)

<u>Course#</u>	<u>Title</u>	<u>Credits</u>
BMGT 205C*	Professional Business Communication	
or		
COMX 115C	Intro to Interpersonal Communication	3
MCH 227*	Swiss CNC and Mill-Turn Systems	4
MCH 223*	Advanced Manual Lathe	3
MCH 224*	Advanced CNC Lathe Operations	3
MCH 299*	Capstone: Machinist	3
	Semester Total	16
	AAS Degree Total Credits	69

**Indicates prerequisite and/or corequisite required; check course description.*

Note: Although M111 and M114 are offered fully online, students are required to schedule a 1 hour conference with their instructor each week.

EXHIBIT B: COURSE PROFILES

Proposed Course Splits			
ELCT	100	Introduction to Electricity	ELCT 107 – Lecture Only
			ELCT 108 – Lab Only
ELCT	110	Basic Electricity I	ELCT 112 – Lecture Only
			ELCT 113 – Lab Only
ELCT	137	Electrical Drafting	ELCT 135 – Lecture Only
			ELCT 136 – Lab Only
ELCT	210	Advanced Current Theory	ELCT 208 – Lecture Only
			ELCT 209 – Lab Only
ELCT	250	Programmable Logic Controllers	ELCT 248 – Lecture Only
			ELCT 249 – Lab Only
ETEC	245	Digital Electronics	ETEC 243 – Lecture Only
			ETEC 244 – Lab Only
ETEC	250	Solid State Electronics	ETEC 248 – Lecture Only
			ETEC 249 – Lab Only
MCH	101	Introduction to Manufacturing Processes	MCH 105 – Lecture Only
			MCH 106 – Lab Only
MCH	120	Blueprint Reading and Interpretations for Machining	MCH 118 – Lecture Only
			MCH 119 – Lab Only
MCH	129	Machine Quality Control and Precision Measurements	MCH 126 – Lecture Only
			MCH 128 – Lab Only
MCH	132	Introduction to Engine Lathes	MCH 131 – Lecture Only
			MCH 133 – Lab Only
MCH	134	Introduction to Mills	MCH 135 – Lecture Only
			MCH 138 – Lab Only
MCH	221	Advanced Manual Mill	MCH 216 – Lecture Only
			MCH 217 – Lab Only
MCH	222	Advanced CNC Mill Operations	MCH 218 – Lecture Only
			MCH 219 – Lab Only
MCH	226	Advanced CAD-CAM	MCH 228 – Lecture Only
			MCH 229 – Lab Only

EXHIBIT C

STUDENT INFORMATION AND CONSENT AGREEMENT

For students enrolling in courses offered through the RevUp Consortium

*To be posted on the Enrolling Institution's website with requirement that student read and execute prior to registration in FVCC online courses.

1. Course Information. Insert name of Enrolling Institution entered into a Course Sharing Memorandum of Understanding with Flathead Valley Community College (FVCC) which will expand your opportunity to select and access high-quality online courses from FVCC. Even though the online lecture courses are taught by FVCC faculty or instructors, credits earned count toward your degree/program here, your financial aid will not be affected, and you will not need to transfer credits. If there is a lab portion associated with the course you choose, it will be taught by our faculty or instructors on this campus. If you elect to register for one of these courses, you must be aware of the following information and agree to the policies that govern the course delivery.

2. Registration. Courses offered through FVCC will be listed in our academic catalog. You may register for the course through our usual registration process, paying all tuition and fees in the process. Since you will be enrolling as our student, you are responsible for adhering to the established policies and procedures found in our catalog and student handbook, including the refund policy. In addition, you are responsible for adhering to established academic policies and procedures of FVCC when enrolled in an FVCC online course.

Please note: Special discounts and tuition waivers may not apply to this course. Also, registration and enrollment deadlines at FVCC may differ from ours.

3. Delivery. FVCC is accredited by the Northwest Commission on Colleges and Universities. FVCC's course instructor will supply the syllabus via email or via a link in their learning management system. It is your responsibility to contact the course instructor and comply with the requirements and the schedule of the course. It is also your responsibility to comply with the academic policies of FVCC in areas such as academic integrity, course performance, and behavioral standards. Evaluation of your performance and computation of the grade in the lecture portion of your course is the responsibility of the instructor at FVCC. Any dispute regarding process or content of that evaluation is subject to the review policies of FVCC.

This course will be completed online and there will be no in-person meeting requirements for the lecture component of the course; however, some courses may require occasional conference calls between the student and instructor and the course may contain a lab component which you will take at Insert name of Enrolling Institution. The online instructor may require a proctored exam and will give you guidelines to follow. Course materials may be provided through FVCC's learning management system which may or may not be the same as ours. The course instructor or a representative from FVCC will contact you with information regarding how to enter its learning management system. It is your responsibility to remember the unique username and password for this course. Keep a record of this information and who to contact at FVCC in case there is an issue.

4. Start/End Dates. It is your responsibility to review the course syllabus and know when the course begins and ends. These dates may differ from a majority of the courses offered by our institution.

5. Financial Aid. If you are eligible for federal financial aid programs, this course will not affect your eligibility. Even though the online lecture instructor does not work for our institution, this course has been approved by the appropriate academic department at Insert name of Enrolling Institution.

6. Records. Data from your academic record at Insert name of Enrolling Institution will be shared with appropriate persons from FVCC including, but not limited to, name, address, phone number, email address, and student ID. This data will be used by the online course instructor to help maintain a record of your performance on the assignments and activities of the course. Furthermore, the online course instructor and the lab instructor at this college will confer about your progress in the course, in order to assure your success in the course.

7. Course Grade. The online course instructor will submit the final grade earned in the online lecture portion of the course to the Insert name of Enrolling Institution registrar. The grade will be posted on your Insert name of Enrolling Institution transcript and used in the calculation of your GPA. Grade appeals for this course will be addressed to the online course instructor first and then to the Insert name of Enrolling Institution through its academic appeals process. Please note that the course grade used by the instructor may be translated to fit Insert name of Enrolling Institution's grading system.

Agreement

By registering for an FVCC online course, you have chosen to agree and accept the information provided above and to consent to the sharing of data and information as described above.

Student Name

Date

June 2016

ITEM 171-2912-LI0616

Request for authorization to offer Welding & Fabrication A.A.S. & Tier 4 C.T.S.

THAT

Great Falls College Montana State University requests authorization from the Montana Board of Regents to offer an associate of applied science and Tier 4 certificate of technical studies in Welding and Fabrication.

EXPLANATION

As part of the RevUp grant, GFC MSU developed an A.A.S. – Welding & Fabrication. This is a continuation of the College’s existing Certificate of Applied Science (C.A.S.) and is in response to industry and student requests for additional welding and fabrication skills. The credential is stacked, so the final semester of the A.A.S. will be identified as a C.T.S., an industry recognized credential.

ATTACHMENTS

Academic Proposal Request Form
Curriculum Proposal Form
Attachment #1 - Fee Request
Attachment #2 - Catalog Page

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

ITEM 171-2912-LI0616 Submission Month or Meeting: June 2016

Institution: Great Falls College Montana State University CIP Code: 48.0508

Program/Center/Institute Title: Welding Fabrication & Technology Associate of Applied Science (A.A.S.) & Tier 4 Certificate of Technical Studies (C.T.S.)

Includes (please specify below): Online Offering Options

Please mark the appropriate type of request and submit with an Item Template and any additional materials, including those listed in parentheses following the type of request. For more information pertaining to the types of requests listed below, how to complete an item request, or additional forms please visit <http://mus.edu/che/arsa/preparingacademicproposals.asp>.

x **A. Level I:**

Campus Approvals

- 1a. **Placing a program into moratorium** (Program Termination and Moratorium Form)
- 1b. **Withdrawing a program from moratorium**
- 2. **Adding, re-titling, terminating or revising a campus certificate of 29 credits or less**
- 3. **Adding a BAS/AA/AS area of study**
- 4. **Offering an existing program via distance or online delivery**

OCHE Approvals

- 5. **Re-titling an existing program**
- 6. **Terminating an existing program** (Program Termination and Moratorium Form)
- 7. **Consolidating existing programs** (Curriculum Proposal Form)
- 8. **Adding a new minor where there is a major or an option in a major** (Curriculum Proposal Form)
- 9. **Revising a program** (Curriculum Proposal Form)
- x 10. **Adding a temporary certificate or AAS degree program** *Approval limited to 2 years*

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

B. Level II:

1. **Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Intent to Plan Form)
2. **Exceeding the 120 credit maximum for baccalaureate degrees** *Exception to policy 301.11*
3. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and Completed Intent to Plan Form, except when eliminating or consolidating)
4. **Re-titling an academic, administrative, or research unit**

Specify Request:

As part of the RevUp grant, GFC MSU developed an A.A.S. – Welding & Fabrication. This is a continuation of the existing Certificate of Applied Science (C.A.S.) and is in response to industry and student requests for additional welding and fabrication skills. The credential is stacked, so the final semester of the A.A.S. will be identified as a C.T.S., an industry recognized credential.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

1. Overview

As part of the RevUp grant, GFC MSU developed an AAS – Welding & Fabrication. This is a continuation of the College’s existing Certificate of Applied Science (CAS) and is in response to industry and student requests for additional welding and fabrication skills. The credential is stacked, so the final semester of the AAS will be identified as a CTS, an industry recognized credential.

- A. Provide a one paragraph description of the proposed program. Be specific about what degree, major, minor or option is sought.**

The Welding and Fabrication CAS is currently designed on a Tier system, using two semesters both ending with a CTS. The CTS, an industry recognized credential allows students to either enter the workforce or continue to the next Tier of the welding and fabrication program. By adding Tier 3 and Tier 4, both resulting in an individual CTS, the credentials would stack together, allowing the student to enter into the workforce with a higher skill level and complete an AAS upon completion of the final, or 4th Tier.

2. Institutional and System Fit

- A. What is the connection between the proposed program and existing programs at the institution?**

The new credentials stack with the college’s existing CAS and Tier 3 CTS to create an AAS or Tier 4 CTS.

- C. Describe what differentiates this program from other, closely related programs at the institution (if appropriate).**

N/A

- E. Describe the relationship between the proposed program and any similar programs within the Montana University System. In cases of substantial duplication, explain the need for the proposed program at an additional institution. Describe any efforts that were made to collaborate with these similar programs; and if no efforts were made, explain why. If articulation or transfer agreements have been developed for the substantially duplicated programs, please include the agreement(s) as part of the documentation.**

Each campus offers courses in their welding programs that may be regionally specific. GFC MSU is not substantially duplicating any other program in the MUS.

3. Program Details

- A. Provide a detailed description of the proposed curriculum. Where possible, present the information in the form intended to appear in the catalog or other publications. NOTE: In the case of two-year degree programs and certificates of applied science, the curriculum should include enough detail to determine if the characteristics set out in Regents’ Policy 301.12 have been met.**

See attachment A2 – Catalog Page

Montana Board of Regents
CURRICULUM PROPOSAL FORM

B. Describe the planned implementation of the proposed program, including estimates of numbers of students at each stage.

The plan to offer Tier 3 fall 2016 and Tier 4 spring 2017 with an intake of 12-15 students. The college anticipates the program will grow as students enter the workforce and then return for further training and in some instances continue after their CAS.

4. Need

A. To what specific need is the institution responding in developing the proposed program?

The Welding & Fabrication CTS tier system allows students to select the level of training desired to enter the workforce at levels commensurate with specific occupations that require job skills taught at the varying levels. This also allows for students who have been in the workforce to continue working on an advanced degree.

B. How will students and any other affected constituencies be served by the proposed program?

Industry is in need of skilled labor and will support the change. Adding Tier 3 and Tier 4 will provide a student ability to enter into the workforce with a greater degree of skill and confidence or continue their education seeking an AAS. It will also provide students returning to education the opportunity for a more in-depth welding education. Without the ability to utilize financial aid, many students are not able to obtain the necessary skills needed to be competitive in the workforce.

C. What is the anticipated demand for the program? How was this determined?

Meeting with industry partners and advisory board members provided input into the curriculum. The College anticipates the demand for the program to be 12-15 students once they have completed Tier 2 or are able to demonstrate the necessary competencies.

5. Process Leading to Submission

A. Describe the process of developing and approving the proposed program. Indicate, where appropriate, involvement by faculty, students, community members, potential employers, accrediting agencies, etc.

The Welding and Fabrication program was developed in consultation with the RevUp welding and fabrication program directors. The Montana RevUp grant has also had great input into what is needed for the Montana workforce. Members of our local advisory board have expressed need for the next level of a welding program. The AAS was approved by the GFC MSU Curriculum Committee on March 11, 2016.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

6. Resources

- A. Will additional faculty resources be required to implement this program? If yes, please describe the need and indicate the plan for meeting this need.**

No. At this time, it is anticipated that current faculty will teach certain courses in which they have previously specialized.

- B. Are other, additional resources required to ensure the success of the proposed program? If yes, please describe the need and indicate the plan for meeting this need.**

The additional equipment needed to teach the curriculum has been purchased with grant funding.

7. Assessment

- A. How will the success of the program be measured?**

The Welding and Fabrication Tier 3 and 4 CTS will be measured by the successful completion and placement of graduates into the workforce or continuing on to achieve the AAS degree.

THE MONTANA UNIVERSITY SYSTEM
 Inventory and Validation of Fees -- New Programs
New Non-Mandatory Fees -- Rates per Semester

Unit Name: Great Falls College Montana State University

NAME OF FEE	RUBRIC	BOR AUTHORIZATION	% CHANGE		% CHANGE		FUND	DESCRIPTION
			FY 17 FEE	FY 18 FEE	FY 17 FEE	FY 18 FEE		
Program Fees								
Welding Tier 4			\$650	\$650	0%	0%	331005	Costs of program specific consumables including, but not limited to welding gases, rods, wire, metal sheets and fragments, welding hood visors, pliers, anti-splatter, and student protective wear.

Attachment 2: Program Details

Welding Technology & Fabrication CIP Code: 48.0508 Associate of Applied Science and Certificates of Technical Studies

Program Director: Joel Sims
Faculty: Doug Zander, Monte Cobb

Program Website (<http://www.gfcmsu.edu/webs/Welding>)

For more information on other programs in this field, visit the catalog page for Welding CAS

Program Application (Fall 2016 applications available February 12)

Gainful Employment Programs Information -- Tier 3

Gainful Employment Programs Information – Tier 4

Note: The Welding programs are limited enrollment programs. Interested students must apply for entry into the programs. An application packet is available here on the GFC MSU catalog website, the Welding program website or Admissions. To be accepted into these programs, students must have a qualifying placement assessment score or have completed M 065 within the last 3 years.

This program follows the National Center for Construction Education and Research (NCCER) curriculum.

Outcomes Tier 3 Graduates are prepared to:

- Produce welds in all positions that meet industry standards using the following process(es) with 3"-6" schedule 40 & 80 pipe
 - GTAW
 - SMAW
 - GMAW
 - FCAW
- Will be exposed to:
 - Pipe groove joints
 - Pipe layout tools
 - Metal Identification
 - Braze and weld cast iron
 - Hard surface
- Use Computer Aided Design software to:
 - Draw and edit a 2D object
 - Annotate a drawing
 - Plot and scale drawings

Outcomes Tier 4 Graduates are prepared to:

- Learn to set up and weld aluminum plate using spool guns in all positions on plate of various thicknesses including groove, fillet and spot welds.
- Weld aluminum plate using TIG process in all positions and various thicknesses including groove, fillet and spot welds.
- Learn the benefits of PULSE ARC technology and how it effects the weld, base metal, and the welder.
- Learn to weld aluminum using spool gun Pulse in all positions on plate of various thicknesses including groove, fillet and spot welds.
- Learn how to troubleshoot and fix problems with machines, spools guns, TIG torches and assemblies, base metals conditions and shielding gasses.
- Demonstrate the ability to take general arrangements blueprints and break them down into shop drawings.
- Properly dimension and detail shop drawings.
- Include weld symbols into shop drawings.
- Demonstrate machine set-up for the successful welding of aluminum, stainless steel, carbon steel;
- Demonstrate machine tool set-up/operation...press brake, Shear, lathe, milling machine, various welding machines, for the successful forming, machining and welding of metals;
- Demonstrate the ability to plan, design and construct a project to industry standards.
- For graphic design and documentation, Autocad will be used;
- Demonstrate fillet and groove welding to American Welding Society Standards.

Outcomes Associate of Applied Science Graduates are prepared to:

- Produce welds in all positions that meet industry standards using the following process(es) with 3"-6" schedule 40 & 80 pipe
 - GTAW
 - SMAW
 - GMAW
 - FCAW
- Will be exposed to:
 - Pipe groove joints
 - Pipe layout tools
 - Metal Identification
 - Braze and weld cast iron
 - Hard surface
- Use Computer Aided Design software to:
 - Draw and edit a 2D object
 - Annotate a drawing
 - Plot and scale drawings
- Learn to set up and weld aluminum plate using spool guns in all positions on plate of various thicknesses including groove, fillet and spot welds.
- Weld aluminum plate using TIG process in all positions and various thicknesses including groove, fillet and spot welds.
- Learn the benefits of PULSE ARC technology and how it effects the weld, base metal, and the welder.
- Learn to weld aluminum using spool gun Pulse in all positions on plate of various thicknesses including groove, fillet and spot welds.

- Learn how to troubleshoot and fix problems with machines, spools guns, TIG torches and assemblies, base metals conditions and shielding gasses.
- Demonstrate the ability to take general arrangements blueprints and break them down into shop drawings.
- Properly dimension and detail shop drawings.
- Include weld symbols into shop drawings.
- Demonstrate machine set-up for the successful welding of aluminum, stainless steel, carbon steel;
- Demonstrate machine tool set-up/operation...press brake, Shear, lathe, milling machine, various welding machines, for the successful forming, machining and welding of metals;
- Demonstrate the ability to plan, design and construct a project to industry standards.
- For graphic design and documentation, Autocad will be used;
- Demonstrate fillet and groove welding to American Welding Society Standards.

Estimated Cost Estimated Resident Program Cost*

Welding Tier 3 & 4 Certificate of Technical Studies

Tuition and Fees \$1,595
Application Fee \$30
Program Fees \$650
Tools/Clothing varies
Books/Supplies \$160
Total \$2,435+

Welding Technology & Fabrication Associate of Applied Science

Tuition and Fees \$6,380
Application Fee \$30
Program Fees \$2,600
Tools/Clothing varies
Books/Supplies \$640
Total \$9,650+

*** Fall 2015 MUS Student Health Insurance Premiums will be changing. Please check the Health Insurance website and/or Student Central for confirmed premium rates. Students will be charged an additional fee of \$21 per credit for online/hybrid courses.**

Program Requirements

Many students need preliminary math and writing courses before enrolling in the program requirements. These courses may increase the total number of program credits. Students should review their math and writing placement before planning out their full program schedules.

GFC MSU Additional Graduation Requirement

Course	Title	Credits	Grade/Sem
COLS 103	Becoming a Successful Student +	1	_____

FIRST SEMESTER of CAS – AFTER FORMAL ACCEPTANCE

(Students who complete the first semester of courses are eligible for the Welding & Fabrication Tier 1 Certificate of Technical Studies degree.)

Course	Title	Credits	Grade/Sem
M 191B	Special Topics: Math for Weld **,+	3	_____
WLDG 110	Welding Theory I +	3	_____
WLDG 111	Welding Theory I Practical +		_____
WLDG 117	Blueprint Rdng-Welding Symbols +	2	_____
WLDG 145	Fabrication Basics +	2	_____

Term Credits 16

SECOND SEMESTER of CAS

(Students who complete the second semester of courses are eligible for the Welding & Fabrication Tier 2 Certificate of Technical Studies degree.)

Course	Title	Credits	Grade/Sem
COMX 102	Inter. Skills in Workplace +	1	_____
WRIT 104	Workplace Communications +	2	_____
WLDG 120	Welding Theory II *,+	2	_____
WLDG 121	Welding Theory II Practical *,+	4	_____
WLDG 130	Intro to Structural Welding *, +	2	_____
WLDG 185	Welding Qualification Tst Prep *,+	4	_____
WLDG 205	Applied Metallurgy *,+	1	_____

Term Credits 16

Total Certificate of Applied Science Credits 32

THIRD SEMESTER of AAS– AFTER FORMAL ACCEPTANCE

(Students who complete the third semester of courses are eligible for the Welding & Fabrication Tier 3 Certificate of Technical Studies degree.)

Course	Title	Credits	Grade/Sem
DDSN 114	Introduction to CAD *,+	3	_____
WLDG 212	Pipe Welding & Layout *,+	4	_____
WLDG 260	Repair-Maintenance Welding *,+	3	_____
WRIT 121	Technical Writing **,+	3	_____
Select one of the following:			
BGMT 299	Entrepreneurship +	3	_____
OR			
WLDG 298	Welding Internship *, +	3	_____

Term Credits 16

FOURTH SEMESTER of AAS

(Students who complete the third semester of courses are eligible for the Welding & Fabrication Tier 4 Certificate of Technical Studies degree.)

Course	Title	Credits	Grade/Sem
WLDG 217	Advanced Blueprint *,+	2	_____
WLDG 237	Aluminum Welding Processes *,+	4	_____
WLDG 245	Metal Fab Design/Construction *,+	5	_____
WLDG 280	Weld Testing Certification *,+	3	_____
WLDG 281	Weld Testing Certification Lab *,+	2	_____
		Term Credits 16	

Total Associate of Applied Science Credits 64

* Indicates prerequisites needed.

** Placement in course(s) is determined by placement assessment.

+ A grade of C- or above is required for graduation.

DDSN 114 – Introduction to CAD

A systems-oriented course designed to introduce students to the concepts, techniques, and applications of PC-based computer-aided drafting that will allow them to create drawing files. Command structure, coordinate systems, text, dimensions, and plotting will be covered.

WLDG 212 – Pipe Welding & Layout

The student will learn to fit and weld open root pipe joints with SMAW, GMAW, FCAW, & GTAW on carbon and stainless steels. Students will apply this knowledge to complete pipe welds in all positions.

WLDG 260 – Repair/Maintenance Welding

Students will learn basic repair and maintenance techniques of various metals. Then apply those techniques to practical applications.

WRIT 121 – Technical Writing

This course introduces students to the creation and evaluation of several kinds of written and oral technical communication. Students will gain experience in communication formats typical of technical careers. This course places emphasis on writing as the craft of the critical thinker, involving analysis of audience, context, and purpose, as well as the ability to locate, synthesize, and analyze, organize, and present information effectively.

BMGT 299 – Entrepreneurship

An overview of the skill areas and business principles needed to start and operate a small business in Montana. Includes components of a business plan, planning & development, identifying sources of capital, managing growth, and marketing issues related to new ventures. This course is designed for the

non-business major. This course is offered through a course-sharing arrangement with Missoula College - University of Montana.

WLDG 298 – Welding Internship

This is the final course that completes the student's curriculum for the Welding & Fabrication Tier 3 CTS. Students will pull together what they have learned in their previous classes and demonstrate their capabilities in preparation for the workforce.

WLDG 217 – Advance Blueprint

Students will design and draw a set of working prints to use for fabrication of a major project identified by the student and instructor.

WLDG 237 – Aluminum Welding Processes

Students will gain knowledge of aluminum welding processes and procedures. Students will apply this knowledge to make welds on aluminum plate in a variety of positions to industry standards.

WLDG 245 – Metal Fab Design/Construction

As a Capstone course students will apply knowledge learned in previous semesters to design and fabricate a welding projects with a minimum of 20 hours of welding. Students will be required to estimate and supply the materials for their project.

WLDG 280 – Weld Testing Certification

Students will gain further in depth knowledge of the welding codes and what is required for welder qualification tests. Students will practice and build skill to complete an unlimited thickness qualification test to a welding code.

WLDG 281 – Welding Testing Certification Lab

Students will gain further in depth knowledge of the welding codes and what is required for welder qualification tests. Students will practice and build skill to complete an unlimited thickness qualification test to a welding code.