

LEVEL II MEMORANDUM

DATE: October 27, 2015

TO: Chief Academic Officers, Montana University System

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

RE: Level II Proposals

The campuses of the Montana University System have proposed new academic programs or changes under the Level II approval process authorized by the Montana Board of Regents. The Level II proposals are being sent to you for your review and approval. 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 Chief Academic Officer's conference call on **November 3, 2015**. Issues not resolved at that meeting should be submitted in writing to OCHE by noon on **Friday, November 6**. If no concerns are received, OCHE will assume that the proposals have your approval.

Level II Items

Dawson Community College:

- Request for authorization to establish a new AAS in Corrosion Technology
[Item #169-200-R1115](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Attachment #1](#)

Montana State University Bozeman:

- Request for Authorization to Develop the Center for Interdisciplinary Health Workforce Studies
[Item #169-2010-R1115](#) | [Academic Proposal Request Form](#) | [Research Center and Institute Proposal Form](#)
- Request for Authorization to Establish an AAS in Photonics and Laser Technology
[Item #169-2011-R1115](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Attachment #1](#)

Montana State University Billings:

- Request for Authorization to Establish an Interdisciplinary Honors Minor
[Item #169-2701-R1115](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#)

Great Falls College Montana State University:

- Request for Authorization to Establish a Computer Programming AAS
[Item #169-2902-R1115](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Attachment #1](#)

November 19-20, 2015

ITEM 169-200-R1115

Request for authorization to establish a new AAS Degree in Corrosion Technology

THAT

The Montana Board of Regents gives approval for Dawson Community College to offer an AAS degree in Corrosion Technology.

EXPLANATION

This two-year Associate of Applied Science degree will prepare students for entry level employment as Corrosion Technicians in the fields of manufacturing, oil & gas industry, government agencies, pipeline maintenance and general corrosion management. Students will learn in state-of-the-art industry labs and classroom settings using NACE-certified equipment while preparing to sit for NACE certification exams. Courses include a capstone project and apprenticeship experience.

ATTACHMENTS

Academic Proposal Request Form
Curriculum Proposal Form
Attachment #1 – Curriculum Schedule

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

Item Number: 169-200-R1115

Meeting Date: November 19-20, 2015

Institution: Dawson Community College

CIP Code: 15.0699

Program Title: Corrosion Technology

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 the [Academic Affairs Handbook](#).

 A. Notifications:

Notifications are announcements conveyed to the Board of Regents at the next regular meeting.

 1a. Placing a program into moratorium (Document steps taken to notify students, faculty, and other constituents and include this information on checklist at time of termination if not reinstated)

 1b. Withdrawing a program from moratorium

 2. Intent to terminate an existing major, minor, option or certificate – Step 1 (Phase I Program Termination Checklist)

 3. Campus Certificates- Adding, re-titling, terminating or revising a campus certificate of 29 credits or less

 4. BAS/AA/AS Area of Study

 B. Level I:

Level I proposals are those that may be approved by the Commissioner of Higher Education. The approval of such proposals will be conveyed to the Board of Regents at the next regular meeting of the Board.

 1. Re-titling an existing major, minor, option or certificate

 2. Adding a new minor or certificate where there is a major or an option in a major (Curriculum Proposal Form)

 3. Revising a program (Curriculum Proposal Form)

 4. Distance or online delivery of an existing degree or certificate program

 5. Terminating an existing major, minor, option or certificate – Step 2 (Completed Program Termination Checklist)

 Temporary Certificate or AAS Degree Program

Approval for programs under this provision will be limited to two years. Continuation of a program beyond the two years will require the proposal to go through the normal Level II Proposal approval process.

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

 C. Level I with Level II Documentation:

This type of proposal may go to the Board as a Level I item if all Chief Academic Officers are in agreement. If consensus among the Chief Academic Officers is not reached, however, the item will go to the Board as a Level II request.

 1. Consolidating existing programs and/or degrees (Curriculum Proposal Form)

X **D. Level II:**

Level II proposals require approval of the Board of Regents. These requests will go to the Board in a two-meeting format, the first being as informational and the second as action.

 1. Re-titling a degree (ex. From B.A. to B.F.A)

 2. Adding a new minor or certificate where there is no major or option in a major (Curriculum Proposal Form)

X **3. Establishing a new degree or adding a major or option to an existing degree** (Curriculum Proposal Form)

 4. Forming, eliminating or consolidating a college, division, school, department, institute, bureau, center, station, laboratory or similar unit (Curriculum Proposal Form or Center Proposal Form, except when eliminating or consolidating)

 5. Re-titling a college, division, school, department, institute, bureau, center, station, laboratory or similar unit

Specify Request:

This two-year Associate of Applied Science degree will prepare students for entry level employment as Corrosion Technicians in the fields of manufacturing, oil & gas industry, government agencies, pipeline maintenance and general corrosion management. Students will learn in state-of-the-art industry labs and classroom settings using NACE-certified equipment while preparing to sit for NACE certification exams. Courses include a capstone project and apprenticeship experience. The need for this program has been demonstrated by industry requests and verified through a symposium in May, 2015, and further through the DACUM process in September, 2015. To ensure a better overview by Dawson Community College staff, local industry invited us and spent a full day in the field explaining the processes and providing first-hand knowledge of the need for corrosion technicians.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

1. Overview

Dawson Community College is requesting approval to offer an AAS in Corrosion Technology in Fall, 2016.

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

This two-year Associate of Applied Science degree will prepare students for entry level employment as Corrosion Technicians in the fields of manufacturing, oil & gas industry, government agencies, pipeline maintenance and general corrosion management. Students will learn in state-of-the-art industry labs and classroom settings using NACE-certified equipment while preparing to sit for NACE certification exams. Courses include a capstone project and apprenticeship experience (new Montana initiatives encouraging apprenticeship experiences provide strong support for this component).

3. Need

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

The need for this program has been demonstrated by industry requests and verified through a symposium in May, 2015, and further through the DACUM process in September, 2015. To ensure a better overview by Dawson Community College staff, local industry invited us and spent a full day in the field explaining the processes and providing first-hand knowledge of the need for corrosion technicians.

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

Students will prepare themselves for employment and to sit for the industry standard, NACE certification exams. Industry will be served by well-prepared, local graduates able to further employer productivity to maintain a competitive edge. This proposal includes a partnership with a local employer to jointly develop a training facility equipped to NACE certifications.

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

NACE is the industry standard with a course enrollment cap of 18 students. We anticipate to fill 18 seats.

4. Institutional and System Fit

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

Corrosion and prevention of corrosion is also part of our welding program instruction.

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

None

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

There are no closely related programs at Dawson Community College.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

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

This meets two of Dawson Community College's strategic goals in the 2015-18 plan: Develop existing and new programs and services to support student success; Expand workforce training and customized business services in partnership with regional employers

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.

There are no other corrosion technology programs in Montana. The nearest corrosion technology programs are in Kilgore, Texas, Seward, Kansas and a 4-year degree in Akron, Ohio.

5. 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 attached curriculum/course plan.

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

We will follow the normal Dawson Community College recruiting timeline as well as direct communication with industry. The estimated number of students for the fall 2016 cohort group is 18.

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.

Adjunct faculty with current industry expertise will be identified and hired in coordination with partner companies in this program; and the costs associated with training, certification, and professional development will be shared by industry partners. These adjunct faculty will oversee the program in coordination with the CTE Division Director and Assistant Vice President of Career-Technical & Workforce Education, to provide consistency to the teaching and learning process. Online curriculum, apprenticeship models, and classroom instruction will be used.

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.

This proposal includes a partnership with a regional employer to develop a training facility equipped to NACE-certifications. Equipment needed for classroom-based instruction includes items such as magnetic, pulse-induction locating equipment, circuit boards and batteries, void meters, data logger, isolation tester, copper sulfate electrodes, UT gauge, thermite weld kit, current mappers & interrupters all for the purpose of

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CURRICULUM PROPOSAL FORM

providing the hands-on experiences that mirror the workplace. All material costs borne by the college are to be paid for out of the "Ullman Trust" which was dedicated for the purpose of developing career-technical programs that prepare students for high-demand jobs. The college's general fund will not be tapped in support of this program development.

7. Assessment

How will the success of the program be measured?

Both faculty and students will be industry certified, and the testing will be conducted by industry partners. Measures of success will include retention, completion/graduation, placement, enrollment, successful apprenticeship placement.

8. Process Leading to Submission

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

Industry requests drove our processes which include the following:

- Symposium for oil, gas and welding in May 2015 with area businesses, Seward Community College (electronically) and welding faculty
- Distribution of symposium summary to participants
- Follow up phone calls with every industry participant in June 2015 asking them to confirm summary symposium summary, confirm need for corrosion technology program and to participate on an advisory board
- Phone call to introduce DACUM process to participants in August 2015
- DACUM held on September 15, 2015
- Distribution of DACUM summary to participants for verification in September 2015

The following industries were represented in these processes as well as our welding faculty, economic development staff and Montana's RevUp staff:

- Montana-Dakota Utilities
- WBI Energies
- PTech Drilling
- Gibbs
- Private Consultant
- Kunda Welding
- Continental Resources
- OneOK Partners (on-sight visit)
- JOMAX Construction (on-sight visit)

DRAFT

Dawson Community College
Associate of Applied Science Degree Corrosion Technology Curriculum
October 2015
Item #169-200-R1115

This two-year Associate of Applied Science degree prepares students for entry level employment as a Corrosion Technician in the fields of manufacturing, oil & gas industry, government agencies, pipeline maintenance and general corrosion management. Students will learn in state-of-the-art industry labs and classroom settings using NACE-certified equipment while preparing to sit for NACE certification exams. Courses include a capstone project and apprenticeship experience.

First Year, First Semester

Course		Semester Hours
CT 101	Safety	1
CT 102	Intro to Corrosion	3
CT 103	DC Circuits	3
WRIT 101	College Writing	3
CT 104	Coatings & Linings	3
CAPP 131	MS Office	3
		16

First Year, Second Semester

Course		Semester Hours
CT 105	Electricity & Electrical Reactions	4
CT 106	Cathodic Protection	4
CT 107	Corrosion Technology	4
M 111	Technical Math	3
		15

Second Year, First Semester

Course		Semester Hours
CT 208	Rectifiers	3
CT 209	Internal Corrosion Control	3
CT 210	Diagrams, Schematics, Maps	3
CT 211	Troubleshooting & Problem Solving	3
CT 212	Internship in Corrosion	3
		15

Second Year, Second Semester

Course		Semester Hours
CT 213	Metallurgy & Corrosion	3
CT 214	Atmospheric Corrosion	3
CT 215	Field Surveys	4
BMGT 237	Human Relations in Business	3
CT 216	Capstone Project	4
		17

Total 63 Semester Hours

November 19-20, 2015

ITEM 169-2010-R1115

Request for Authorization to Develop the Center for Interdisciplinary Health Workforce Studies

THAT

The Board of Regents authorizes MSU to establish the Center for Interdisciplinary Health Workforce Studies to conduct research on the nursing and larger health care workforce, disseminate the results and implications of this research to the nation, and convene stake holders to solve problems confronting the nation's nursing workforce.

EXPLANATION

The Gordon & Betty Moore Foundation (GBMF) has provided a grant to develop the proposed Center at Montana State University. The GBMF is located in Palo Alto, California, and was established by Gordon Moore (co-founder of Intel) to support major programs in the environment, science and patient care. The director of the proposed Center, Dr. Peter Buerhaus, PhD, RN, FAAN, received a four-year grant from the GBMF to establish the Center at Vanderbilt University. Dr. Buerhaus relocated to Montana State University in the middle of the grant support, and with the backing of the GBMF seeks to establish the proposed Center within the College of Nursing at Montana State University.

ATTACHMENTS

Academic Proposal Request Form
Research Center and Institute Proposal Form

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

Item Number: 169-2010-R1115 Meeting Date: November 19-20,2015
Institution: Montana State University- Bozeman CIP Code: _____
Program Title: Center for Interdisciplinary Health Workforce Studies

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 the [Academic Affairs Handbook](#).

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- 3. Campus Certificates- Adding, re-titling, terminating or revising a campus certificate of 29 credits or less**
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- 2. Adding a new minor or certificate where there is a major or an option in a major** (Curriculum Proposal Form)
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- 4. Distance or online delivery of an existing degree or certificate program**
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 Temporary Certificate or AAS Degree Program

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Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

C. Level I with Level II Documentation:

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1. Consolidating existing programs and/or degrees (Curriculum Proposal Form)

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4. Forming, eliminating or consolidating a college, division, school, department, institute, bureau, center, station, laboratory or similar unit (Curriculum Proposal Form or Center Proposal Form, except when eliminating or consolidating)

5. Re-titling a college, division, school, department, institute, bureau, center, station, laboratory or similar unit

Specify Request:

The purpose of the proposed Center for Interdisciplinary Health Workforce Studies (The Center) is to conduct research on the nursing and larger health care workforce, disseminate the results and implications of this research to the nation, and convene stake holders to solve problems confronting the nation's nursing workforce.

The Gordon & Betty Moore Foundation (GBMF) has provided a grant to develop the proposed Center at Montana State University. The GBMF is located in Palo Alto, California, and was established by Gordon Moore (co-founder of Intel) to support major programs in the environment, science and patient care. The director of the proposed Center, Dr. Peter Buerhaus, PhD, RN, FAAN, received a four-year grant from the GBMF to establish the Center at Vanderbilt University. Dr. Buerhaus relocated to Montana State University in the middle of the grant support, and with the backing of the GBMF seeks to establish the proposed Center within the College of Nursing at Montana State University.

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RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

1. State the proposed Institute/Center's name and purpose.

Center for Interdisciplinary Health Workforce Studies

The purpose of the proposed Center for Interdisciplinary Health Workforce Studies (The Center) is to conduct research on the nursing and larger health care workforce, disseminate the results and implications of this research to the nation, and convene stake holders to solve problems confronting the nation's nursing workforce.

The Gordon & Betty Moore Foundation (GBMF) has provided a grant to develop the proposed Center at Montana State University. The GBMF is located in Palo Alto, California, and was established by Gordon Moore (co-founder of Intel) to support major programs in the environment, science and patient care. The director of the proposed Center, Dr. Peter Buerhaus, PhD, RN, FAAN, received a four-year grant from the GBMF to establish the Center at Vanderbilt University. Dr. Buerhaus relocated to Montana State University in the middle of the grant support, and with the backing of the GBMF seeks to establish the proposed Center within the College of Nursing at Montana State University.

2. A comprehensive statement of the Institute/Center's mission and its relationship to the University mission.

A. State the Institute/Center's mission.

The proposed Center's mission is to measurably improve the performance of the nation's health care workforce. The Center will engage policy leaders and professionals to help facilitate discussions around workforce issues, collect data, and help solve problems facing the nursing and larger health workforce. The Center will aim to provide consistent, reliable, and unbiased data and information to improve and sustain the local, state, regional, and national health workforce.

B. Identify the Institute/Center's goals and objectives.

Goal 1: The proposed Center will conduct research on the nursing and larger health care workforce, publish results in leading peer-reviewed journals, and populate the Center's website with timely information about the nursing workforce

Objectives:

1. Develop and maintain an active program of research on the nursing workforce, focusing on analyzing trends in employment, changing demographics, educational attainment and other characteristics
2. Periodically update forecasts of the nation's supply of registered nurses and physicians
3. Conduct studies of nurse practitioners, physicians, physician assistants, and medical assistants involving economic factors (hours worked, participation in the workforce, earnings, employment settings, location)

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4. Conduct comparative studies of primary care nurse practitioners and primary care physicians on the types of services provided, characteristics of practices, characteristics of patients served, costs and quality of services
5. Conduct routine national surveys of nurse practitioners and physicians to describe practice characteristics and gather information on the attitudes, knowledge and behavior on various aspects of their relationships (teamwork, quality of professional relationships, trust, responsibilities, etc.) and how changes in the health care delivery system are affecting access, quality, and costs of care.
6. Develop new data sets useful for conducting research on the nation's health care workforce and make these data sets easily available to others
7. Publish no less than 3 peer-reviewed manuscripts per year that describe the results of studies on the health care workforce
8. Regularly present results of studies at international, national, regional, state and local conferences
9. Routinely interact with the media (on-air, radio, internet, print) on the results of studies

Goal 2: The proposed Center will develop and maintain the nation's "go-to" website providing timely information, data, analysis and perspective on the nursing and larger health care workforce

Objectives:

1. Provide a state of the art and easy to use website that provides the most respected source of timely information on the nation's nursing workforce
2. Provide social media forums for discussion of issues confronting the nation's nursing workforce
3. Employ state of the art analytics to identify, monitor and analyze website use

Goal 3: The proposed Center for Interdisciplinary for Interdisciplinary Health Workforce Studies will educate the next generation of workforce researchers

1. Develop a post-doctoral fellowship program of two years duration in health workforce studies
2. Two or more nurses will complete the post-doctoral fellowship program
3. Investigate other opportunities beyond post-doctoral education to mentor and train nursing workforce researchers

Goal 4: The proposed Center will convene stakeholders to address problems confronting the nation's nursing workforce

1. Organize and provide no less than 4 webinars per year
2. Organize a national conference on the nursing workforce on an every other year basis

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RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

3. Investigate other means by which to convene stakeholders to address problems affecting the nursing workforce

C. What specific need is being responded to in developing the proposed Institute/Center?

The nation's health care delivery and payment systems are being transformed by the implementation of numerous public and private sector reforms. Because the nursing profession is the largest of all health professions (more than 3 million RNs in the labor market), the vitality of the nursing workforce is essential for the success of health reforms and to assure the public's access to health care services. Yet in 2015, nearly 40% of RNs are over age 50 (a little more than 1 million RNs) and essentially all of these RNs will be retiring over the next 15 years. Health care reforms will exert tremendous challenges to both the demand and supply of nurses, yet the federal government has not provided timely data or information useful to policymakers, employers, insurers, payers, and others who seek to ensure the nation has a well prepared and adequately sized nursing workforce. Additionally, existing shortages of primary care physicians amidst growing demand for health care means that an estimated 14% of the nation's population is without adequate access to primary care. Consequently, policy makers and others have recommended greater investments in the nurse practitioner workforce to expand the capacity of the overall primary care workforce, yet studies are needed to assess and update our understanding of the costs and quality of the nurse practitioner workforce.

These and many other gaps in information about the nursing workforce are particularly important to the State of Montana and other states with large rural frontier and Native populations and existing shortages of health care professionals.

The proposed Center will provide needed data, analysis and other information to help stakeholders anticipate changes affecting nurses and to better understand the impact of demographic and economic factors on the overall performance of the nurse labor market and the geographic distribution of nurses. Such data are needed to assist the development and evaluation of initiatives aimed at educating nurses, conducting research, and strengthening the ability of the nursing workforce to overcome health reform challenges and thereby assure the public's access to healthcare.

D. Describe how the Institute/Center benefits the department, college, or institution.

The proposed Center will benefit the College of Nursing by providing new learning opportunities for undergraduate, graduate, doctoral students and faculty. The center will provide access to data for graduate students (in nursing and to non-nursing students as well) conducting research projects relevant to the workforce. The development of post-doctoral research will enhance the overall scholarly climate of the College. By working closely with other academic units of the University (e.g., economics, business, engineering and medical education via the WWAMI program), the proposed Center will further interdisciplinary research and education. Inter-professional communication and collaboration will be enhanced and The Center's activities will increase the College of Nursing's prestige within the University and enhance the national profile and visibility of the College.

E. Describe the Institute/Center's relationship to the University mission.

The proposed Center's mission, goals, and objectives (identified above) will directly align with the University's mission to *"educate students, create knowledge and art, and serve communities by integrating learning, discovery and engagement."* Research conducted by investigators affiliated with

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RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

the proposed Center will help inform local, state and national health care workforce policy development. Offering post-doctoral education will help ensure the availability of future workforce researchers. The Center's website, webinars, conferences and interactions with the media will provide useful and much needed information to organizations, policy makers, and clinicians themselves.

3. Briefly describe the Institute/Center's anticipated activities.

Over the next two years, the proposed Center will **conduct research on the nation's nursing and larger health care workforce**, with studies focused on: the demographic and employment characteristics of key members of the health care workforce (e.g., nurses, physicians, nurse practitioners, physician assistants, medical assistants); assess whether changes in health care delivery systems, particularly the adoption of accountable care organizations, are affecting employment and earnings; assess the impact of state laws and regulations on the distribution of the nurse practitioner workforce; analyze national data bases to determine the contributions of nurse practitioners, including the types, quantities, costs and qualities of services and compare these attributes to physicians.

The proposed Center will **maintain and constantly refine its website** to enhance its ease of use, overall appeal, and ultimately achieve the goal of being the nation's "go-to" resource on the nursing workforce. The Center will deliver a spring and fall webinar series in which we will organize up to 8 presentations focused on important and emerging topics affecting the workforce, such as barriers and challenges to tele-healthcare, understanding and preparing for the transition to value based payment, assessing the impact of accountable care organizations on the employment, earnings, and creation of new roles for members of the workforce and similar topics.

The proposed Center will **organize a national conference** on the nursing workforce in June 2017, and investigate organizing smaller and focused conferences aimed at gathering small groups of researchers/policy makers/educators/practitioners to address problems that impede the workforce planning and policy development (for example, convene a workshop/mini-conference aimed at building consensus on the assumptions, data, definitions and analytic methods used to estimate the future demand and supply of nurses).

The proposed Center will investigate the feasibility of **providing post-doctoral education to nurses**, and explore opportunities to develop joint education programs with other academic units of the University (identified in question 3A) that will provide innovative education to prepare future nursing/health care workforce researchers.

A. Identify faculty expertise available for participation in the Institute/Center's activities.

The proposed Center will find and work collaboratively with the nation's best nursing and health workforce researchers. For example, the Center will involve researchers at universities (e.g., Dartmouth College, Harvard Medical School, Vanderbilt University, Brandeis University, Boston College University, University of San Francisco, etc.); policy and research organizations, including Mathematica Health Policy Research (in Boston); government agencies (The Health Resources and Services Administration, Massachusetts Commission to Assess Reform, etc.); and from national organizations, including the National Forum on State Nursing Workforce Commissions, the American Association of Colleges of Nursing, the American Organization of Nurse Executives, and others. Investigators at the above organizations will work closely with the Center to conduct the research studies identified above.

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RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

At Montana State University, the Center will reach out to establish relationships with faculty in:

- The College of Engineering – to work with experts in systems engineering and human factors research on projects designed to improve the nursing workplace environment, teamwork, and inter-professional relationships that affect the productivity of the workforce.
- Jake Jabs College of Business and Entrepreneurship – to work with experts in organization development and finance to conduct studies assessing current and emerging organizational and financial changes in health care and how they are affecting organizational culture and structures that impact patient safety and quality.
- Department of Agricultural Economics and Economics – to work with labor economists to investigate the impact on the nursing workforce as the fee-for-service payment system that spawns over-utilization of health care services shifts toward *value based payments* that reward quality, efficient resource use, use of electronic health records, and other factors.
- WWAMI – to work with faculty teaching/affiliated with the medical education program in the states of Washington, Wyoming, Alaska, Montana and Idaho on studies of physician location choices, effects of incentives to locate in rural underserved areas, use of tele-health, overcoming challenges for physicians selecting a career in primary care and other graduate medical education issues.
- Office of Rural Health and Montana Area Health Education Center – to work with staff on a myriad of health workforce research and education projects
- Center for Health Equity in Rural Montana and the Montana INBRE Program (IDeA Network of Biomedical Research Excellence) -- to work with Center staff on projects that involve the health workforce research and implementation of community engagement and education projects
- Native American Studies – to work with faculty, as appropriate, on health workforce research affecting Native Americans

B. Which departments on campus will be involved and how will the Institute/Center contribute to the academic programs of the institution?

The need for interdisciplinary research and scholarship has been increasingly recognized if not required by federal funders (the NIH, Agency for Health Research and Quality, Patient Centered Outcomes Research Institute), national policy influencing organizations (the National Academy of Medicine – formerly the Institute of Medicine), payers of health care services (The Center for Medicare and Medicaid Services), and others. Studies of the nation’s workforce similarly require an interdisciplinary and inter professional approach to solving key problems. Therefore, the proposed Center, where appropriate, will be actively involved with students and faculty in the College of Nursing, Department of Agricultural Economics and Economics, Jake Jabs College of Business and Entrepreneurship, Division of Health Sciences – WWAMI Medical Education Program, College of Engineering, Native American Studies, Center for Health Equity in Rural Montana, and Montana INBRE Program.

Effective, mutually beneficial relationship will be established with the academic programs in these university entities. Such relationships will help ensure that the proposed Center will fulfill its mission and accomplish its objectives that were identified above. At the same time, the Center intends to help each of the above MSU entities achieve their respective mission and goals by conducting joint/collaborative research, jointly applying for research grants, and conducting education programs – webinars, class room instruction, small workshops, and conferences.

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RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

4. Identify the organizational structure of the Institute/Center within the institution.

The proposed Center will be housed in the College of Nursing at Montana State University and be directed by Dr. Peter I. Buerhaus, Professor of Nursing. Dr. Buerhaus will report to the Dean of the College of Nursing. A program manager and a yet to be hired part-time administrative assistant will report to the Center Director. The Program Manager has responsibility for maintaining, updating and refining the Center's website, posting Center newsletters, developing materials for the website, organizing webinars, and assisting the Director developing conferences and problem-solving convening's. The Director will oversee the Center's program of workforce research and work directly with Montana State University departments/centers and faculty, and with externally-based faculty.

A. Identify all agencies, organizations and/or institutions that will be involved.

The primary, day-to-day, entity that will be involved with the proposed Center is the College of Nursing - its administrators, students and faculty. Interdisciplinary collaborations will be developed with the College of Engineering, Department of Agricultural Economics and Economics, Jake Jabs College of Business and Entrepreneurship, WWAMI Medical Education Program, Native American Studies, Center for Health Equity in Rural Montana, and Montana Area Health Education Center.

B. Identify advisory council information.

In addition to adding one or more new members to its National Advisory Council to be drawn from Montana State University and/or the State of Montana, the proposed Center intends to continue its current advisory council that consists of leaders and executive directors of the following organizations:

- Association of American Colleges of Nursing
- National Health Policy Forum
- American Organization of Nurse Executives
- California Center for Nursing and Health Care
- President, American Psychiatric Nurses Association and Faculty Scholar for Community Engaged Behavioral Health at Vanderbilt University School of Nursing
- Good Must Grow – a marketing and website consulting organization

5. Identify first year and continuing finances necessary to support the proposed Center/Institute, including the sources of funding.

As noted in question 1 above, the Gordon & Betty Moore Foundation has supported the Center with a four-year grant (\$2.2 million). The first two years of funding established the center at Vanderbilt University and the remaining two years (approximately \$1.5 million) will support the proposed Center at Montana State University College of Nursing. Discussions with the funder are underway to extend support for the proposed Center at Montana State University beyond the foundation's original four-year commitment.

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

No additional paid faculty, staff, or other resources are required for the proposed Center to achieve its goals and objectives.

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

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

Current resources provided by the GBMF grant are adequate to ensure the success of the proposed Center. No additional resources (i.e., personnel or space) are anticipated.

6. Describe other similar Centers/Institutes or research capacities in the state and surrounding region.

As noted below, there are a few Montana State University entities and researchers involved in studies and education of the health care workforce. Additionally, the University of Washington Center for Health Workforce Studies (UW CHWS) was established in 1998 with funding from the federal Health Resources and Services Administration (HRSA). This center is based in the Research Section of the Department of Family Medicine at the University of Washington School of Medicine. An award from the Health Resources and Services Administration in 2014 made the UW CHWS one of five Health Workforce Research Centers (HWRCs) across the U.S., each focusing on a specific aspect of the health workforce. The University of Washington's HWRC at CHWS is addressing allied the health workforce and thus there is little or no overlap in the activities of the proposed Center whose focus is primarily on the nursing workforce.

A. Describe the relationship between the proposed Center/Institute and any similar Centers/Institutes, programs, or research capacities within the Montana University System.

The Office of Rural Health and Montana Area Health Education Center (AHEC) located at Montana State University conducts some research as part of its mission. The proposed Center will coordinate with both of these organizations to avoid duplication of research projects, education and webinar offerings.

The Center for Health Equity in Rural Montana and the Montana INBRE Program are also based at Montana State University. These entities conduct a diverse portfolio of research aimed at enhancing health of rural and Native American Indian populations. The proposed Center will seek to develop a relationship with this Center to not only avoid duplication, but more importantly determine areas where collaborative research and education projects can be mutually beneficial.

Importantly, the proposed Center will maintain a national focus of its research and education programs and will be careful to avoid intruding in research, education and service initiatives that are part of the missions of other organizations based at Montana State University health workforce.

B. In cases of substantial duplication, explain the differences between these and the need for the proposed Center/Institute at an additional institution. Describe any efforts that were made to collaborate with these Centers/Institutes, programs or research capacities. If no efforts were made explain why.

No substantial duplication is intended or anticipated. Rather, the development of a collaborative, complementary relationship will drive the focus of the proposed Center with other organizations who are concerned with the nation's and the state's nursing and health care workforce.

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RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

7. Assessment: How will the success of the program be measured?

The funder of the proposed Center, the Gordon and Betty Moore Foundation, has provided a list of measurable outcomes the Center must obtain. These outcomes include measures of the Center's Website usage, number of published manuscripts, number of webinars provided, number of national conferences organized and implemented, and number of post-doctoral nursing fellows trained, and impact of the Center on resolving problems affecting the nursing workforce. Annual reports describing the Center's performance on the GBMF outcomes were prepared and submitted to the GBMF when the Center was based at Vanderbilt University. Annual reports will also be submitted to the GBMF by the proposed Center at MSU College of Nursing.

8. State the internal campus review and approval process which has occurred prior to submission to the Commissioner's Office. Indicate, where appropriate, involvement by faculty, students, community members, professional constituencies, etc.

The proposed Center was an existing center at Vanderbilt University where Dr. Buerhaus served as its director. It was understood by the Dean of the College of Nursing that upon Dr. Buerhaus' employment in the College of Nursing, the Center would transfer to the MSU College of Nursing. The Dean of the College of Nursing has reviewed and approved this proposal.

November 19-20, 2015

ITEM 169-2011-R1115

Request for Authorization to Establish an Associate of Applied Science in Photonics and Laser Technology

THAT

The Board of Regents of Higher Education authorizes Montana State University to establish an Associate of Applied Science (AAS) in Photonics and Laser Technology.

EXPLANATION

An Associate of Applied Science in Photonics and Laser Technology program will prepare students for a career as a photonics (laser/electro-optics) technician. A 2012 survey showed the demand for new photonics technicians was shown to be 800 annually over the next 5 years. Local and state wide demand is promising for students wanting to pursue this degree.

Gallatin College is proposing an Associate of Applied Science in Photonics and Laser Technology. This program will prepare students for a career as a photonics (laser/electro-optics) technician. Photonics technicians are proficient in the scientific principles of optics, fiber-optics, and lasers, and the processes and equipment incorporating these devices in electronic and electro-optics systems used for manufacturing, communications, defense, homeland security, medical, information technology, energy, environmental monitoring, lighting, displays, and entertainment. This Associate of Applied Science in Photonics and Laser Technology (AAS PLT) will prepare students for entry level employment as a photonics or photonics-related technician. This curriculum will first present a foundation of electronics curriculum core, which is critical to the success of the student in the photonics/laser technology portion of the program and in general in the photonics/electro-optic industry. A large portion of the electronics curriculum will be hands on and students will spend a large portion of their first year in an electronics lab. Photonics and optics will be introduced in the 2nd semester of course work. Along with gaining a strong electronics background, students will spend more than 40 percent of their time in the lab training on a variety of industrial lasers and optical systems to prepare the student for easy transition into the photonics work force.

ATTACHMENTS

Academic Proposal Request Form
Curriculum Proposal Form
Attachment #1 - Course List

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

Item Number: 169-2011-R1115

Meeting Date: November 19-20,2015

Institution: Montana State University- Bozeman

CIP Code: 15.0304

Program Title: AAS Photonics and Laser Technology

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 the [Academic Affairs Handbook](#).

 A. Notifications:

Notifications are announcements conveyed to the Board of Regents at the next regular meeting.

 1a. Placing a program into moratorium (Document steps taken to notify students, faculty, and other constituents and include this information on checklist at time of termination if not reinstated)

 1b. Withdrawing a program from moratorium

 2. Intent to terminate an existing major, minor, option or certificate – Step 1 (Phase I Program Termination Checklist)

 3. Campus Certificates- Adding, re-titling, terminating or revising a campus certificate of 29 credits or less

 4. BAS/AA/AS Area of Study

 B. Level I:

Level I proposals are those that may be approved by the Commissioner of Higher Education. The approval of such proposals will be conveyed to the Board of Regents at the next regular meeting of the Board.

 1. Re-titling an existing major, minor, option or certificate

 2. Adding a new minor or certificate where there is a major or an option in a major (Curriculum Proposal Form)

 3. Revising a program (Curriculum Proposal Form)

 4. Distance or online delivery of an existing degree or certificate program

 5. Terminating an existing major, minor, option or certificate – Step 2 (Completed Program Termination Checklist)

 Temporary Certificate or AAS Degree Program

Approval for programs under this provision will be limited to two years. Continuation of a program beyond the two years will require the proposal to go through the normal Level II Proposal approval process.

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ACADEMIC PROPOSAL REQUEST FORM

C. Level I with Level II Documentation:

This type of proposal may go to the Board as a Level I item if all Chief Academic Officers are in agreement. If consensus among the Chief Academic Officers is not reached, however, the item will go to the Board as a Level II request.

1. Consolidating existing programs and/or degrees (Curriculum Proposal Form)

D. Level II:

Level II proposals require approval of the Board of Regents. These requests will go to the Board in a two-meeting format, the first being as informational and the second as action.

1. Re-titling a degree (ex. From B.A. to B.F.A)

2. Adding a new minor or certificate where there is no major or option in a major (Curriculum Proposal Form)

3. Establishing a new degree or adding a major or option to an existing degree (Curriculum Proposal Form)

4. Forming, eliminating or consolidating a college, division, school, department, institute, bureau, center, station, laboratory or similar unit (Curriculum Proposal Form or Center Proposal Form, except when eliminating or consolidating)

5. Re-titling a college, division, school, department, institute, bureau, center, station, laboratory or similar unit

Specify Request:

An Associate of Applied Science in Photonics and Laser Technology program will prepare students for a career as a photonics (laser/electro-optics) technician. A 2012 survey showed the demand for new photonics technicians was shown to be 800 annually over the next 5 years. Local and state wide demand is promising for students wanting to pursue this degree.

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CURRICULUM PROPOSAL FORM

1. Overview

An Associate of Applied Science in Photonics and Laser Technology program will prepare students for a career as a photonics (laser/electro-optics) technician. A 2012 survey showed the demand for new photonics technicians was shown to be 800 annually over the next 5 years. Local and state wide demand is promising for students wanting to pursue this degree.

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

Gallatin College Montana State University is proposing an Associate of Applied Science in Photonics and Laser Technology. This program will prepare students for a career as a photonics (laser/electro-optics) technician. Photonics technicians are proficient in the scientific principles of optics, fiber-optics, and lasers, and the processes and equipment incorporating these devices in electronic and electro-optics systems used for manufacturing, communications, defense, homeland security, medical, information technology, energy, environmental monitoring, lighting, displays, and entertainment. This Associate of Applied Science in Photonics and Laser Technology (AAS PLT) will prepare students for entry level employment as a photonics or photonics-related technician. This curriculum will first present a foundation of electronics curriculum core, which is critical to the success of the student in the photonics/laser technology portion of the program and in general in the photonics/electro-optic industry. A large portion of the electronics curriculum will be hands on and students will spend a large portion of their first year in an electronics lab. Photonics and optics will be introduced in the 2nd semester of course work. Along with gaining a strong electronics background, students will spend more than 40 percent of their time in the lab training on a variety of industrial lasers and optical systems to prepare the student for easy transition into the photonics work force.

3. Need

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

According to the September 2014 Optics and Photonics news article "Fueling the Photonics Workforce" there were only 34 programs producing photonics AAS technicians. In a 2012 survey completed by the National Center for Optics and Photonics Education (OP-TEC) the demand for new photonics technicians was shown to be 800 annually over the next 5 years. The survey also stated that the most appropriate education to fill this demand was from two-year programs not four year engineering programs. The thirty four, two-year colleges with photonics programs in the U.S. currently graduate 250-300 technicians per year (approximately 15% of the national demand). OP-TEC's goal is to help colleges meet this employment demand by starting new programs, like the one Gallatin College MSU is proposing here, and increasing the enrollments at colleges where photonics education is currently offered.

Given the above data alone, our students will have plenty opportunities around the country. However, the local and state wide demand is just as promising for students wanting to pursue this degree. In 2012 Regional Technology Strategies, Inc., in consultation for the Governor's Office of Economic Development, identified a rapidly growing cluster (a geographically dense concentration of companies in a particular industry) of optics and photonics companies and research institutions

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CURRICULUM PROPOSAL FORM

in Montana. Comprised of 28 organizations in the Gallatin Valley and 38 in the State of Montana, this cluster is the highest per capital concentration of optics and photonics companies and research institutions in the United States and is recognized by the state for its economic growth potential. The Montana Photonics Industry Alliance was formed in October 2013 to promote the growth and success of the Montana optics cluster organizations. One of the first action items of the alliance was to help implement a two-year photonics technician program in the Gallatin Valley to supply quality technicians into the workforce.

As a result, the Gallatin College MSU Program Development Manager spent several months visiting several optics, laser, and photonics-related businesses and meeting with members of the Montana Photonics Industry Alliance to determine the exact industry needs. The photonics industry in Montana encompasses organizations which employed approximately 517 people as reported in July 2015. A sampling of local data, projecting future workforce need, is presented in below table. This following information was collected by Gallatin College MSU directly from local business owners or managers.

Projections of employee need over next 5 years

Business Name	Modest Projection	Moderate Projections
ILX	5	20
FLIR	10	20
Quantel	5	10
Bridger Photonics	2	5
Quantum	5	12
TOTAL	27	67

The above chart only reflects 5 of the 38 state-wide optics, laser, and photonics-related companies. If we include the other 33 companies one could modestly assume another 33 (one hire per company in the next five years) which would be a demand of 59 new technicians in the next 5 years. Gallatin College MSU is projecting it will graduate 12 technicians a year, starting spring of 2018. This technician output would met 84% of a low projected state demand, and not even impact national workforce demand.

In addition to the above data MPIA completed a survey of its members and the following table was provided as a summary of that surveys workforce need.

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Survey Question	Survey Results (totaled from 20 of the 28 MPIA companies)
Percentage of companies surveyed that require technicians have photonics skills	13/20 = 65%
Current # of open photonics technician jobs	6
1 year expected needs for photonics technicians	23.5
# of those hires they would prefer have a 2-year photonics technician degree	21.5
5 year expected needs for photonics technicians	60.5
# of those hires they would prefer have a 2-year photonics technician degree	58.5

The results of this survey only reflect 20 of the 28 state optics, laser, and photonics-related companies, as 8 companies could not be reached in time for this proposal. Of the 20 companies that did provide feedback on the survey, 13 require technicians that have photonics skills, therefore the results in table represent the total expected needs of primarily only 13 companies. The totaled results show that among those 13 companies, there are currently 6 open (unfilled) photonics technician positions, 23.5 expected photonics technician hires in the next year, and 60.5 expected photonics technician hires in the next 5 year. Of those 60.5 expected hires in the 1 and 5 year time periods, the companies expressed the desire to have nearly all (21.5/23.5 and 58.5/60.5) of those future employees trained with a 2-year photonics technician degree. Using the 5 year results as a better long-term metric for this program, it is evident that there will be an average of ~12 photonics technician hires per year for the next 5 years.

The workforce demand is high as demonstrated by the above data, but what about the wages for these technicians. The average annual salary for technicians in the photonics/laser-optics field is \$41,137, with a standard deviation of \$13,896.

	Wages	Total Annual Openings
National Data	\$41,137	800
State	n/a	n/a
Local	\$30,000-\$38,000	11-14*

*5 of 38 reporting

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

This program provides students a post-secondary degree in an advanced technology field that is growing not only nationally but locally as well. Our local optics, laser, and photonics-related industry leaders are in immediate need of photonics technicians as demonstrated by the data above. In addition, Bozeman is well suited for this AAS program as 28 of the 38 optics industry companies are located in the Gallatin Valley.

Students will have excellent opportunities for internships and additionally, several companies stated they are willing to assist with instruction and supply advanced photonic equipment that will better prepare

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students for their careers. The Montana Photonics Industry Alliance has personally requested this program (speaking for the cluster of industry partners in the state) and voluntarily worked alongside Gallatin College MSU in the writing of this proposal.

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

The Montana Photonics Industry Alliance (MPIA) and the National Center for Optics and Photonics Education (OP-TEC), are in full support of this program. OP-TEC has been funded by the National Science Foundation to specifically support the development of new programs and build the capacity of existing programs because the demand for this type of technician is critical to national workforce demand and growing this technology. The partnership with OP-TEC and MPIA will be valuable as Gallatin College MSU begins to recruit students for this program. OP-TEC supports other AAS Photonics programs across the county and has documented best practices for recruiting and retention that have had a positive outcome. The primary determination of the need of this program came in the form of a direct request from the MPIA (speaking for the industry partners) to setup this program.

There is certainly industry demand, what about student demand? It is recognized that this will be one of Gallatin College MSU's most challenging programs. Gallatin College MSU works closely with eight area high schools, offering them career pathways and dual enrollment, using this pipeline to meet program enrollment will be one strategy to address student demand. Local employers will also be used as a recruiting tool. Currently employers in this industry have over 400 employees; Gallatin College MSU will work with those employers to get the word out about this new program. In the fall of 2014 Gallatin College started another advanced manufacturing program, CNC Machining, the first year 12 students enrolled and 10 are now employed in their industry. At writing of this proposal the CNC Machine program is fully enrolled for fall of 2015. Gallatin College MSU has a demonstrated record of recruiting and fully enrolling programs using its community contacts with high schools, industry, and other typical recruiting strategies. It should also be noted for the CNC program we only had two months to recruit, this program will have six to nine months for recruitment advertising and marketing.

4. Institutional and System Fit

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

There is limited connection between the proposed program and existing programs. Currently Gallatin College MSU is offering a Design Drafting AAS and a CNC Machining CAS program both include SolidWorks mechanical design courses. Currently in industry, crossover occurs with photonics and cnc machining/SolidWorks mechanical designing. This industry crossover could convey into the learning environment to provide students with a very diverse skill set. In the private sector CNC machine shops often make components for nearly all of the optics, laser, and photonics-related businesses and SolidWorks is commonly used to design these components. Thus there is great opportunity to integrate projects or student work in all three of these programs if the Photonics and Laser Technology program is approved. A photonics technician with additional experience in Solidworks design or CNC machining would be an extremely valuable employee to any photonics or photonics-related business and similarly for the Design Drafting student.

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MSU has an established an Optical Technology Center which is a multidisciplinary center offering opportunities in the field of optics, lasers, and photonics for students, faculty, industry and other interested partners. The overarching goal of MSU's Optical Technology Center is to maintain a nationally competitive optics program that promotes collaboration with local optical industry, leading to economic growth and improved student opportunities in Montana. Gallatin College has met with the Director of MSU's Optical Technology Center and received a full endorsement from him regarding the addition of this program and the potential collaboration on faculty, space, and equipment. This Photonics AAS would be a valuable affiliate of MSU's Optical Technology Center, and assist in making Montana State University, Gallatin College MSU, and the Gallatin Valley a major optics and photonics educational hub for years to come. There is no immediate plans for crossover between the two-year and four-year degrees due to the industry demand for two-year photonics technicians, however, there could be potential for student transferability into the four year side with proper advising during the AAS phase.

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

No

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

Montana State University, under its Electrical Engineering and Physics departments, offer several courses in optics for higher level undergraduate and graduate students. Furthermore, in a Master's or Ph.D. program in these departments, a student can focus their degree almost entirely on optics. These students' skills are both theoretical and applied; they are trained to think as an engineer/physicist not a technicians. In addition to the value of these engineers our industry also needs photonics technicians. The proposed Photonics and Laser Technology program will produce workers that have applicable hands on training to step immediately into the workforce and contribute at an applied level from day one.

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

Gallatin College MSU operates under the MSU Strategic plan and the Comprehensive Two-Year Mission Plan for Gallatin College MSU. Below are the MSU strategic plan metrics that this program will contribute towards.

In the MSU Strategic Plan 2012:

Metric L.2.3: "By 2019, the number of associate degrees conferred will increase from 38 to 70 per year. Workforce certificates conferred will increase from 35 to 65 per year." By offering additional workforce certificate opportunities and utilizing community partners that will support those certificates with employment and student referrals, this program should increase the number of certificates conferred.

Metric L.3.1: "By 2019, the percent of graduates employed full time in their field or in positions of their choosing will increase from an average of 62 percent to 70 percent. By offering another option for students that are focused on targeted employment opportunities students should be able to better fulfill their employment goals and help MSU meet its goals.

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Metric A.1.5: "By 2019, the number of students enrolled in Gallatin College MSU degree and certificate programs will double to 400." By offering another certificate option to our community we should attract another variety of students, perhaps that we haven't been able to recruit before. If Gallatin College MSU is going to double the amount of students attending more certificates must be added so students can maintain workforce diversity for the local economy.

Metric A.2.4: "By 2019, the number of nontraditional students enrolled in MSU undergraduate and Gallatin College MSU programs will increase to 3,200 (a 20 percent increase)." Gallatin College MSU hopes that by offering this AAS in Photonics and Laser Technology, more non-traditional students will have the opportunity to attend college. The college has experienced an increase in nontraditional students with the addition of applied degree programs.

Gallatin College MSU also operates under a Two-Year Comprehensive Mission Expansion Plan, approved by Board of Regents March 2013. By adding the AAS in Photonics and Laser Technology, the following numbered initiatives will be addressed and responses to these can be found in above metric answers.

- #1. Enrollment and program growth;
- #3. Increase percentage of regional high school graduates that access Gallatin College MSU through increasing dual enrollment;
- #5. Develop industry partnerships and meet local workforce demand;
- #6. Expand short-term workforce training;
- #8. Prepare students to be career ready.

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.

There are no other programs like this in the state.

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5. 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.**

The Gallatin College MSU Associate of Applied Science in Photonics and Laser Technology will prepare graduates with the following:¹

1. Have knowledge required to be successful in the optics, laser, and photonics support field. Students will be exposed to laser systems, electronics, optics and electro-optics. In particular, graduates will be prepared for a variety of careers in design and manufacturing, materials processing, communications, medical applications, semiconductor fabrication, optical systems, electronics, military applications, sales, and education.
2. Graduates will have a foundation in electronics that includes electronic components and circuitry knowledge base.
3. Our graduates will be able to function in a professional manner in their field, and use, maintain and clean equipment and tools required in the field of optics, lasers, and photonics.
4. Graduates will have knowledge of the following optics intensive components:

Nature of light, Geometric optics, wave optics, optical components, optical devices and principles of operation, optical support and positioning equipment, physics of lasers and laser operations, fiber and fiber optics, optics of imaging and displays, materials processing systems, optical and electro optical systems for precision measurements and alignments, holography, applied mathematics, applied physics, applied chemistry.
5. Our graduates will be able to analyze, configure, test, measure, troubleshoot and assist with problems that arise in a professional optics, lasers, and photonics, environment.
6. Our graduates will be able to communicate technical ideas, procedures, and results with Professionals in written, oral or graphic format.

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Fall (1st semester)	Course Name/Description	Credits
College Algebra M 121 (Q) OR Tech Math 111 (depending on student pathway)	Pre-calculus OR Technical Math	3*
WRIT 101 (W) OR WRIT 104/COMX 102 (depending on student pathway)	College Writing I OR Workplace Communication(2)/Interpersonal Skills in Workplace (1)	3*
ETEC 101 (new GC)	AC/DC Electronics with lab	4
CAPP 120 or CAPP 156 (depending on prior learning)	Intro to Computers or MS Intro to Excel	3*
PHSX 103	The Physics of How Things Work	3*
TOTAL fall semester 1	(12 General Ed Credits)	16
Spring (2nd semester)		
M 151 (Q) OR Technical Math II: Photonics focus (depending on student pathway)(new GC)	Pre-calculus OR Technical Math II	3*
ETEC 103(new GC)	AC/DC Electronics II w/lab	4
PLTT 100 (new MUS)	Fundamentals of Light and Lasers and Lab (3 Lecture and 3 Lab)	6
PHSX 110	Applied Physics	3*
TOTAL spring semester 2	(6 General Ed. Credits)	16
Fall 2nd Yr. (3rd semester)	Course name	Credits
WRIT 121(new GC)	Intro to Technical Report Writing (lab reports)	3*
ETEC 245 (new GC)	Digital Electronics	4

PLTT 102 (new MUS)	Laser Systems and Application OP-TEC Course 2A/lab (3 Lecture and 3 Lab)	6
Total fall 2 nd yr.	(3 General Ed. Credits)	13
Spring (4th semester)		
ETEC 280 (new GC)	Advanced Electronics	4
PLTT 103 (new MUS)	Laser Systems and Application OP-TEC Course 2B/ lab	6
PLTT 298 (new MUS)	Internship (work experience 225 hours)	5
Total spring 2 nd yr.		15
Program Total	(21 General Ed. Credits)	60

*indicates course is part of the General Education

The attached List of Courses provides learning outcomes for each course listed in the table above.

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

As soon as the BOR approves the program Gallatin College MSU staff, industry partners, and MSU Engineering will begin discussions about space, faculty, and equipment. This group will be considered the Gallatin College MSU Photonics Industry Advisory Board. All parties that have been engaged in the advisory of this proposal would like to start program fall of 2016. During the spring of 2016 these first meetings of the advisory will involve hiring a Program Director. Once hired the Program Director will begin work on space, course approvals, and equipment. There are six new courses that will need to be approved in this program OP-TEC has already written the curriculum for these courses and vetted them with industry professionals. There is also a textbook for the content. In the Spring of 2016 recruiting for the program should begin and Program Director can start student orientations. By summer of 2016 space should be secured and equipment and lab set up started. The goal, as discussed below, will be to have educated 25-30 students by the end of the third year (2019), and then grow the program linearly from there.

To assist in the implementation of the proposed program, Gallatin College MSU, with the full support of OP-TEC, will be applying for a National Science Foundation Advanced Technological Education (ATE) Small New Institution grant. This project grant will be designed to provide funds for equipment, and supplies to establish the new program, train faculty to teach new courses and perform outreach activities to local high schools in order to promote the new program. The intent of this NSF funding is to develop technical programs to advance the education of technicians for high-technology fields that drive our nation's economy. The due date for the Proposal is October, 8, 2015. OP-TEC estimates the likelihood of Gallatin College MSU receiving this grant to be greater than 65% success rate as this is for a new photonics related program. In addition, further funding through the NSF ATE program is available after the completion of the first 3 year phase to further advance the program at the Gallatin College MSU.

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.

Every program at Gallatin College MSU is overseen by a Program Director that has contractual teaching responsibilities of 9-12 credits a semester. Given this requirement Gallatin College MSU will need to hire adjuncts to cover 4-7 credits depending on the semester. The primary plan to meet this new resource demand is utilize the county mill levy funding Gallatin College MSU receives. Secondly Gallatin College MSU is applying for an NSF-ATE grant that will provide some funding to support instructional time.

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 primary needs will be to secure space and fully equip a photonics/optics lab. This program will also require the use of an electronics lab. The NSF ATE grant as described earlier would go a long way in addressing this need, Gallatin College MSU understands the grant may not be received and will depend on the mill levy funding

Montana Board of Regents
CURRICULUM PROPOSAL FORM

to support this new program. Furthermore, Gallatin College MSU has begun discussions with Montana State University Electrical Engineering Department about sharing their fully equipped photonics/optics lab until either a larger space can be secured to house both programs or Gallatin College MSU is able to secure their own location. Gallatin College MSU is currently in discussions with a commercial landlord that we are current leaseholders with to expand our off-site space. Several industry partners have verbally committed to donating equipment to help equip a photonics/optics lab to help get this program going.

Op-Tec has provided an equipment list for all the labs included in the Photonics portion of this program and has estimated a cost of \$200,000 to establish a photonics/optics lab from scratch. The electronics lab will not be a costly as a photonics lab and is projected to be under \$30,000.

7. Assessment

How will the success of the program be measured?

Program success can be defined by several metrics in two-year education. Are students having a positive learning experience and gaining the skills required to sustain them in industry specific employment. Gallatin College MSU continually assesses these measures and outcomes at the program and course levels.

In addition, we will incur annual assessments based on student, employer, and alumni satisfaction feedback, input provided by Montana Photonics Alliance employers, including feedback provided during Industry Advisory Committee meetings. Student enrollment, graduation rates, and employment trends will be collected, reviewed and analyzed. Appropriate modifications to the program will occur based on the above feedback and data analysis.

8. Process Leading to Submission

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

Gallatin College MSU was approached by the Montana Photonics Industry Alliance (MPIA) in the spring of 2014 and asked to implement a two-year photonics technician program. MPIA's mission is to promote optic and photonics job opportunities, support initiatives designed to start and attract new companies, educate public on photonics opportunities, and be an interface between Montana optics and educational institutions. In their 2012 report MPIA identified employee recruiting as a high priority. In the same 2012 report, MPIA listed an action item as "Continue to build the talent base . . . Establish a robust optics internship program." Gallatin College MSU has been working alongside a sub-committee of the MPIA to develop this program so graduates will meet the needs of their membership and industry partners in Bozeman, across the state and in the country.

An additional resource that has been utilized to develop this proposal is the National Center for Optics and Photonics Education or OP-TEC. This group has provided program courses, course content, space and equipment requirements and workforce demand data. They are funded by NSF to assist and grow two-tear photonics and optics programs at technical colleges across the country.

Dr. Joe Shaw, Director of MSU's Optical Technology Center, and Professor with Electrical and Computer Engineering Department at MSU has been consulted two times as Gallatin College MSU prepared the program

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proposal. There are possible opportunities to working together on lab space and faculty sharing. This proposal was also presented to Dr. Rob Maher, Department Head of Electrical & Computer Engineering, for his review. In addition to those MSU instructors, Gallatin College MSU Math and CNC Machining Directors reviewed the proposal.

This proposal will be reviewed by MSU's Curriculum and Programs Committee, MSU's Academic Programs Working Group, MSU Faculty Senate, MSU Dean's Council, MUS CAO's, and finally the MUS Board of Regents.

Photonics and Laser Technology: List of Courses

College Algebra M 121 or Tech Math I:

FALL 1ST SEMESTER

M 121Q: College Algebra. 3 Credits. Offered by MSU. (Transfer student option)

PREREQUISITE: [M 096](#), [M 097](#) or Math Placement Test within the past 12 months. Further development of algebraic skills through the study of linear, quadratic, polynomial, exponential, and logarithmic functions.

- Solve linear, quadratic, and rational exponential and logarithmic equations and be able to use each of these to model and solve applied problems.
- Solve absolute value equations and inequalities and express solutions of inequalities in interval notation.
- Identify relations vs. functions; use function notation; identify domain, range, intervals of increasing/decreasing/constant values; algebraically and graphically identify even and odd functions.
- Find zeros, asymptotes, and domain of rational functions.
- Evaluate and sketch graphs of piecewise functions and find their domain and range.
- Use algebra to combine functions and form composite functions, evaluate both combined and composite functions and their graphs, and determine their domains.
- Identify one-to-one functions, find and verify inverse functions, and sketch their graph.
- Graph linear, polynomial, radical, rational, exponential, logarithmic and circular equations.

M 111: Technical Mathematics. 3 Credits. Offered by Gallatin College. This course presents basic mathematical topics as they are applied in a trades program. Use of fractions, ratios, measuring tools, measurement systems, dimensional arithmetic, percent, proportion, linear equations, applied geometry, basic trigonometry.

- Utilize and apply mathematical operations, measurement (English and Metric Systems), introductory geometric principles and applied algebra into technical applications in academic and workplace situations;
- Read, interpret, and produce solutions to applications at the introductory technical mathematics level;
- Apply ratio and proportion concepts to introductory technical mathematical situations;
- Apply appropriate technology in a mathematical situation;
- Determine the validity of results and data;
- Solve any component of a right triangle with any two components given.

WRIT 101W: College Writing I. 3 Credits. Offered by Gallatin College (transfer student option). Studies in the discovery and written expression of ideas, stressing organization, support, audience awareness, clarity, and persuasive presentation. Taught around a particular topic or theme varying with each offering.

- Use writing as a means to engage in critical inquiry by exploring ideas, challenging assumptions, and reflecting on and applying the writing process;
- Read texts thoughtfully, analytically, and critically in preparation for writing tasks;
- Develop multiple, flexible strategies for writing, particularly inventing, organizing, drafting, revising, and copyediting;
- Demonstrate an understanding of research as a process of gathering, evaluating, analyzing, and synthesizing appropriate primary and secondary sources;
- Integrate their own ideas with those of others;
- Formulate an assertion about a given issue and support that assertion with evidence appropriate to the issue, position taken, and given audience;
- Demonstrate proficiency in the use of the conventions of language and forms of discourse, including grammar, syntax, punctuation, spelling, and mechanics;
- Use conventions of format and structure appropriate to the rhetorical situation and audience;
- Develop and organize logical thoughts as a means of building evidence that results in a persuasive argument;
- Understand how to self-edit and appreciate its importance in crafting a professional document.

WRIT 104: Workplace Communications. 2 Credits. Offered by Gallatin College. This course reviews the basic elements of grammar and language arts skills in business writing. Emphasis is placed on writing business letters, memos, emails, and reports for a variety of business applications as well as giving oral presentations. Letters of application and resumes are also covered.

- Determine audience, purpose, and topic for workplace writing tasks;
- Develop skills in prewriting, organizing, drafting, editing and revising documents;
- Produce and edit short technical documents such as instructions, memos, and incident reports;
- Demonstrate basic competency in the use of grammar, syntax, punctuation, spelling, and mechanics;
- Design and evaluate documents in order to clearly and effectively communicate the message to the intended audience;
- Demonstrate the ability to work individually and in small groups to produce written documents

COMX 102: Interpersonal Skills in the Workplace. 1 Credit. Offered by Gallatin College. This course covers the basic elements of communication in the business environment, including listening, speaking, and reading. It also looks at the importance of nonverbal communication, ethics, and professional courtesy. It discusses the importance of internal skills like teamwork and external skills with customers such as reflective listening. Successful interview skills are discussed in class and demonstrated in final student project.

- Understand the key elements of the communication process;
- Identify the elements of nonverbal and verbal communication and explain their significance in the communication process;
- Describe appropriate business ethics and professional courtesy;
- Identify practical skills geared toward improving communication in the workplace;
- Practice skills in listening reflectively, attentively, and more empathetically.

EETEC 101: AC/DC Electronics. (new to Gallatin College, exists in the MUS) This course introduces safety rules, concepts, and operating characteristics of direct current (DC) and alternating current (AC) electrical circuits. Selection, inspection, use, and maintenance for common electrical test equipment is also covered.

- Demonstrate safe practices when handling electrical circuits and equipment;
- Explain definitions and measurement of resistance, voltage, and current;
- Use Ohms Law and Watts Law to analyze electrical circuits;
- Explain DC circuits;
- Conduct analysis on series and parallel circuits;
- Use common meters and General Purpose Electronic Test Equipment (GPETE);
- Use an oscilloscope to analyze various electrical circuits and components;
- Explain electrical sources;
- Explain electrical connections;
- Explain series, parallel and complex circuits;
- Explain capacitors and inductors;
- Measure voltage, current, resistance and power;
- Explain conductors, wire sizes, and ampacity;
- Explain resistors;
- Explain voltage and current divider laws;
- Explain electromagnetism;
- Explain batteries;
- Explain circuit protection devices;
- Explain power and energy;
- Explain DC and AC differences;
- Explain electric motors;
- Explain transformers;
- Explain electronic construction – PCB;
- Explain basic AC theory and AC quantities and measurement.

CAPP 120: Introduction to Computers. 3 Credits. Offered at Gallatin College. Computer hardware and software concepts as they apply to all computers. Exposure to software packages such as Windows, word processors, spreadsheets, and Internet applications. Laboratory projects reflect practical usage in resolving real world problems/situations.

- Understand basic computer terminology and concepts;
- Familiarize students with the major components of computer hardware;
- Introduce students to operating systems and application software;
- Demonstrate basic file management skills;
- Introduce social, ethic, legal, cultural issues involving technology.

CAPP 156: MS Introduction to Excel. 3 Credits. Offered at Gallatin College. (Option for experienced students)

- Create and manipulate data;
- Format data and content;
- Create and modify formulas;
- Reference, summarize and query data using formulas;
- Use conditional logic in a formula;
- Present data using charts, conditional formatting and illustrations;
- Create macros and templates;
- Collaborate on and secure data.

PHSX 103IN. The Physics of How Things Work. 3 Credits. (Offered at MSU) PREREQUISITE: High School Algebra. A practical approach to a broad array of fundamental topics in physics for non-science majors taught by analyzing things that are used and observed in everyday life. Classroom demonstrations will provide the opportunity for in-class analysis, discussions, and hands-on activities. Physics principals will be used to scrutinize issues such as energy and recycling from economic and environmental perspectives. The latest technology in transportation, electronics, and energy production will be analyzed. The connection between basic research in physics and modern technology will be examined. Students will build on everyday knowledge of the physical world through a combination of lecture and laboratory experiences. Topics will include mechanics, thermodynamics, optics, and electromagnetism. At the end of this course students will have an understanding of the concepts covered by the basic laws of physics, and make estimates and predictions about occurrences in certain physical situations. Throughout the course students will investigate the correspondence between physics and the other areas of sciences as well as basic mathematics.

- Compare and contrast terms describing motion such as speed, acceleration, velocity and projectiles.
- Identify and demonstrate Newton's Laws of Motion utilizing basic math principles.
- Differentiate between energy, force, momentum, and constant velocity; and be able to calculate those using algebraic equations.

- Describe and utilize Newton's Law of Gravity.
- Explain temperature, heat, specific heat, and thermodynamics.
- Identify and describe electric current, circuits, and magnetic fields.
- Describe and explain light, waves, optics, lenses, electromagnetic spectrum, and curved mirrors.
- Demonstrate a quantitative and qualitative understanding of the fundamental scientific process.
- Demonstrate a working knowledge of basic physics principles.
- Solve physics problems analytically through the application of foundational physics principles and theory.
- Demonstrate working knowledge of pertinent quantitative laboratory methods, techniques, instrumentation, and equipment. Collect and quantitatively analyze data and present results in standard scientific form. Interpret correctly experimental results and draw logical conclusions.
- Apply basic critical thinking skills to problem analysis and synthesis.

SPRING 2ND SEMESTER

M151Q or M117 (depending on student path)

M 151Q: Precalculus. 3 Credits. Offered by MSU. PREREQUISITE: M121Q or ACT/SAT 25 above, 580 above. **(Rich Math Faculty?)**

- Explain equation-solving, arbitrary functions, graphs, the uses of graphing calculators, lines, quadratics and higher-degree polynomials, distance and circles, fractional powers such as square roots, word problems, percents, rational functions, inequalities, exponential functions, logarithmic functions, and applications;
- Apply the basic methods and functions of trigonometry necessary for calculus;
- Explain basic definitions and properties; solve equations; solve triangles with the Laws of Sines and Cosines; solve more-complicated figures, radian measure, and numerous trigonometric identities and their derivations and applications;
- Read and write mathematical symbolism which is appropriate for word problems

M117: Technical Math II. 3 Credits. (New MUS/Gallatin College) (Rich Math Faculty?)

- Scientific notation
- Unit conversion
- Introductory algebra
- Powers and roots
- Ratio and proportion
- Exponents and logarithms
- Graphing in rectangular coordinates
- Angle measures in two and three dimensions
- Special Graphs

EETEC 103: AC/DC Electronics II w/lab. 4 Credits. (New Gallatin College)

This lecture/lab course provides an introduction to solid state devices. Topics covered include PN diode characteristics, rectifier circuits, bipolar transistors, field effect transistors, and amplifier circuits. Capacitors, inductors, low voltage power supplies, triodes.

- General semiconductor theory
- Diode theory, operation and circuits.
- Transistor theory, operations and circuits
- Transistor Models
- Voltage and Power amplifiers
- Emitter Follower circuits
- Field Effect Transistors - Theory and circuits
- Thyristors - SCR and Triac theory, operation, and circuits.
- Frequency response of semiconductor circuits.

PLTT 100 Fundamentals of Lights and Lasers. 3 Credits Lecture and 3 Lab (New MUS/Gallatin College course)

This is a comprehensive study of photonics and is designed as a one-semester course, with a 3 credit lecture and a 3 credit lab. It provides the foundation required to prepare technicians in the areas of optics, electro-optics, laser, and photonics. The course is designed for use as the introductory course in the AAS program for laser/electro-optics and photonics. The content consists of six modules.

- Nature and Properties of light covers the wave and particle properties of light, light interactions, and fundamentals of laboratory safety.
- Optical handling and positioning cover bulk optical materials and their properties, optical coatings and methods of coating deposition, laboratory mountings, positioning equipment, surface quality of optical components, inspection methods and procedures, and the care and cleaning of optics.
- Light sources and laser safety covers important properties of nonlaser and laser light sources, nonlaser light sources, concepts of laser safety, and laser safety standards and safety classifications.
- Basic geometrical optics cover the laws of reflection and refraction, image formation with mirrors, and image formation with lenses.
- Basic physical optics covers light waves and their interaction with various objects in interference, diffraction and polarization processes.
- Principles of lasers cover the generation of laser light, optical cavities and modes, laser beam characteristics, and a brief survey of different types of lasers.

PHSX 110: Applied Physics. 3 Credits. (New to MSU/Gallatin College)

- Explain and use basic equations for motion.
- Use Newton's laws to solve various mechanical problems.
- Use Newton's laws to solve problems in rotational motion including satellite dynamics.
- Explain and use the concepts in electric and magnetic fields.
- Analyze basic AC and DC circuits with passive components.
- Predict behavior in simple circuits with active components.
- Use the concepts of first-order geometric optics.
- Understand the concepts behind waves and wave optics.

FALL 2nd YEAR - 3RD SEMESTER**WRIT 121: Intro to Technical Writing. 3 Credits. (New to Gallatin College).**

- Provide clear writing in a range of genres for intended users;
- Evaluate a writing task to meet the needs of intended users;
- Brainstorm and analyze topics in order to organize visually for the reader;
- Conduct contextual inquiry and research to ensure the relevance, accuracy, and credibility of information for an intended user;
- Employ word-processing, layout, and graphics software to design visually and verbally usable, clear documents;
- Comprehensively edit documents using a variety of editing techniques;
- Learn to collaborate effectively by role-playing.

ETEC 245: DIGITAL ELECTRONICS. 4 Credits. (New to Gallatin College).

This course covers basic digital circuits and their use in microprocessors and other digital devices. Reading digital logic schematics and building, testing, and troubleshooting digital circuits is also covered.

Given the need to understand the basic operating principles of digital electronic devices and upon completion of this course, the student will be able to:

- List and define the different types of digital gates.
- Construct the truth table for the different types of digital gates.
- List and define the different types of digital circuits used in microprocessors and computers.
- Add and subtract binary numbers.
- Determine and draw the output wave forms for digital circuits.
- Explain how memory circuits work.
- Read basic digital logic circuit schematics.
- Test digital logic circuits to determine their output codes.
- Troubleshoot digital circuits, with logic probes, to determine wiring and faulty gate problems.

PLTT 102: Laser Systems and Application OP-TEC Course 2A/ lab: 6 Credits. (New to MUS and Gallatin College)

This is a 3 lecture and 3 credit lab course. Covers more advanced concepts in photonics and the operating principles, output characteristics, diagnostics, and applications for the six most widely used laser types. All-important lasers are described and classified according to their active medium, output wavelength, and application.

- Laser Q-Switching, Mode Locking, and Frequency Doubling
- Laser Output Characteristics
- Laser Types and Their Applications
- Carbon Dioxide Lasers and Their Applications
- Fiber Lasers and Their Applications

EETEC 280: Advanced Electronics. 4 Credits. (New to Gallatin College)

- Upon completing this course, a student will 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
- Implement process control principles including linear and derivative process control Successfully use techniques to trouble shoot electromechanical and solid state problems

PLTT 103: Laser Systems and Application OP-TEC Course 2B/ lab. 6 Credits. (New to MUS/Gallatin College)

- Diode Lasers, Their Applications and Measurements
- Energy Transfer, Characteristics and Materials in Semiconductor Lasers
- Energy Transfer of and Operating Parameters of Argon-Ion Laser
- Nd:YAG Lasers and Their Applications
- Excimer Lasers and Their Applications
- Systems Integration in Photonics

PLTT 298: Internship. 5 Credits. (New to MUS and Gallatin College)

- Supervised by Program Director, paid training experience with clearly identified learning outcomes and goals related to student's studies.
- 225 hours of internship in the photonics/laser/optics business.

November 19-20, 2015

ITEM 169-2701-R1115

Request for Authorization to Establish an Interdisciplinary Honors Minor

THAT

The Board of Regents of Higher Education authorizes Montana State University Billings to establish a new minor program: Interdisciplinary Honors Minor.

EXPLANATION

Montana State University Billings seeks permission to create a new Interdisciplinary Honors Minor (IHM). This proposal uses current faculty and honors courses that are already being taught on campus. While honors minors are relatively rare nationally, the plan enables the University Honors Program to continue to enhance a curricular path that enables some of the University's most talented students to take full advantage of their intellectual and personal talents and to do so in a way that supports their major and career plans. The IHM consists of 21 honors credits, including 2 required courses HONR 111 Perspectives and Understanding and HONR 499, Honors Problem-Solving Capstone. Students earn the remaining 15 credits in honors sections of General Education courses, in special topic HONR seminars or specially designed departmental seminars, with honors contracts or independent study courses, and with internships. At least 9 credits must be at the 300-level or higher, and, in addition, students must compile a minor portfolio that represents their experience in the minor. The Minor provides a complement to any major and, more importantly, is designed to: challenge students to take full advantage of their intellectual and personal talents; to develop skills in problem-solving, self-expression, and creativity; and to provide real-world and research experience.

ATTACHMENTS

Academic Proposal Request Form
Curriculum Proposal Form

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

Item Number: 169-2701-R1115

Meeting Date: November 19-20, 2015

Institution: Montana State University Billings

CIP Code: 30.0000

Program Title: Interdisciplinary Honors Minor

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 the [Academic, Research and Student Affairs Handbook](#).

 A. Notifications:

Notifications are announcements conveyed to the Board of Regents at the next regular meeting.

 1a. Placing a program into moratorium (Document steps taken to notify students, faculty, and other constituents and include this information on checklist at time of termination if not reinstated)

 1b. Withdrawing a program from moratorium

 2. Intent to terminate an existing major, minor, option or certificate – Step 1 (Phase I Program Termination Checklist)

 3. Campus Certificates (CAS/AAS)-Adding, re-titling, terminating or revising a campus certificate of 29 credits or less

 4. BAS/AA/AS Area of Study

 B. Level I:

Level I proposals are those that may be approved by the Commissioner of Higher Education. The approval of such proposals will be conveyed to the Board of Regents at the next regular meeting of the Board.

 1. Re-titling an existing major, minor, option or certificate

 2. Adding a new minor or certificate where there is a major or an option in a major (Curriculum Proposal Form)

 3. Merging or re-titling a department

 4. Revising a program (Curriculum Proposal Form)

 5. Distance or online delivery of an existing degree or certificate program

 6. Terminating an existing major, minor, option or certificate – Step 2 (Completed Program Termination Checklist and updated catalog)

 Temporary Certificate or AAS Degree Program

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

Approval for programs under this provision will be limited to two years. Continuation of a program beyond the two years will require the proposal to go through the normal Level II Proposal approval process.

 C. Level I with Level II Documentation:

This type of proposal may go to the Board as a Level I item if all Chief Academic Officers are in agreement. If consensus among the Chief Academic Officers is not reached, however, the item will go to the Board as a Level II request.

 1. Adding an option within an existing major or degree (Curriculum Proposal Form)

 2. Consolidating existing programs and/or degrees (Curriculum Proposal Form)

 X D. Level II:

Level II proposals require approval of the Board of Regents. These requests will go to the Board in a two-meeting format, the first being as informational and the second as action.

 1. Re-titling a degree (ex. From B.A. to B.F.A) (Curriculum Proposal Form)

 X 2. Adding a new minor or certificate where there is no major or option in a major (Curriculum Proposal Form)

 3. Establishing a new degree or adding a major or option to an existing degree (Curriculum Proposal Form)

 4. Forming, eliminating or consolidating a college, division, school department, institute, bureau, center, station, laboratory or similar unit (Curriculum Proposal Form or Center Proposal Form)

 5. Re-titling a college, division, school department, institute, bureau, center, station, laboratory or similar unit (Curriculum Proposal Form or Center Proposal Form)

Specify Request:

Montana State University Billings seeks permission to create a new Interdisciplinary Honors Minor (IHM). This proposal uses current faculty and honors courses that are already being taught on campus. While honors minors are relatively rare nationally, the plan enables the University Honors Program to continue to enhance a curricular path that enables some of the University's most talented students to take full advantage of their intellectual and personal talents and to do so in a way that supports their major and career plans. The IHM consists of 21 honors credits, including 2 required courses HONR 111 Perspectives and Understanding and HONR 499, Honors Problem-Solving Capstone. Students earn the remaining 15 credits in honors sections of General Education courses, in special topic HONR seminars or specially designed departmental seminars, with honors contracts or independent study courses, and with internships. At least 9 credits must be at the 300-level or higher, and, in addition, students must compile a minor portfolio that represents their experience in the minor. The Minor provides a complement to any major and, more importantly, is designed to: challenge students to take full advantage of their intellectual and personal talents; to develop skills in problem-solving, self-expression, and creativity; and to provide real-world and research experience.

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CURRICULUM PROPOSAL FORM

1. Overview

This proposal for a new Interdisciplinary Honors Minor (IHM) at MSUB uses current faculty and honors courses that are already being taught on campus. While honors minors are relatively rare nationally, the plan enables the University Honors Program to continue to enhance a curricular path that enables some of the University's most talented students to take full advantage of their intellectual and personal talents and to do so in a way that supports their major and career plans. The IHM moves students from general education courses, to seminars and internships; they finish with capstone course and a portfolio. The IHM has been developed over the past year and a half in consultation with a number of campus constituencies. We are ready to move forward with the Interdisciplinary Minor upon receipt of Board of Regents approval.

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

The IHM consists of 21 honors credits, including 2 required courses HONR 111 Perspectives and Understanding and HONR 499, Honors Problem-Solving Capstone. Students earn the remaining 15 credits in honors sections of General Education courses, in special topic HONR seminars or specially designed departmental seminars, with honors contracts or independent study courses, and with internships. At least 9 credits must be at the 300-level or higher, and, in addition, students must compile a minor portfolio that represents their experience in the minor. The Minor provides a complement to any major and, more importantly, is designed to: challenge students to take full advantage of their intellectual and personal talents; to develop skills in problem-solving, self-expression, and creativity; and to provide real-world and research experience.

3. Need

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

The University Honors Program (UHP) provides a means better to serve the needs of the University's high ability, intensely motivated students. While the University's enrollment has declined over the last 4 years, the UHP's has more than doubled and we will begin the 2015-16 academic year with approximately 85 students. The UHP will likely reach a planned steady state of 130-to-150 students within the next 3 years. The University's Strategic Plan makes development of the UHP one of the initiatives for Core Theme One (Cultivating Teaching Excellence) B. "Develop a culture that maintains and supports rigorous academic achievement as well as creative and inquisitive scholarly endeavors." Also, since most programs require a minor as a graduation requirement, students will benefit from an option that allows them to use their honors courses to fulfill this requirement.

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

In addition to meeting the needs of UHP students, the honors curriculum serves many other students as well because most honors classes are open to non-honors as well as honors students. With their emphasis on critical inquiry, on knowledge produced not knowledge received, and on creative problem-solving and communication skills, honors classes benefit students in most of the University's programs and majors.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

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

We anticipate that approximately half of the UHP students will choose the option of the IHM. Currently, half of our membership enters the program late in their sophomore or during junior year, too late to acquire the 21 hours of honors credit required for the minor. Other students enter the program, for example pre-engineering students, with the intention of transferring to Montana State University or Montana Tech. However, for students entering the program upon admission to the University or during their freshman year, the minor should be the preferred option.

4. Institutional and System Fit

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

The Interdisciplinary Honors Minor will complement any major in the University.

B. Will approval of the proposed program require changes to any existing programs at the institution? If so, please describe. No.

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?

The Honors minor is consistent with the MSUB Strategic Plan, especially with Core Theme One where the UHP is explicitly mentioned as part of the effort to: "Develop a culture that maintains and supports rigorous academic achievement as well as creative and inquisitive scholarly endeavors." The UHP is designed in concert with two other themes from the Strategic Plan: Promoting and Engaging in Civic Responsibility and Enhancing the Community. For example, each the UHP capstone course focuses on a problem in Billings and requires the students to develop a plan for the stakeholders for this problem.

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 State University Honors College offers an honors degree and the Davidson Honors College of the University of Montana designates its graduates as University Honors Scholars, but neither offer honors minors. With their traditionally aged students and their residential honors communities, these honors colleges enhance the academic missions of Montana State University and the University of Montana. With our many non-traditional and commuting students, the UHP and this proposed minor is designed to contribute to Montana State University Billings' mission and its motto, Access and Excellence. As a result of the Common Course Numbering initiative in the MUS system, honors courses have been FLOCed. This process has facilitated UHP students who have transferred to Davidson and MSU Honors Colleges.

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5. 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 attached.

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

Implementation can begin immediately upon Board of Regents approval. There are only two significant differences in the requirements between the current honors degree, i.e. the designation as a University Honors Scholar and those for the proposed Interdisciplinary Honors Minor. The minor requires HONR499, the Honors Capstone (or departmental capstone that meets Honors requirements) and the completion of a portfolio documenting the learning experience in the Minor. We estimate that 25 of the UHP's current 80 students would graduate with the minor, with the number gradually rising to half of the program's projected 140+/- students pursuing the minor at any time.

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.

- 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.**

No.

7. Assessment

How will the success of the program be measured?

The required portfolio will provide a qualitative mechanism for assessment. Other more informal measures can be used to assess the success of the program, as for example, student and alumni accomplishments. As an aside, MSUB's first three Goldwater Scholarship nominees have all been members of the UHP, and, with the Minor, we expect more such significant achievements. In more quantitative terms, membership in the UHP and completion of the Interdisciplinary Honors Minor can be tracked as measures of the goal of improving in the recruitment and retention of academically talented and motivated students.

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8. Process Leading to Submission

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 idea for an Honors minor resulted from Honors Council meeting (the 14 faculty and administrators and the 2 students who serve as board of directors and legislature for the UHP) and was developed in subsequent Council meetings. A draft proposal was then vetted with the Provost, the Deans, and the Provost Council. It has since been officially approved by all the appropriate internal groups and administrators, including Chancellor Mark Nook. We have shared the proposal with the Honors dean at Montana State University, Dr. Ilse-Mari Lee, and have her endorsement of our proposed minor. In developing our ideas for a minor, we also gotten feedback from a few Honors directors at other institutions.

Required Courses:

HONR 111 Perspectives and Understanding, 3 credits
HONR 499 Honors Problem-Solving Capstone, 3 credits*

*A department capstone that contains the following elements may be substituted for honors capstone:

- original research or creative scholarship,
- written interpretation or analysis, and
- public presentation or a defense.

General Education Honors Options:

ARTZ 105 Visual Language-Drawing, 3 credits
COMX 110 Introduction to Public Speaking, 3 credits
COMT 160 Introduction to Intercultural Communication, 3 credits
EDU 105 Education and Democracy, 3 credits
HSTA 200 Historian as Detective, 3 credits*
WRIT101 College Writing, 3 credits

*Requires special permission

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Honors Electives Offered 2014-2015:

The following list represents the Honors electives in 2014-15, but, since many courses were special topic courses, is not predictive the course titles for 2016 and beyond. Students will need a minimum of 6 credits from this category.

ARTH 436 Women in Art, 3 credits
COMX 482 Women Media and Society, 3 credits
ENST 335 The Environmental Vision, 3 credits
HONR 294/494 Writing for Stage and Screen, 3 credits
HONR 294/494 Philosophy of Mind, 3 credits
HONR 294/494 Contemporary Environment and Nature Writing, 3 credits
HONR 290/490 Internships, 1-6 credits
HONR 298/498 Independent Study, 1-3 credits
LIT 294/494 African American Literature, 3 credits
NASX 294/494 Advanced Readings in Native American Studies, 3 credits
PSCI 472 Constitutional Law: Civil Liberties, 3 credits

The Minor Portfolio:

After completing the minor courses, students work with their faculty advisors to compile a minor portfolio that represents their learning experience in the minor. Typically it will include samples of student work and a brief essay focusing on the ways in which their work has contributed to their learning experience at MSUB and toward their career objectives.

Commitment to Service Learning and Practical Experience:

The Honors Problem-Solving Capstone makes service learning a central component in that students serve as consultants to Billings stakeholders on a problem in the community. In 2014 and 2015, students investigated hunger in Billings and presented their findings to representatives from a variety of social service and government agencies. The UHP also strongly encourages its students to gain internships and assists their efforts to do so, thereby coupling practical experience to the traditional emphasis that honors programs have to critical inquiry and research.

November 19-20, 2015

ITEM 169-2902-R1115

Request for Authorization to Establish a Computer Programming Associate of Applied Science Degree

THAT

The Montana Board of Regents of Higher Education authorizes Great Falls College Montana State University to establish a Computer Programming Associate of Applied Science degree (AAS).

EXPLANATION

This proposal outlines the need for a Computer Programming AAS to address the need for trained computer programmers with an emphasis in database web application development. Virtually every business operating today uses software to manage its business operations. While many solutions are purchased "off the shelf", there remains a persistent need to tailor applications to specific businesses. The business areas represented in the Great Falls area include the growth industries of health care, manufacturing, telecommunications and financial services.

ATTACHMENTS

Academic Proposal Request Form
Curriculum Proposal Form
Attachment #1- Program Degree Summary

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

Item Number: **169-2902-R1115**

Meeting Date: **November 19-20, 2015**

Institution: **Great Falls College Montana State University**

CIP Code: **11.0201**

Program Title: **Computer Programming Associate of Applied Science (AAS)**

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 the [Academic Affairs Handbook](#).

A. Notifications:

Notifications are announcements conveyed to the Board of Regents at the next regular meeting.

- 1a. Placing a program into moratorium** (Document steps taken to notify students, faculty, and other constituents and include this information on checklist at time of termination if not reinstated)
- 1b. Withdrawing a program from moratorium**
- 2. Intent to terminate an existing major, minor, option or certificate – Step 1** (Phase I Program Termination Checklist)
- 3. Campus Certificates- Adding, re-titling, terminating or revising a campus certificate of 29 credits or less**
- 4. BAS/AA/AS Area of Study**

B. Level I:

Level I proposals are those that may be approved by the Commissioner of Higher Education. The approval of such proposals will be conveyed to the Board of Regents at the next regular meeting of the Board.

- 1. Re-titling an existing major, minor, option or certificate**
- 2. Adding a new minor or certificate where there is a major or an option in a major** (Curriculum Proposal Form)
- 3. Revising a program** (Curriculum Proposal Form)
- 4. Distance or online delivery of an existing degree or certificate program**
- 5. Terminating an existing major, minor, option or certificate – Step 2** (Completed Program Termination Checklist)

Temporary Certificate or AAS Degree Program

Approval for programs under this provision will be limited to two years. Continuation of a program beyond the two years will require the proposal to go through the normal Level II Proposal approval process.

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 C. Level I with Level II Documentation:

This type of proposal may go to the Board as a Level I item if all Chief Academic Officers are in agreement. If consensus among the Chief Academic Officers is not reached, however, the item will go to the Board as a Level II request.

 1. Consolidating existing programs and/or degrees (Curriculum Proposal Form)

 D. Level II:

Level II proposals require approval of the Board of Regents. These requests will go to the Board in a two-meeting format, the first being as informational and the second as action.

 1. Re-titling a degree (ex. From B.A. to B.F.A)

 2. Adding a new minor or certificate where there is no major or option in a major (Curriculum Proposal Form)

 3. Establishing a new degree or adding a major or option to an existing degree (Curriculum Proposal Form)

 4. Forming, eliminating or consolidating a college, division, school, department, institute, bureau, center, station, laboratory or similar unit (Curriculum Proposal Form or Center Proposal Form, except when eliminating or consolidating)

 5. Re-titling a college, division, school, department, institute, bureau, center, station, laboratory or similar unit

Specify Request:

The Montana Board of Regents of Higher Education authorizes Great Falls College Montana State University to offer a Computer Programming Associate of Applied Science degree (AAS).

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1. Overview

This curriculum proposal outlines the need for a Computer Programming Associate of Applied Science (AAS) to address the need for trained computer programmers with an emphasis in database web application development. Virtually every business operating today uses software to manage its business operations. While many solutions are purchased “off the shelf”, there remains a persistent need to tailor applications to specific businesses. The business areas represented in the Great Falls region include the growth industries of health care, manufacturing, telecommunications and financial services.

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

The Computer Programming AAS prepares students for employment as a computer programmer developing web, desktop and enterprise applications. The program consists of 62 credits. Upon completion of the program graduates will be prepared to:

- Understand the fundamentals of computer programming and data structures
- Understand the languages for web and enterprise applications such as Java, Python, PHP, and JavaScript
- Understand data Modeling, Database design and Structured Query Language (SQL)
- Have proficiency in web server administration and application development environments
- Understand the software life-cycle, classical and current methodologies and best practices

3. Need

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

As previously discussed, most businesses operating today use software to manage their operations. Even though there is readymade software available, there remains a persistent need to tailor applications to specific businesses. The business areas represented in the Great Falls region include the growth industries of health care, manufacturing, telecommunications and financial services.

The Montana Department of Labor and Industry’s April 2014 Report *Montana Job Projections 2012-2022* projects the increase in demand for software developers to be 30.8% through 2022 and for Web developers to increase by 21%. Median annual salary for software developers with an Associate degree was cited as \$44,200. If those students choose to continue on to the baccalaureate, the wages jumped to \$78,200 per year.

It is also worth noting that the current Computer Information Technology (CIT) program advisory board members expressed a need for programmers trained as specified in this curriculum proposal. That advisory board overwhelmingly supported and contributed to the creation of this new credential.

Finally, Great Falls Public Schools (GFPS) is expanding the teaching of programming at the high school Level, expanding awareness and interest in programming as a degree. This creates opportunities for this program to be supported by a strong dual credit opportunity for area students.

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

In addition to creating a new credential supporting living wage jobs in the Great Falls area (as described in the Program Overview), both the Web and Graphic Design programs at GFC MSU will benefit significantly

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from the availability of programming courses with direct applications to Web development (CSCI 240 Database and SQL, CSCI 211 Client-Side Programming, CSCI 213 Web Programming Techniques II, and CSCI Server-Side Programming). Emerging local industries in the Great Falls area have expressed their support for the degree through the existing CIT advisory board.

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

To build upon the need for this program as defined in Section A of this curriculum proposal, several meetings with local industry via the existing CIT program advisory board occurred. In these meetings, it was determined that the need to support emerging industry in the Great Falls region is critical. Having a credential such as the Computer Programming AAS will not only support existing need, it will attract new business and industry to our area.

In addition, the GFPS indicated, during the curriculum development phase that there is significant interest being expressed in a dual credit option for this program. That option would allow students to complete the first year of this program during their junior and senior years of high school and complete the degree in one year upon successfully graduating from high school and enrolling at the college. Estimates provided to GFC MSU during the curriculum development phase indicated that over 40 students have a strong interest in enrolling in such a program fall 2016.

4. Institutional and System Fit

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

This degree complements the existing CIT programs in Web Design, Graphic Design, Network and Microcomputer support programs as it fills a crucial gap in the technical skills that GFCMSU offers the business community. Websites are becoming increasingly dependent on frameworks that require programming skills to implement and maintain them. The skills gained through the proposed curriculum are an ideal complement to a web-based business solution.

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

No. There is no requirement to change any existing program at GFC MSU at this time.

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

The Computer Programming AAS is related to the CIT Web Design program in that it involves skills impacting web site development. That said, the Computer Programming AAS is focused on the functionality and back-end support of Web applications. The college's existing Web Design degree is focused on the appearance and user experience aspects of a Website. For students interested in programming, the college's existing CIT program is not the appropriate credential.

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

The Computer Programming AAS aligns with GFC MSU's strategic goals as follows:

Increase Transfer Student Participation: The design of each course in this program conforms to the Montana University System's common course numbers and closely follow the objectives of each course. The

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credential will initially provide a 1 + 3 transfer option to MSU 4-year institutions and allow GFC MSU to grow the program into a 2+2 option in the coming years.

Increase Adult Student Participation: This degree is well-suited to adult students currently working in businesses wishing to leverage their existing workplace knowledge by adding computer programming to their skillset. Our plan to eventually offer the entire curriculum on-line will make this more attractive to working adults.

Increase High School Participation: We are currently working with GFPS to begin offering this degree beginning fall of 2016 to a cohort of high school students who will spend ½ days on campus at GFCMSU. In addition, faculty from GFC MSU will be available to GFPS teachers to offer technical assistance and ensure alignment and continuity of courses. We have had tremendous success with full credentials being offered to students via dual credit and see this degree as one more option to help students earn a degree that will give them a foundation to earn a living wage job and still remain in the Great Falls area and the state of Montana.

- 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.**

UM Helena's programming degree is somewhat focused on the Microsoft programming stack (specifically, C# and .NET) due to the demand for that technology in state government. This demand does not exist in the Great Falls area nor is it a dominant technology in the region. This proposal focuses more on industry-standard technology stacks and those employed in the Great Falls area. City College MSU Billings offerings are quite similar; however, students in the Great Falls region require a local option so they can remain here and raise their families.

5. 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.**

Please see attached curriculum.

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

Implementation will use a cohort model with each class being offered once per year, organized to accommodate pre-requisites course work. Assuming an average 75% retention rate, the number of students estimated in the program are as follows (this figure does not include the dual credit students working on concurrent courses in preparation for entry fall 2017):

	New Cohort Size	Total Students
Year 1	10	10
Year 2	15	23
Year 3	20	37

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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.

In the second year of the program, additional faculty will be required for full coverage. The current plan is to utilize adjunct faculty and if need be, overload on the part of current 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.

No. No additional resources are required to ensure the success of the proposed program. Current classroom space and lab is sufficient.

7. Assessment

How will the success of the program be measured?

Success will be measured by tracking retention and completion of the program. Goal is 80% for the first year. Graduation will be tracked with a 70-80% goal.

8. Process Leading to Submission

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 decision to create this offering was the result of discussions with current students, informal discussions with CIT faculty and the desires of the CIT advisory board. Additionally, the experience of the Program Director, having worked the previous 18 months as an applications developer for the State of Montana's Department of Administration, further highlighted the need for, and lack of, qualified applicants to fill programming positions.

The program was approved by the GFC MSU Curriculum Committee on October 2, 2015.

Computer Programming AAS

Program Director: Steve Robinett

Overview:

This degree prepares students for employment as a computer programmer developing web, desktop and enterprise applications.

Outcomes:

Graduates are prepared to:

- Understand the fundamentals of computer programming and data structures.
- Understand the languages for web and enterprise applications such as Java, Python, PHP, and JavaScript.
- Understand data Modeling, Database design and Structured Query Language (SQL).
- Have proficiency in web server administration and application development environments.
- Understand the software life-cycle, classical and current methodologies and best practices.

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

COLS	103	Becoming a Successful Student +	1
First Year Fall			
SUBJ	No	TITLE	CR
CSCI	100	Intro to Programming +	3
MART	231	Interactive Web I +	4
CAPP	120	Intro to Computers +	3
WRIT	101	College Writing **,+ OR	
WRIT	121	Intro to Technical Writing **,+	3
M	108	Business Mathematics **,+ OR	
M	121	College Algebra **,+	3-4
		Total	15 - 16

First Year Spring			
SUBJ	No	TITLE	CR
BGEN	105	Introduction to Business +	3
CSCI	111	Programming with Java I *,+	3
ITS	210	Network OS – Desktop *,+	3
CAPP	156	MS Excel *,+	3
CSCI	240	Databases and SQL *,+	3 NEW
		Total	15
Second Year Fall			
SUBJ	No	TITLE	CR
CSCI	132	Bsc Data Structures/Algorithms *,+	4 NEW
CSCI	211	Client Side Programming *,+	3 NEW
STAT	216	Intro to Statistics **,+	4
COMX	115	Intro to Interpersonal Communications +	3
		Total	14
Second Year Spring			
SUBJ	No	TITLE	CR
CSCI	214	Server Web Programming & Admin *,+	3 NEW
CSCI	223	Software Development *,+	3 NEW
CSCI	299	Programming Capstone *, +	3 NEW
CSCI	213	Web Programming Techniques*,+	3 NEW
ITS	224	Intro To Linux *,+	4
		Total	16
		Program Total	61- 62

* Indicates prerequisites needed.

** Placement in course(s) is determined by placement assessment.

+ A grade of C- or above is required for graduation.