LEVEL II MEMORANDUM

DATE: February 10, 2021

TO: Chief Academic Officers, Montana University System

FROM: Brock Tessman, Deputy Commissioner for Academic, Research, and Student Affairs

RE: March 2021 BOR 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 Wednesday, February 17. Issues not resolved at that meeting should be submitted in writing to OCHE by noon on Friday, February 19. If no concerns are received, OCHE will assume that the proposals have your approval.

Level II Items

University of Montana Missoula:
- Request to retitle the Department of Business Technology to the Department of Business and Technology
  Item #193-1001-R0321

Montana Technological University:
- Request to retitle the Center for Advanced Mineral and Metallurgical Processing (CAMP) to Center for Advanced Materials Processing
  Item #193-1503-R0121

Helena College University of Montana:
- Request to retitle Continuing Education, Workforce Development and Community Engagement Division to Community Education Center
  Item #193-1902-R0321

Montana State University Bozeman:
- Request to offer a B.S. in Biomedical Engineering
  Item #193-2010-R0321 | Curriculum Form | Fiscal Form | Intent to Plan
- Request to retitle the Department of Microbiology and Immunology to the Department of Microbiology and Cell Biology
  Item #193-2011-R0321
- Request to offer a PhD in Exercise and Nutrition Sciences
  Item #193-2012-R0321 | Curriculum Form | Fiscal Form | Intent to Plan
- Request to offer an M.S. in Cybersecurity
  Item #193-2015-R0321 | Curriculum Form | Fiscal Form | Intent to Plan

Great Falls College Montana State University:
- Request to permanently authorize the A.A.S. in Cybersecurity
  Item #193-2901-R0321 |Curriculum Form | Fiscal Form | Intent to Plan

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

March 2021

ITEM 193-1001-R0321

Request for authorization to retitle the Department of Business Technology to the Department of Business and Technology

Institution: **Missoula College**   CIP Code: **N/A**

Program/Center/Institute Title: **Department of Business and Technology, Missoula College**

Includes (please specify below):   Face-to-face Offering: _____   Online Offering: _____   Blended Offering: _____

Options: _____

Proposal Summary [360 words maximum]

What:
Missoula College requests authorization from the Montana Board of Regents to retitle the Department of Business Technology to the Department of Business and Technology.

Why:
The new name better reflects offerings of the Department given the recent merge with the Department of Applied Computing and Engineering Technology. The current department name, Business Technology, does not accurately portray its curricular offerings in information technology, computer science, and engineering technology. Given the new slate of offerings, the Department has proposed Business and Technology as a more appropriate title.

Resources:
No additional resources are required.

ATTACHMENTS
   None

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

_____ **A. Level I:**

   Campus Approvals

      1a. Placing a postsecondary educational program into moratorium (Program Termination and Moratorium Form)

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

    1b. Withdrawing a postsecondary educational program from moratorium

    2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less

    3. Establishing a B.A.S./A.A./A.S. area of study

    4. Offering an existing postsecondary educational program via distance or online delivery

OCHE Approvals

    5. Re-titling an existing postsecondary educational program

    6. Terminating an existing postsecondary educational program <u>(Program Termination and Moratorium Form)</u>

    7. Consolidating existing postsecondary educational programs <u>(Curriculum Proposal Form)</u>

    8. Establishing a new minor where there is a major or an option in a major <u>(Curriculum Proposal Form)</u>

    9. Revising a postsecondary educational program <u>(Curriculum Proposal Form)</u>

    10. Establishing a temporary C.A.S. or A.A.S. degree program *Approval limited to 2 years*

X   **B. Level II:**

    1. Establishing a new postsecondary educational program <u>(Curriculum Proposal and Completed Request to Plan Form)</u>

    2. Permanent authorization for a temporary C.A.S. or A.A.S degree program <u>(Curriculum Proposal and Completed Request to Plan Form)</u>

    3. Exceeding the 120-credit maximum for baccalaureate degrees *Exception to policy 301.11*

    4. Forming, eliminating or consolidating an academic, administrative, or research unit <u>(Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)</u>

X   **5. Re-titling an academic, administrative, or research unit**

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

Provost Office

Status: *Approved*

Deadline: *No deadline*

Provost

Status: *Approved*

Deadline: *No deadline*

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

March 2021

ITEM 193-1503-R0321

ITEM TITLE : Request to Retitle the Center for Advanced Mineral and Metallurgical Processing (CAMP) to Center for Advanced Materials Processing

Institution: **Montana Technological University**   CIP Code: **N/A**

Program/Center/Institute Title: **Center for Advanced Materials Processing (CAMP)**

Includes (please specify below):   Face-to-face Offering: ____   Online Offering: ____   Blended Offering: _____

Options: _____

Proposal Summary [360 words maximum]

What: Montana Technological University requests authorization from the Montana Board of Regents to retitle the Center for Advanced Mineral and Metallurgical Processing (CAMP) to the Center for Advanced Materials Processing (CAMP).

Why: Originally, mineral and metallurgical processing was the primary activity of this center but the scope of the center's activities has enlarged significantly over the past 20 years to include nanotechnology and nanofabrication, additive and agile manufacturing, metal casting, cold spray technology and other materials-related research and development. The activities of the center include faculty investigators and students from chemistry, electrical engineering, mechanical engineering, environmental engineering as well as metallurgical and materials engineering and other campuses in the Montana University System. The Center provides a broad range of research support and services to industry. The proposed new name preserves the historical acronym "CAMP."

Resources: The retitling will not require resources.

ATTACHMENTS
   Memo

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

_____**A. Level I:**

   Campus Approvals

      1a. Placing a postsecondary educational program into moratorium (Program Termination and Moratorium Form)

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

_____ **1b. Withdrawing a postsecondary educational program from moratorium**

_____ **2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less**

_____ **3. Establishing a B.A.S./A.A./A.S. area of study**

_____ **4. Offering an existing postsecondary educational program via distance or online delivery**

OCHE Approvals

_____ **5. Re-titling an existing postsecondary educational program**

_____ **6. Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)

_____ **7. Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)

_____ **8. Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)

_____ **9. Revising a postsecondary educational program** (Curriculum Proposal Form)

_____ **10. Establishing a temporary C.A.S. or A.A.S. degree program** _Approval limited to 2 years_

_____ **B. Level II:**

_____ **1. Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Request to Plan Form)

_____ **2. Permanent authorization for a temporary C.A.S. or A.A.S degree program** (Curriculum Proposal and Completed Request to Plan Form)

_____ **3. Exceeding the 120-credit maximum for baccalaureate degrees** _Exception to policy 301.11_

_____ **4. Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)

__X__ **5. Re-titling an academic, administrative, or research unit**

MONTANA
TECHNOLOGICAL UNIVERSITY

November 20, 2020

TO: Board of Regents of the Montana University System

FROM: Beverly Karplus Hartline, Ph.D., Vice Chancellor for Research

RE: Proposal to Retitle a Research Unit

Dear Members of the Board of Regents:

We would like to simplify CAMP's name to Center for Advanced Materials Processing, keeping the same acronym. Currently its title is "Center for Advanced Mineral & Metallurgical Processing".

The Center for Advanced Mineral and Metallurgical Processing (CAMP) at Montana Technological University is a Regent-approved research center originally established in 1989 (named at that time the Advanced Minerals and Hazardous Waste Processing Center) to serve mining and mineral processing industries, primarily in Montana. Its name was changed with the Regents' approval to the Center for Advanced Mineral Processing (CAMP) in 1992. In 1997, the Regents approved its third name, the Center for Advanced Mineral and Metallurgical Processing (CAMP) in 1997. Over the past 20 years, CAMP's activities have expanded significantly to support a broader range of clientele, including Montana industry beyond the mining and minerals sector, Federal agencies, the Montana Bureau of Mines and Geology, Montana's Materials Science Ph.D. program, other MUS campuses, and other companies, while continuing to support mining, mineral processing, and metallurgical firms.

The proposal to simplify the Center's name to "Center for Advanced Materials Processing" originated in CAMP several months ago and responds to suggestions from the CAMP Advisory Board. Materials encompasses mineral and metallurgical processing along with a broader suite of other materials processing activities, including additive manufacturing, composites, plastics, surface treatments, nanotechnology, and more. The Chancellor and Provost support the name change. Montana Tech's Research Advisory Committee approved the name-change proposal on November 12, 2020. This proposal was approved by the Faculty Senate on November 20, 2020. We have reached out to colleagues and counterparts at the University of Montana in Missoula and Montana State University in Bozeman, who either strongly support or have no objections to the name change. Important to all stakeholders is continuation of the CAMP acronym, which this proposal preserves.

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

MARCH 2021

ITEM 193-1902-R 0321

ITEM TITLE: Requesting authorization to re-title Continuing Education, Workforce Development and Community Engagement Division to *Community Education Center*

Institution: **Helena College**   CIP Code: **N/A**

Program/Center/Institute Title: **Continuing Education, Workforce Development and Community Engagement Division /Helena College**

Includes (please specify below):   Face-to-face Offering: **X**   Online Offering: **X**   Blended Offering: **X**

Options:

Proposal Summary [360 words maximum]

What: A name change from Continuing Education, Workforce Development and Community Engagement Division to Community Education Center

Why: A broader description provided by a new title will enable our department to segment and better describe the services offered within the department. The current title is limiting and does not accurately portray the services that the department has been able to provide to both students and the community. By renaming the Continuing Education Department to the Community Education Center, the branding of the department and the segments of areas that serve our students and community such as Workforce Development, Business, Non-Credit Courses, Testing, and Community Engagement will be easily defined, recognized and marketable under the umbrella of the new title.

Resources: No Resources necessary.

ATTACHMENTS
No Attachments

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

_____ **A. Level I:**

Campus Approvals

1a. Placing a postsecondary educational program into moratorium (Program Termination and Moratorium Form)

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

    1b. Withdrawing a postsecondary educational program from moratorium

    2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less

    3. Establishing a B.A.S./A.A./A.S. area of study

    4. Offering an existing postsecondary educational program via distance or online delivery

OCHE Approvals

    5. Re-titling an existing postsecondary educational program

    6. Terminating an existing postsecondary educational program (Program Termination and Moratorium Form)

    7. Consolidating existing postsecondary educational programs (Curriculum Proposal Form)

    8. Establishing a new minor where there is a major or an option in a major (Curriculum Proposal Form)

    9. Revising a postsecondary educational program (Curriculum Proposal Form)

    10. Establishing a temporary C.A.S. or A.A.S. degree program *Approval limited to 2 years*

X   **B. Level II:**

    1. Establishing a new postsecondary educational program (Curriculum Proposal and Completed Request to Plan Form)

    2. Permanent authorization for a temporary C.A.S. or A.A.S degree program (Curriculum Proposal and Completed Request to Plan Form)

    3. Exceeding the 120-credit maximum for baccalaureate degrees *Exception to policy 301.11*

    4. Forming, eliminating or consolidating an academic, administrative, or research unit (Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)

X   **5. Re-titling an academic, administrative, or research unit**

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

March/2021

ITEM 2010-R0321

ITEM TITLE

Institution: **Montana State University – Bozeman**   CIP Code: **14.0501**

Program/Center/Institute Title: **BS in Biomedical Engineering**

Includes (please specify below):   Face-to-face Offering: __X__   Online Offering: _____   Blended Offering: _____

Options: _____

Proposal Summary [360 words maximum]

What: Establish a BS degree program in Biomedical Engineering

Why: Montana State University-Bozeman has offered a minor in Biomedical Engineering since 2018, and there are already 50 students who have added the minor to their academic plan, and many other students have expressed an interest in adding the minor in the future. The US Bureau of Labor Statistics (BLS) projects that employment of biomedical engineers is growing 7% from 2016 to 2026. However, the BLS expects an acceleration of this growth rate due to "increasing numbers of technologies and applications to medical equipment and devices, along with the medical needs of a growing aging population." A Biomedical Engineering program would therefore support the MUS Strategic Plan, Objective 2.1.1, "Increase degrees and certificates awarded in high-demand occupational fields."

There are a growing number of bioscience companies in Montana (e.g., Golden Helix, GlaxoSmithKlein Hamilton, SiteOne Therapeutics, Bioscience Labs, and many others, see the Montana Bioscience Alliance for additional companies). Many of these companies are in an initial start-up phase, but some will need individuals with the combination of engineering and medical science skills that are possessed by biomedical engineers in order to support their growth. These companies will be asked for input on design of the BS in Biomedical Engineering as well as desired skills for BS graduates of the program.

Resources: A number (5 to 10) existing faculty in the Norm Asbjornson College of Engineering at MSU-Bozeman have a background in Biomedical Engineering, either through academic degrees or extensive research funding/publications. Hence, the proposed BS degree in Biomedical Engineering can be initiated with minimal to no resources for the initial student cohort. Resources will be required as the program grows and student cohorts progress towards graduation. An implementation plan has been developed that describes anticipated faculty resources that will be required as the program grows. It is not expected that more than a few new faculty will be required for the first five years of the program. The only other major resource requirement is an instruction laboratory.

ATTACHMENTS

Curriculum Proposal Form
Fiscal Analysis Form
Intent to Plan

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

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

_____ **A. Level I:**

Campus Approvals

_____ **1a. Placing a postsecondary educational program into moratorium** (Program Termination and Moratorium Form)

_____ **1b. Withdrawing a postsecondary educational program from moratorium**

_____ **2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less**

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OCHE Approvals

_____ **5. Re-titling an existing postsecondary educational program**

_____ **6. Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)

_____ **7. Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)

_____ **8. Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)

_____ **9. Revising a postsecondary educational program** (Curriculum Proposal Form)

_____ **10. Establishing a temporary C.A.S. or A.A.S. degree program** *Approval limited to 2 years*

x **B. Level II:**

X **1. Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Request to Plan Form)

_____ **2. Permanent authorization for a temporary C.A.S. or A.A.S degree program** (Curriculum Proposal and Completed Request to Plan Form)

_____ **3. Exceeding the 120-credit maximum for baccalaureate degrees** *Exception to policy 301.11*

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

4. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)

5. **Re-titling an academic, administrative, or research unit**

Montana Board of Regents
CURRICULUM PROPOSAL FORM

1. **Overview of the request and resulting changes.** Provide a one-paragraph description of the proposed program. Will this program be related or tied to other programs on campus? Describe any changes to existing program(s) that this program will replace or modify. *[100 words]*

   Biomedical engineers apply their knowledge of life sciences, physical sciences, and engineering to solve problems that affect life on Earth. Graduates of the program have the ability to combine engineering principles with medical sciences to design and create equipment, devices, computer systems, software, and other tools used in human healthcare. Students in the program begin with a foundation in mathematics, chemistry and biochemistry, anatomy and physiology, cellular biology and physics. Later courses develop the principles of engineering design, optimization, and modeling to apply the foundational skills to problems affecting life and health.

2. **Relation to institutional strategic goals.** Describe the nature and purpose of the new program in the context of the institution's mission and core themes. *[200 words]*

   Montana State University is a research university that provides transformational learning experiences for students. Choosing Promise, the strategic plan for MSU-Bozeman, recognizes the need for MSU to "promote wellness in our communities: access and equity in education and health outcomes, community-based participatory research, biomedical sciences and entrepreneurship." A Biomedical Engineering program would conduct research that promotes health and the graduates of the program could work and support the biomedical sciences industry. MSU-Bozeman is also home to a thriving engineering college with ABET accredited degree programs, and MSU-Bozeman is uniquely positioned to develop a BS in Biomedical Engineering using existing faculty and existing student demand. The efficiency with which MSU-Bozeman can offer a BS program in Biomedical Engineering will support the Efficiency goal in the MUS strategic plan and help control education costs for students by minimizing the new financial resources required to establish the program.

3. **Process leading to submission.** Briefly detail the planning, development, and approval process of the program at the institution. *[100 words]*

   MSU-Bozeman currently offers a BS in Biological Engineering, a minor in Biomedical Engineering, and an MS in Bioengineering. During the planning discussions for those programs, a strong need for a BS in Biomedical Engineering was identified. Recent tenure-track faculty hires with backgrounds and research programs in the biomedical engineering field and the recent establishment (or planned establishment) of Biomedical Engineering programs at peer institutions in the region accelerated the need for establishing a BS in Biomedical Engineering at MSU-Bozeman. An intent to plan proposal was approved by the BOR in 2019.

4. **Program description.** Please include a complete listing of the proposed new curriculum in Appendix A of this document.

   a. List the program requirements using the following table.

	Credits
Credits in required courses offered by the department offering the program	15
Credits in required courses offered by other departments	86
Credits in institutional general education curriculum	18

Montana Board of Regents
CURRICULUM PROPOSAL FORM

Credits of free electives	9
Total credits required to complete the program	128

b. List the program learning outcomes for the proposed program. Use learner-centered statements that indicate what students will know, be able to do, and/or value or appreciate as a result of completing the program.

ABET specifies the required learning outcomes for accredited engineering programs.

The Student Learning Outcomes for the Biomedical Engineering Program are:

An ability to identify, formulate, and solve complex biomedical engineering problems by applying principles of engineering, science, and mathematics

An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

An ability to communicate effectively with a range of audiences

An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

5. **Need for the program.** To what specific student, regional, and statewide needs is the institution responding to with the proposed program? How will the proposed program meet those needs? Consider workforce, student, economic, societal, and transfer needs in your response as appropriate. *[250 words]*

Montana State University-Bozeman has offered a minor in Biomedical Engineering since 2018, and there are already 50 students who have added the minor to their academic plan, and many other students have expressed an interest in adding the minor in the future. The US Bureau of Labor Statistics (BLS) projects that employment of biomedical engineers is growing 7% from 2016 to 2026. However, the BLS expects an acceleration of this growth rate due to "increasing numbers of technologies and applications to medical equipment and devices, along with the medical needs of a growing aging population." A Biomedical Engineering program would therefore support the MUS Strategic Plan, Objective 2.1.1, "Increase degrees and certificates awarded in high-demand occupational fields."

Montana Board of Regents
CURRICULUM PROPOSAL FORM

There are a growing number of bioscience companies in Montana (e.g., Golden Helix, GlaxoSmithKlein Hamilton, SiteOne Therapeutics, Bioscience Labs, and many others, see the Montana Bioscience Alliance for additional companies). Many of these companies are in an initial start-up phase, but some will need individuals with the combination of engineering and medical science skills that are possessed by biomedical engineers in order to support their growth. These companies will be asked for input on design of the BS in Biomedical Engineering as well as desired skills for BS graduates of the program.

6. **Similar programs.** Use the table below to identify and describe the relationship between any similar programs within the Montana University System.

Institution Name	Degree	Program Title
N/A		

a. If the proposed program substantially duplicates another program offered in the Montana University System, provide a rationale as to why any resulting duplication is a net benefit to the state and its citizens. *[200 words]*

There are existing programs in biomedical sciences, but these programs do not include extensive training in engineering principles and tools. There are also existing engineering programs, but these programs do not include extensive coverage in medical sciences areas. Therefore, a biomedical engineering program will not overlap with any other programs in the MUS.

The most closely related programs are biological engineering, chemical engineering, mechanical engineering, and the Biomedical Sciences option in Cell Biology and Neuroscience at Montana State University. A few select courses from these programs will be required for the proposed program to avoid offering redundant courses.

b. Describe any efforts that were made to collaborate with similar programs at other institutions. If no efforts were made, please explain why. *[200 words]*

7. **Implementation of the program.** When will the program be first offered? If implementation will occur in phases, please describe the phased implementation plans. *[100 words]*

The initial curriculum includes 5 classes that are not currently available. During the first few years, substitute courses have been identified for 4 of the 5 courses if resources are not available to offer the new courses. There is not a current course that can serve as a substitute for Engineering Analysis of Physiological Systems, so it simply must be taught in the first year of the program being offered if there are established engineering students transferring into this proposed program. Fortunately, there are multiple, qualified faculty already in the college of engineering.

a. Complete the following table indicating the projected enrollments in and graduates from the proposed program.

Fall Headcount Enrollment	Graduates

Montana Board of Regents
CURRICULUM PROPOSAL FORM

AY2022	AY2023	AY2024	AY2025	AY2026	AY2022	AY2023	AY2024	AY2025	AY2026
50	90	120	150	150	0	0	25	30	35

b. Describe the methodology and sources for determining the enrollment and graduation projections above. *[200 words]*

Based on the more than 50 students already in the Biomedical Engineering minor after just one year and the strong interest from prospective freshman in engineering and human health, we anticipate roughly 50 students switching from other majors into Biomedical Engineering during first year or two, and we anticipate initial freshman class sizes of 20-50 students based on similar majors (Biological Engineering, Chemical Engineering, and Mechanical Engineering). Long-term demand is likely to be 250-500 students based on similar engineering programs at MSU as well as enrollment in BME at peer institutions.

c. What is the initial capacity for the program?

The initial capacity depends on the distribution of new, freshman students and students transferring from other programs. It will be impossible for the program to support more than 100 students for the first year or two. Long-term, the capacity of the program will be primarily limited by the number of faculty available to advise and teach the required courses.

8. **Program assessment.** How will success of the program be determined? What action would result if this definition of success is not met? *[150 words]*

The program will be assessed in four areas: external ABET accreditation, student progress towards the BS degree, graduation rate, and graduate employment. An external advisory board consisting of engineering alumni, employers, and faculty at peer institutions will be formed to assess each of the four areas. The external advisory board will recommend actions for any identified deficiencies.

a. Describe the assessment process that will be used to evaluate how well students are achieving the intended learning outcomes of the program. When will assessment activities occur and at what frequency? *[150 words]*

Faculty participating in the program will convene each year between May 1 and May 15 to assess the courses in the program and assess student learning outcomes using random samples of student work. The external advisory board will also convene each year in February or March to assess the program more broadly in the four areas described above.

b. What direct and indirect measures will be used to assess student learning? *[100 words]*

Direct measures will include samples of student work in senior year courses to assess whether or not the student learning outcomes are being achieved. Graduates will be surveyed 2-years and 4-years after graduate to determine if the program is adequately preparing graduations for their initial employment.   Students will be required to take the Fundamentals of Engineering exam when a Biomedical Engineering specific exam is available.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

    c. How will you ensure that the assessment findings will be used to ensure the quality of the program?
[100 words]
Identifying areas of concern through assessment, addressing the concern, and reassessing are all fundamental to ABET accreditation. Thus, ABET reviewers will ensure the quality of the program and the continuous improvement of the program based on assessment.

    d. Where appropriate, describe applicable specialized accreditation and explain why you do or do not plan to seek accreditation. *[100 words]*

       ABET accreditation will be pursued once there are graduates of the program. ABET does not accredit programs until there are graduates.

9. Physical resources.

    a. Describe the <u>existing</u> facilities, equipment, space, laboratory instruments, computer(s), or other physical equipment available to support the successful implementation of the program. What will be the impact on existing programs of increased use of physical resources by the proposed program? How will the increased use be accommodated? *[200 words]*

       Students in the Biomedical Engineering program would take existing laboratory courses in Chemistry, Physics, Microbiology and Immunology, and engineering. Students would utilize computer labs and software that currently exist in the college. Since most of the early students in the program are likely to be students transferring from current engineering majors, the overall increase in use is expected to be very small and management. Long-term, it is difficult to predict program demand, but additional physical spaces may be required to support the program.

    b. List <u>needed</u> facilities, equipment, space, laboratory instruments, etc., that must be obtained to support the proposed program. (Enter the costs of those physical resources into the budget sheet.) How will the need for these additional resources be met? *[150 words]*

       The only facility needed within two years of the start of the program in a Biomedical Engineering instructional lab. The lab does not need to be large by engineering lab standards, but a few hundred square feet will be required. Some of the equipment for the lab can be repurposed from existing instructional labs, but approximately $100,000 to $150,000 in new equipment will be necessary.

10. Personnel resources.

    a. Describe the <u>existing</u> instructional, support, and administrative resources available to support the successful implementation of the program. What will be the impact on existing programs of increased use of existing personnel resources by the proposed program? How will quality and productivity of existing programs be maintained? *[200 words]*

       Initially, the program will receive instructional support from existing faculty in departments within the college of engineering. It is anticipated the 3 or 4 of the new courses will be initially taught by existing faculty (approximately 1 course will be taught by faculty from each of the existing departments). Administrative support will be provided by the NACOE Dean's office (approximately 0.3 FTE).

Montana Board of Regents
CURRICULUM PROPOSAL FORM

    b. Identify <u>new</u> personnel that must be hired to support the proposed program. (Enter the costs of those personnel resources into the budget sheet.) What are the anticipated sources or plans to secure the needed qualified faculty and staff? *[150 words]*

      The following projections for new personnel were used in the fiscal analysis of the proposed program:

      0 – 99 majors: substitute Biological Engineering courses for some of the course requirements and have existing engineering faculty teach biomechanics and bioinstrumentation courses.

      100-199 majors: add one new faculty member and have this individual teach design, lab, and intro courses

      200-249 majors: add a second new faculty member to enable teaching of all new Biomedical Engineering courses

      250-299 majors: create a new Biomedical Engineering department with a staff person to support the new department, invite existing NACOE faculty to join the department and hire an external department head if an internal option is not available.

      300-399 majors: add a third new faculty member

      400 majors or more: add a fourth new faculty member

11. Other resources.

    a. Are the available library and information resources adequate for the proposed program? If not, how will adequate resources be obtained? *[100 words]*

      Library and information resources are adequate.

    b. Do existing student services have the capacity to accommodate the proposed program? What are the implications of the new program on services for the rest of the student body? *[150 words]*

      Existing services are adequate.

12. Revenues and expenditures. Describe the implications of the new program on the financial situation of the institution. *[100 words]*

    a. Please complete the following table of budget projections using the corresponding information from the fiscal analysis form for the first three years of operation of the new program.

	Year 1	Year 2	Year 3
Revenues	$571,849	$1,031,158	$1,476,264
Expenses	$46,291	$253,821	$379,964
Net Income/Deficit (revenues-expenses)	$525,558	$777,337	$1,096,300

Montana Board of Regents
CURRICULUM PROPOSAL FORM

b. Describe any expenses anticipated with the implementation of the new program. How will these expenses be met? *[200 words]*

The initial expenses are: NTT faculty, TT faculty, GTA's, and startup expenses associated with the instruction lab and faculty hires. The expenses will be met using revenue generated by the program.

   i. If funding is to come from the reallocation of existing state appropriated funds, please indicate the sources of the reallocation. What impact will the reallocation of funds in support of the program have on other programs? *[150 words]*

   Funding is expected to come from new tuition revenue.

   ii. If an increase in base funding is required to fund the program, indicate the amount of additional base funding and the fiscal year when the institution plans to include the base funding in the department's budget.

   Based on enrollment projections, additional tuition revenue of approximately $500,000 is expected in year 1 and approximately $1M in years 2 and 3.

   iii. If the funding is to come from one-time sources such as a donation, indicate the sources of other funding. What are the institution's plans for sustaining the program when that funding ends? *[150 words]*

   iv. Describe the federal grant, other grant(s), special fee arrangements, or contract(s) that will be valid to fund the program. What does the institution propose to do with the program upon termination of those funds? *[150 words]*

   Faculty associated with the Biomedical Engineering program are expected to pursue federal research grant funding, but this will not directly impact program revenue.

13. **Student fees.** If the proposed program intends to impose new course, class, lab, or program fees, please list the type and amount of the fee.

   The proposed program will use the existing engineering program fee as well as other, MSU-wide, student fees. No new fees are requested.

14. Complete the fiscal analysis form.

   Attached.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

Signature/Date

10/9/2020 | 3:57 PM MDT

College or School Dean:

DocuSigned by:
Brett Gunnink
4D3351D90E3C4F2...

Chief Academic Officer:

12/14/2020 | 9:39 AM

DocuSigned by:
Robert Mokwa
212A28411AC04BD...

Chief Executive Officer:

12/14/2020 | 9:39 AM

DocuSigned by:
7D6A4CE96C3F415...

Flagship Provost*:

12/14/2020 | 9:39 A

DocuSigned by:
Robert Mokwa
212A28411AC04BD...

Flagship President*:

DocuSigned by:
7D6A4CE96C3F415...

12/14/2020 | 9:39 A

*Not applicable to the Community Colleges.

Montana Board of Regents

CURRICULUM PROPOSAL FORM

Appendix A – Proposed New Curriculum

The curriculum is 128 credits comprised of a Basic Program plus Electives which students select to meet both University Core requirements and requirements of the Biological Engineering degree.

Student Performance and Retention Requirements: Students are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the Bachelor of Science degree requirements. Moreover, students must achieve a C- or better grade prior to taking follow-on courses.

Freshman Year		Credits
	Fall	**Spring**
EBME 100 Intro to Biomed Eng	1	
CHMY 141 - College Chemistry I	4	
M 171Q - Calculus I	4	
PHSX 220 - Physics I with Calculus	4	
US or W Core course	3	
CHMY 143 - College Chemistry II		4
M 172Q - Calculus II		4
PHSX 222 - Physics II with Calculus		4
US or W Core course		3
EBME 101: Biomedical Engineering Seminar		1
Year Total:	16	16

Sophomore Year		Credits
	Fall	**Spring**
M 273Q - Multivariable Calculus	4	
CHMY 211 - Elements of Organic Chemistry	5	
BIOB 260 - Cellular and Molecular Biology	4	
ECHM 201 - Elementary Principles of Chemical and Biological Engineering	4	
M 274 - Introduction to Differential Equation		4
EBIO 216 - Elem Princ of Biological Engineering		3
BIOH 201 - Human Anatomy and Physiology I (or an approved anatomy and physiology course)		5
IA, IH, IS, or D Core course		3
Year Total:	17	15

Junior Year		Credits
	Fall	**Spring**
EGEN 201 - Engineering Mechanics--Statics	3	

Montana Board of Regents
CURRICULUM PROPOSAL FORM

BCH 380 - Biochemistry	5	
EBIO 324 - Bioengineering Transport	3	
IA, IH, IS, or D Core course	3	
M 221 - Introduction to Linear Algebra	3	
EBIO 461 - Principles of Biomedical Engineering		3
EBME 3xx Eng Analysis Physiological Sys		3
EIND 354 - Engineering Probability and Statistics I		3
IH, IA, IS, or D Core course		3
EGEN 205 - Mechanics of Materials		3
Year Total:	17	15

Senior Year		**Credits**
	Fall	**Spring**
EMAT 464 - Biomedical Materials Engineering	3	
EBME 4xx Biomedical Engineering Lab	3	
EBME 4xx Bioelectronics and Instrumentation	4	
Professional Electives	3	
EBIO 407 - Biological Engineering Thermodynamics	3	
EMEC 440 - Biomechanics of Human Movement		3
EBME 4xx Biomedical Engineering Design		4
Professional Elective		6
IA, IH, IS, or D Core course		3
Year Total:	16	16
Total Program Credits:		**128**

Academic Degree Program Proposal - Fiscal Analysis Form

CAMPUS:	Bozeman
AWARD LEVEL:	UG
PROGRAM NAME:	BS is Biomedical Engineering
PROGRAM CODE:	

	FY2022	FY2023	FY2024	FY2025	FY2026
ENROLLMENT PROJECTIONS					
Headcount					
annual unduplicated headcount of students with declared major or minor within the program	50	90	120	150	150
Credit Hours					
annual avg. credits hours earned per student in program related curriculum	32	32	32	32	32
Student FTE					
Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24	53.33333333	96	128	160	160
Completions					
Annual number of program completers	0	0	10	30	40

REVENUE	FY2022	FY2023	FY2024	FY2025	FY2026
Tuition Revenue (net of waivers)	$561,352	$1,010,433	$1,347,244	$1,684,055	$1,684,055
Institutional Support					
Other Outside Funds (grants, gifts, etc.)			$100,000	$100,000	$100,000
Program Tuition/Fees	$10,497	$20,725	$29,020	$37,315	$37,315
Total Revenue	**$571,849**	**$1,031,158**	**$1,476,264**	**$1,821,370**	**$1,821,370**
Total Revenue per Student FTE	**$10,722**	**$10,741**	**$11,533**	**$11,384**	**$11,384**

EXPENDITURES		FY2022	FY2023	FY2024	FY2025	FY2026
Tenure Track Faculty	FTE			1.0	1.0	1.0
	Salary + Benefits			$113,722	$113,722	$113,722
Non-tenure Track Faculty *Includes Adjunct Instructors	FTE	0.1	0.3	0.3	0.3	0.3
	Salary + Benefits	$11,891	$23,782	$23,782	$23,782	$23,782
Graduate Teaching Assistants	FTE		2.0	2.0	3.0	3.0
	Salary + Benefits		$36,119	$36,119	$54,178	$54,178
Staff	FTE			1.0	1.0	1.0
	Salary + Benefits			$23,782	$23,782	$23,782
Total Faculty & Staff	FTE					
	Salary + Benefits	**$11,891**	**$59,901**	**$197,404**	**$215,464**	**$215,464**

	FY2022	FY2023	FY2024	FY2025	FY2026
Operations (supplies, travel, rent, etc)	$34,400	$93,920	$82,560	$103,200	$103,200
Start-up Expenses (OTO)		$100,000	$100,000	$100,000	$100,000
Total Expenses	**$46,291**	**$253,821**	**$379,964**	**$418,664**	**$418,664**

	FY2022	FY2023	FY2024	FY2025	FY2026
Student FTE to Faculty (TT + NTT) Ratio	373.0	336.8	99.6	124.5	124.5
Net Income/Deficit (Revenue - Expenses)	**$525,558**	**$777,337**	**$1,096,300**	**$1,402,706**	**$1,402,706**

The signature of the campus Chief Financial Officer signifies that he/she has reviewed and assessed the fiscal soundness of the proposal and provided his/her recommendations to the Chief Academic Officer as necessary.

DocuSigned by:

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Campus Chief Financial Officer Signature

Chief Financial Officer Comments

2 additional lab sections of ANP with funds going to MBI are included at about $50k total for lab costs due to need for cadavers.

Program/Center/Institute Title: **BS in Biomedical Engineering**

Campus, School/Department: **MSU-Bozeman, NACOE**   Expected Submission Date: **Fall 2020**

Contact Name/Info: **Jeffrey Heys**

To increase communication, collaboration, and problem-solving opportunities throughout the MUS in the program/center/institute development process, please complete this form not more than 18 months in advance of the anticipated date of submission of the proposed program/center/institute to the Board of Regents for approval. The completed form should not be more than 2-3 pages. For more information regarding the Intent to Plan process, please visit http://mus.edu.che/arsa/academicproposals.asp.

1) Provide a description of the program/center/institute.

Biomedical engineers combine engineering principles with medical sciences to design and create equipment, devices, computer systems, software, and other tools used in human healthcare[1]. The **BS in Biomedical Engineering** degree is intended to provide training and practical skills to students seeking to work as Biomedical Engineers. Students will be trained in a number of required subfields, including: (1) bioinformatics, (2) biomechanics, (3) biomaterials, (4) tissue engineering, (5) medical devices, and (6) medical instrumentation. Students would have the option of also receiving training in optional subfields, including: (1) biomedical optics, (2) genetic engineering, (3) neural engineering, and (4) pharmaceutical engineering.

2) Describe the need for the program/center/institute. Specifically, how the program/center/institute meets current student and workforce demands. (Please cite sources).

MSU-Bozeman currently offers a BS in Biological Engineering, a minor in Biomedical Engineering, and has proposed an MS in Bioengineering. During the planning discussions for both the Biomedical Engineering minor and the MS in Bioengineering, a strong need for a BS in Biomedical Engineering was identified. Recent tenure-track faculty hires with backgrounds and research programs in the biomedical engineering field and the recent establishment (or planned establishment) of Biomedical Engineering programs at peer institutions in the region accelerated the need for establishing a BS in Biomedical Engineering at MSU-Bozeman.

Montana State University-Bozeman has offered a minor in Biomedical Engineering for slightly more than one year, and there are already 50 students that have added the minor to their academic plan, and many other students have expressed an interest in adding the minor in the future. The US Bureau of Labor Statistics (BLS) projects that employment of biomedical engineers is growing 7% from 2016 to 2026. However, the BLS expects an acceleration of this growth rate due to "increasing numbers of technologies and applications to medical equipment and devices, along with the medical needs of a growing aging population." A Biomedical Engineering program would therefore support the MUS Strategic Plan, Objective 2.1.1, "Increase degrees and certificates awarded in high-demand occupational fields."

There are a growing number of bioscience companies in Montana (e.g., Golden Helix, GlaxoSmithKlein Hamilton, SiteOne Therapeutics, Bioscience Labs, and many others, see the Montana Bioscience Alliance for additional companies). Many of these companies are in an initial start-up phase, but some will need individuals with the

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[1] Definition from the United States Department of Labor

Montana University System

Intent to Plan Form

combination of engineering and medical science skills that are possessed by biomedical engineers in order to support their growth. These companies will be asked for input on design of the BS in Biomedical Engineering as well as desired skills for BS graduates of the program.

3) Describe how the program/center/institute fits with the institutional mission, strategic plan, and existing institutional program array.

Montana State University is a research university that provides transformational learning experiences for students. Choosing Promise, the strategic plan for MSU-Bozeman, recognizes the need for MSU to "promote wellness in our communities: access and equity in education and health outcomes, community-based participatory research, biomedical sciences and entrepreneurship." A Biomedical Engineering program would provide both research that promotes wellness and the graduates of the program could work and support the biomedical sciences industry. MSU-Bozeman is also home to a thriving engineering college with ABET accredited degree programs, and MSU-Bozeman is uniquely positioned to develop a BS in Biomedical Engineering using existing faculty and existing student demand. The efficiency with which MSU-Bozeman can offer a BS program in Biomedical Engineering will support the Efficiency goal in the MUS strategic plan and help control education costs for students by minimizing the new financial resources required to establish the program.

4) Describe how the program/center/institute overlaps, complements, or duplicates existing efforts in the MUS. Describe efforts that will be made to collaborate with similar programs at other institutions. If no efforts will be made, please explain why.

The proposed BS in Biomedical Engineering will provide students with a unique combination of engineering principles with medical sciences. There are existing programs in biomedical sciences, but these programs do not include extensive training in engineering principles and tools. There are also existing engineering programs, but these programs do not include extensive coverage in medical sciences areas. Therefore, a biomedical engineering program will not overlap with any other programs in the MUS.

Signature/Date

College/School Dean: _____ 9/18/19

Chief Academic Officer: _____ 11/19/19

Chief Executive Officer: _____

Flagship Provost*: _____ 11/19/19

Flagship President*: _____ Nov 19, 2019

*Not applicable to the Community Colleges.

Date of Final Review:

When submitting the proposal to the BOR, include this signed form with the Level II request.

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

March 2021

ITEM 193-2011-R0321

ITEM TITLE

Institution: **Montana State University-Bozeman**   CIP Code: _____

Program/Center/Institute Title: **Department of Microbiology and Immunology**

Includes (please specify below):   Face-to-face Offering: _____   Online Offering: _____   Blended Offering: _____

Options: 10 undergraduate degree options, 2 minor options, 3 Ph.D. degree options, 3 M.S. degree options

Proposal Summary [360 words maximum]

What: We request approval to re-title the Department of Microbiology and Immunology to the Department of Microbiology and Cell Biology, which reflects the merger of the Departments of Microbiology and Immunology and Cell Biology and Neuroscience at MSU-Bozeman.

Why: The Department of Microbiology and Immunology and the Department of Cell biology and Neuroscience were merged last year, resulting in the formation of a large department at MSU with a variety of research and educational disciplines being represented. In efforts to unify the department and represent the various educational and research opportunities, the faculty worked together over the course of the last 8 months to develop a new name for the department. **Through several meetings of the faculty in the merged department and voting by all of the tenure track faculty, as well as representatives from the non-tenure track faculty, the faculty recently voted to request that the departmental name be changed to Microbiology and Cell Biology.** This name reflects the merger of the two departments, while keeping important components of the original names that represent the nature of our combined research and teaching programs.

Resources: Since the merged department has been operating at full capacity for more than a year, there are no major resources being requested in retitling the department name, other than small costs associated with changing letterhead on envelopes, website updates, etc.

ATTACHMENTS

Click or tap here to enter text.

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

_____   **A. Level I:**

Campus Approvals

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

1a. Placing a postsecondary educational program into moratorium (Program Termination and Moratorium Form)

1b. Withdrawing a postsecondary educational program from moratorium

2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less

3. Establishing a B.A.S./A.A./A.S. area of study

4. Offering an existing postsecondary educational program via distance or online delivery

OCHE Approvals

5. Re-titling an existing postsecondary educational program

6. Terminating an existing postsecondary educational program (Program Termination and Moratorium Form)

7. Consolidating existing postsecondary educational programs (Curriculum Proposal Form)

8. Establishing a new minor where there is a major or an option in a major (Curriculum Proposal Form)

9. Revising a postsecondary educational program (Curriculum Proposal Form)

10. Establishing a temporary C.A.S. or A.A.S. degree program *Approval limited to 2 years*

X   B. Level II:

1. Establishing a new postsecondary educational program (Curriculum Proposal and Completed Request to Plan Form)

2. Permanent authorization for a temporary C.A.S. or A.A.S degree program (Curriculum Proposal and Completed Request to Plan Form)

3. Exceeding the 120-credit maximum for baccalaureate degrees *Exception to policy 301.11*

4. Forming, eliminating or consolidating an academic, administrative, or research unit (Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)

X   5. Re-titling an academic, administrative, or research unit

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

March/2021

ITEM 2021-R0321

ITEM TITLE

Institution: **Montana State Univ-Bozeman**   CIP Code: **31.0505**

Program/Center/Institute Title: **PhD Exercise and Nutrition Sciences**

Includes (please specify below):   Face-to-face Offering: _____   Online Offering: _____   Blended Offering: _____

Options: 1 – Exercise Nutrition, Metabolism and Physiology
2 – Biomechanics and Motor Control

Proposal Summary [360 words maximum]

What:

The PhD in Exercise and Nutrition Sciences (EXNS) will build on the existing MS in EXNS and leverage expertise of EXNS program faculty and inter-departmental collaborations at MSU to deliver the following options: 1) exercise nutrition, metabolism, and physiology, and 2) biomechanics and motor control.

Why:

1) Exercise Science programs at all levels have been growing for many years and growth is projected to continue (Thomas, 2014). This projected growth is based, at least in part, on the need for preventive and therapeutic health services as our population ages (double the number of individuals 65+ y by 2030

2) Demand for PhD trained university faculty in Nutrition Science, particularly for individuals who hold both the PhD and Registered Dietitian (RD) credentials is expanding. The Commission on Dietetic Registration will begin requiring a graduate degree from an Accreditation Council for Education and Nutrition and Dietetics (ACEND) accredited program to be eligible to become an RD starting in 2024. Montana State University is ACEND accredited and in position to take a leadership position in the production of PhD prepared RD's to meet demand for this unique combination.

3) The current master's program in Exercise and Nutrition Sciences has enrollment of 17-24 students and there is a growing demand to pursue study in both proposed options at the PhD level.

Resources:

Facilities: Nutrition Research Laboratory, Movement Science Laboratory, Neuromuscular Biomechanics Laboratory.

TT faculty: 6

Support: Graduate Coordinator

Administrative Resources: Graduate Programs Coordinator

One new NTT faculty instructor is requested (.5 FTE in Year 2, increased to 1.0 FTE in Year 5) to support the undergraduate program and backfill teaching and supervision for the TT faculty to ensure adequate time and resources for the research active, doctorally prepared, TT faculty to deliver the PhD program.

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

Two PhD level GTA lines are requested in Year 1, 3 in Year 2, and 4 in Years 3-5.

ATTACHMENTS
    Intent to Plan
    Curriculum Proposal
    Fiscal Analysis

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

A. Level I:

Campus Approvals

    1a. Placing a postsecondary educational program into moratorium (Program Termination and Moratorium Form)

    1b. Withdrawing a postsecondary educational program from moratorium

    2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less

    3. Establishing a B.A.S./A.A./A.S. area of study

    4. Offering an existing postsecondary educational program via distance or online delivery

OCHE Approvals

    5. Re-titling an existing postsecondary educational program

    6. Terminating an existing postsecondary educational program (Program Termination and Moratorium Form)

    7. Consolidating existing postsecondary educational programs (Curriculum Proposal Form)

    8. Establishing a new minor where there is a major or an option in a major (Curriculum Proposal Form)

    9. Revising a postsecondary educational program (Curriculum Proposal Form)

    10. Establishing a temporary C.A.S. or A.A.S. degree program *Approval limited to 2 years*

X **B. Level II:**

    X   **1. Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Request to Plan Form)

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

2. Permanent authorization for a temporary C.A.S. or A.A.S degree program (Curriculum Proposal and Completed Request to Plan Form)

3. Exceeding the 120-credit maximum for baccalaureate degrees *Exception to policy 301.11*

4. Forming, eliminating or consolidating an academic, administrative, or research unit (Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)

5. Re-titling an academic, administrative, or research unit

Montana Board of Regents
CURRICULUM PROPOSAL FORM

1. **Overview of the request and resulting changes.** Provide a one-paragraph description of the proposed program. Will this program be related or tied to other programs on campus? Describe any changes to existing program(s) that this program will replace or modify. *[100 words]*

The PhD in Exercise and Nutrition Sciences (EXNS) will build on the existing MS in EXNS and leverage expertise of EXNS program faculty and inter-departmental collaborations at MSU to deliver the following options: 1) exercise nutrition, metabolism, and physiology, and 2) biomechanics and motor control. The EXNS PhD will require a minimum of 60 credits, including a minimum of 18-28 credits of dissertation and consideration of up to 21 non-research credits from the MS degree. Additionally, each student will develop an academic portfolio that includes research (presentations, peer-reviewed publications, grant writing) and teaching (development of course materials, instruction, student mentoring).

2. **Relation to institutional strategic goals.** Describe the nature and purpose of the new program in the context of the institution's mission and core themes. *[200 words]*

- **Intentional Focus 1: Transformational Learning**

  Goal 1.2: Expand high-quality graduate education. Addition of a PhD in Exercise and Nutrition Sciences will expand the scale of doctoral education

- **Intentional Focus 2. Scholarship that Improves Lives**

  Goal 2.1: Enhance the significance and impact of scholarship. Research performed by PhD students in combination with their supervising faculty will significantly enhance the quality and quantity of scholarly output.

  Goal 2.2: Expand interdisciplinary scholarship. Current interdisciplinary collaborations between EXNS faculty and mechanical engineering, biochemistry, microbiology and immunology, and statistics will be deepened as doctoral students work across laboratories.

  Goal 2.3: Strengthen institutional reputation in scholarship. The EXNS faculty have been recognized for their strength in research, e.g. awards, invited presentations, and external funding. Adding doctoral students will provide an opportunity to synergistically strengthen our reputation in scholarship.

  Goal 2.4: Elevate expectations for scholarship. Addition of doctoral students will elevate our research quality and productivity of current and future faculty members.

- **Intentional Focus 3: Expanding Engagement**

  Goal 3.3 Foster a culture of collaboration, continuous improvement and individual growth. The EXNS PhD program will increase collaboration and external grant applications between the EXNS program faculty and those of engineering, biochemistry, microbiology and immunology, and others.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

3. **Process leading to submission.** Briefly detail the planning, development, and approval process of the program at the institution. *[100 words]*

The EXNS PhD program has been in development for approximately five years. In that time, we have taken the following steps:

1. Augment faculty resources. We have added three faculty members and now have nine research active faculty member team to support the EXNS PhD program.
2. Direct appropriate faculty time and teaching resources to the EXNS PhD program. This step involved a curricular overhaul to adjust teaching loads to support PhD student supervision.
3. Define the focus of the program and identify new and existing graduate level courses that will be needed.
4. Develop the EXNS PhD program application.

4. **Program description.** Please include a complete listing of the proposed new curriculum in Appendix A of this document.

a. List the program requirements using the following table.

Exercise Nutrition, Metabolism, and Physiology Curriculum

	Credits
Credits in required courses offered by the department offering the program	42-46
Credits in required courses offered by other departments	12
Credits in institutional general education curriculum	0
Credits of free electives	2-6
Total credits required to complete the program	60

Biomechanics and Motor Control Curriculum

	Credits
Credits in required courses offered by the department offering the program	42-52
Credits in required courses offered by other departments	6-18
Credits in institutional general education curriculum	0
Credits of free electives	3
Total credits required to complete the program	60

Montana Board of Regents
CURRICULUM PROPOSAL FORM

    a.   List the program learning outcomes for the proposed program. Use learner-centered statements that indicate what students will know, be able to do, and/or value or appreciate as a result of completing the program.

Through required coursework and research requirements, successful EXNS PhD students will develop and demonstrate:
1) Advanced ability to critically analyze research, identify gaps in knowledge, and develop research hypotheses
2) Advanced ability to design research strategies for hypothesis driven research
3) Mastery of scientific writing for both grant proposals and peer reviewed journal articles
4) Technical knowledge and laboratory skills to carry out cutting-edge research
5) Advanced skills in data analysis and presentation, e.g. tables and figures
6) Ability to design and deliver college-level courses.
7) Advanced oral communication skills, including development and delivery of high-quality research presentations.

5. **Need for the program.** To what specific student, regional, and statewide needs is the institution responding to with the proposed program? How will the proposed program meet those needs? Consider workforce, student, economic, societal, and transfer needs in your response as appropriate. *[250 words]*
   1) Exercise Science programs at all levels have been growing for many years and growth is projected to continue (Thomas, 2014). This projected growth is based, at least in part, on the need for preventive and therapeutic health services as our population ages (double the number of individuals 65+ y by 2030). Exercise science and related programs of study are the primary undergraduate majors for students pursuing careers in physical therapy, occupational therapy, and athletic training (increasingly utilized in health-related fields unrelated to sport) and related fields, as well as for students pursuing careers in medicine and dentistry.
   2) Similarly, the demand for PhD trained university faculty in Nutrition Science, particularly for individuals who hold both the PhD and Registered Dietitian (RD) credentials is expanding. The Commission on Dietetic Registration will begin requiring a graduate degree from an Accreditation Council for Education and Nutrition and Dietetics (ACEND) accredited program to be eligible to become an RD starting in 2024. Montana State University is ACEND accredited and in position to take a leadership position in the production of PhD prepared RD's to meet demand for this unique combination. This change will increase demand for PhD prepared faculty as the number of graduate programs in nutrition science or related areas grows. Currently, only 4% of RD's hold doctoral degrees.
   3) The current master's program in Exercise and Nutrition Sciences has enrollment of 17-24 students and there is a growing demand to pursue study in both proposed options at the PhD level.

6. **Similar programs.** Use the table below to identify and describe the relationship between any similar programs within the Montana University System.

Institution Name	Degree	Program Title
Montana State University	PhD	Engineering, Mechanical Engineering option

Montana Board of Regents
CURRICULUM PROPOSAL FORM

University of Montana	PhD	Integrative Physiology and Rehabilitative Medicine (to be proposed in near future)
University of Montana	DPT	Doctorate of Physical Therapy

a. If the proposed program substantially duplicates another program offered in the Montana University System, provide a rationale as to why any resulting duplication is a net benefit to the state and its citizens. *[200 words]*

The PhD programs identified above are the most closely related programs but **do not substantially duplicate either of the proposed options in the EXNS PhD program.**

b. Describe any efforts that were made to collaborate with similar programs at other institutions. If no efforts were made, please explain why. *[200 words]*

Faculty from the proposed EXNS PhD have been in communication with a Department Chairs and faculty at University of Montana associated with the Integrative Physiology and Rehabilitative Medicine proposal, and they have provided a letter of support for the EXNS PhD at Montana State University. The Department of Mechanical and Industrial Engineering at MSU has also provided a letter of support.

In light of potential synergy without overlap or duplication, we intend to support the proposed PhD in Integrative Physiology and Rehabilitative Medicine when that proposal is brought forward from UofM. There is absolutely no overlap with the Doctorate of Physical Therapy program aimed at preparing physical therapists for clinical practice, thus, no efforts were made to collaborate with this program.

There is a synergistic relationship between the faculty (Becker and Graham) of the Biomechanics and Motor Control option and two faculty from Mechanical and Industrial Engineering at MSU (Monfort and Pew). This collaborative group shares lab facilities (a tremendous asset to both departments) and serve together on graduate committees for both departments. A PhD obtained through HHD in biomechanics and/or motor control will differ from that of Engineering in that it is person/biologically focused with the purpose of understanding the biological mechanisms of movement and control.

7. **Implementation of the program.** When will the program be first offered? If implementation will occur in phases, please describe the phased implementation plans. *[100 words]*
   1) **Curriculum delivery changes to enable incorporation of the PhD program into faculty workloads.** These changes (described in more detail within the Process Leading to Submission section below) have been approved at the departmental and college levels and will begin in Fall 2020.
   2) **Addition of new courses to the EXNS curriculum.** Most courses for the PhD program are 500-level courses currently being offered at MSU. New course development and curriculum delivery changes allow for the remaining courses to be added starting in AY 20/21. These new courses include NUTR 520, NUTR 521, KIN 5XX (Motor Control), KIN 690 (dissertation) and KIN 525 which has been redesigned. KIN 591A, KIN 591B, and KIN 591C are additional new courses that will be cross-listed as Mechanical and Industrial Engineering (EMECH) courses. See the Appendix for additional details. Health and Human Performance faculty have been working for several years on a "2020 Plan" that will accommodate offering the new courses while sustaining offerings of undergraduate courses in more efficient ways (i.e. offering lecture courses once in fall semester rather than twice, and offering jointly supervised multi-

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section labs in spring semester). The addition of GTA lines and NTT FTE will ensure an adequate number of instructors for labs and undergraduate courses.

3) **Enrollment of students into the PhD program.**

a. Complete the following table indicating the projected enrollments in and graduates from the proposed program.

b.

Fall Headcount Enrollment					Graduates				
AY__21_	AY_22__	AY_23__	AY_24__	AY_25__	AY__24_	AY_25__	AY__26_	AY__27_	AY_28__
≥ 4	≥ 6	≥ 8	≥ 8	≥ 10	≥ 0	≥ 0	≥ 2	≥ 4	≥ 6

c. Describe the methodology and sources for determining the enrollment and graduation projections above. *[200 words]*

Interest in PhD level training from faculty within the proposed PhD is evidenced by current supervision of PhD students in the Individual Interdisciplinary PhD (IIP), e.g. Dr. Miles chairs an IIP student in the areas of nutrition and metabolism, immunology, and microbial ecology, and Drs. Miles and McMilin co-chair an IIP student in the areas of nutrition, interprofessional health education, and psychology. Similarly, Dr. Jason Carter, the newly appointed Vice President for Research and Economic Development and Graduate Education at Montana State University, is currently supervising doctoral students from his previous institution will supervise students in the EXNS PhD. Additionally, current faculty in the EXNS graduate program also serve as members of PhD committees for students. Thus, the majority of the EXNS faculty are currently supervising PhD students and or serving on PhD committees and enthusiastically anticipate continued PhD supervision in the EXNS PhD program.

Faculty who will supervise PhD students discussed a staggered onboarding of PhD students with one third to one half of faculty taking on a new PhD student each year so that at least two students will begin the program each year and begin completing the PhD after the third year.

d. What is the initial capacity for the program?

We anticipate adding at least two incoming PhD students each year and having a minimum of six, but likely 8-10 PhD students in the program at a time after the first three cohorts are enrolled.

8. **Program assessment.** How will success of the program be determined? What action would result if this definition of success is not met? *[150 words]*

Success of the PhD in EXNS will be assessed be monitoring the successful matriculation of students through coursework, comprehensive examinations, and dissertation completion in 3-4 years will be an important measurement of success. An additional measure of success will be placement of our graduates in academic, research, and industry positions upon completion of the degree.

a. Describe the assessment process that will be used to evaluate how well students are achieving the intended learning outcomes of the program. When will assessment activities occur and at what frequency? *[150 words]*

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- Data will be collected regarding milestone completion. Details of course completion, pass/fail rates from comprehensive exams (1st and 2nd attempts) and dissertation defenses will be recorded and monitored so that problems can be detected and acted upon in a pro-active and timely fashion and success of the program can be evaluated.
- Presentation and publications of the students will be documented. It is expected that students will have 3-6 national or international level presentations and 3-6 peer-reviewed publications before completion of the PhD. Individual and collective data will be recorded and monitored so that students and their committees will have that feedback and success of the program can be evaluated.
- Independent teaching and evaluations of teaching for the students will be monitored and recorded so that students and committee chairs can have that feedback and success of the program can be evaluated.
- Post-graduation placements will be tracked.

1) What direct and indirect measures will be used to assess student learning? *[100 words]*

The primary direct measures used to assess student learning will be the comprehensive examination and the PhD dissertation defense. The EXNS PhD program comprehensive exam will be conducted by the students committee, typically in the beginning of the third year of the program. Students will prepare a grant proposal based on one or more elements of his/her proposed dissertation prior to an oral exam. Students in the EXNS PhD program will complete and defend dissertations with a minimum of three completed manuscripts for which the candidate is first author.

2) How will you ensure that the assessment findings will be used to ensure the quality of the program? *[100 words]*

Faculty of the EXNS PhD program will review outcome metrics on an annual basis and work collectively to elevate the program quality over time.

3) Where appropriate, describe applicable specialized accreditation and explain why you do or do not plan to seek accreditation. *[100 words]*

Accreditation of the PhD in EXNS will occur through the Northwest Accreditation for Montana State University as a whole. No other accreditations are applicable to this program.

9. **Physical resources.**

a. Describe the <u>existing</u> facilities, equipment, space, laboratory instruments, computer(s), or other physical equipment available to support the successful implementation of the program. What will be the impact on existing programs of increased use of physical resources by the proposed program? How will the increased use be accommodated? *[200 words]*

Research active faculty currently perform their research in collaboration with their graduate students in established laboratory facilities including the Nutrition Research Laboratory, the Movement Science Laboratory, and the Neuromuscular Biomechanics Laboratory. Each of these laboratories is well-equipped with state-of-the-art technology for cutting edge research. Additional work is conducted in community and field settings. A proposed new facility to house this program is currently in development as part of the Romney/Student Wellness Center Renovation and will include an excellent facility to enhance existing capacity and capabilities (estimated 2-3 years from now). Graduate student numbers are anticipated to

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grow only slightly with the addition of this program as faculty will work with similar or slightly greater numbers of students for longer periods of time. Current facilities, office space, equipment, and computers in the laboratories is sufficient to support addition of the PhD program.

b. List <u>needed</u> facilities, equipment, space, laboratory instruments, etc., that must be obtained to support the proposed program. (Enter the costs of those physical resources into the budget sheet.) How will the need for these additional resources be met? *[150 words]*

None proposed.

10. **Personnel resources.**

a. Describe the <u>existing</u> instructional, support, and administrative resources available to support the successful implementation of the program. What will be the impact on existing programs of increased use of existing personnel resources by the proposed program? How will quality and productivity of existing programs be maintained? *[200 words]*

Instructional resources: Five TT faculty teach graduate courses and serve as committee chairs and members for PhD students (Miles, Becker, Graham, Tarabochia, Seifert); one additional TT faculty to serve as committee chair and member for PhD students (Carter).

Support: Graduate Coordinator – Dawn Tarabochia, PhD

Administrative Resources: Graduate Programs Coordinator – Milana Lazetich

The addition of the PhD program will add an additional level of graduate student mentoring effort by faculty and staff that is expected to be manageable with the existing personnel. Based on experience with the addition of an Individual Interdisciplinary PhD student to an existing laboratory group, the additional level of effort may be offset by the presence of graduate students at the PhD level who provide leadership and serve as resources to help undergraduate students. It is also possible that the impact will be beneficial as the current model of completing all graduate paperwork and tasks for a graduate degree are completed in a 2-year span for MS students and will be completed in a 3-year span (post-MS) for PhD Students. Additionally, addition of PhD students as GTA's and potential undergraduate course instructors will elevate the quality of the undergraduate major of Health and Human Performance.

b. Identify <u>new</u> personnel that must be hired to support the proposed program. (Enter the costs of those personnel resources into the budget sheet.) What are the anticipated sources or plans to secure the needed qualified faculty and staff? *[150 words]*

One new NTT faculty instructor is requested (.5 FTE in Year 2, increasing to 1.0 FTE in Year 5) to support the undergraduate program and ensure adequate time and resources for the research active TT faculty to deliver the PhD program curriculum and supervise doctoral students. These positions will cover teaching of courses formerly taught by Dr. Dawn Tarabochia who will be adjusting her teaching load to supervise both masters and doctoral students, provide administrative support by coordinating clinical research collaborations, e.g. biomechanics and motor control collaborations with physical therapists in the community, serve as an internship liaison with area clinics, and provide support as a laboratory/GTA coordinator. **Two PhD level GTA lines are requested in Year 1, a total of 3 GTAs in Year 2, and 4 in Years 3-5**. It is anticipated that students will begin the program as GTA's and transition to GRA funded positions in their second or third years. These positions are requested as additions to the Department of Health and Human Development base budget. GTAs will instruct

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undergraduate labs that have been added to accommodate increased enrollment and program restructuring: KIN 320, KIN 322, KIN 325R, KIN 330, and NUTR 411.

11. Other resources.

    a. Are the available library and information resources adequate for the proposed program? If not, how will adequate resources be obtained? *[100 words]*

      Yes

    b. Do existing student services have the capacity to accommodate the proposed program? What are the implications of the new program on services for the rest of the student body? *[150 words]*

      Yes

12. Revenues and expenditures. Describe the implications of the new program on the financial situation of the institution. *[100 words]*

    a. Please complete the following table of budget projections using the corresponding information from the fiscal analysis form for the first three years of operation of the new program.

	Year 1	Year 2	Year 3
Revenues	$38,740	$97,135	$116,505
Expenses	$38,740	$97,135	$116,505
Net Income/Deficit (revenues-expenses)	$0	$0	$0

    b. Describe any expenses anticipated with the implementation of the new program. How will these expenses be met? *[200 words]*

        i. If funding is to come from the reallocation of existing state appropriated funds, please indicate the sources of the reallocation. What impact will the reallocation of funds in support of the program have on other programs? *[150 words]*

          N/A

        ii. If an increase in base funding is required to fund the program, indicate the amount of additional base funding and the fiscal year when the institution plans to include the base funding in the department's budget.

          Two GTA lines will be requested in Year 1 ($38,740), with the addition of 1 GTA in Year 2 ($58,111 total) and another in Year 3 ($77,481 total). A .5 FTE NTT will be requested in Year 2 ($39,024), increasing to 1.0 FTE in Year 5 ($79,049) (see fiscal form for additional details).

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    iii. If the funding is to come from one-time sources such as a donation, indicate the sources of other funding. What are the institution's plans for sustaining the program when that funding ends? *[150 words]*

      N/A

    iv. Describe the federal grant, other grant(s), special fee arrangements, or contract(s) that will be valid to fund the program. What does the institution propose to do with the program upon termination of those funds? *[150 words]*

13. Student fees. If the proposed program intends to impose new course, class, lab, or program fees, please list the type and amount of the fee.

    No new course, lab, or program fees proposed.

14. Complete the fiscal analysis form.

Completed by Megan Lasso on January 13, 2021.

Signature/Date

College or School Dean:	*Alison Harmon* 8596262C40F2420...	1/14/2021 | 8:40 AM MST
Chief Academic Officer:	*Robert Mokwa* 212A28411AC04BD...	1/14/2021 | 8:40 AM MST
Chief Executive Officer:	*[signature]* 7D6A4CE96C3F415...	1/14/2021 | 8:40 AM MST
Flagship Provost*:	*Robert Mokwa* 212A28411AC04BD...	1/14/2021 | 8:40 AM MST
Flagship President*:	*[signature]* 7D6A4CE96C3F415...	1/14/2021 | 8:40 AM MST

*Not applicable to the Community Colleges.

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Appendix A – Proposed New Curriculum

Admission Requirements:

Master of Science in one of the following areas: Exercise Science, Kinesiology, Biomechanics, Motor Control, Nutrition Science, or related disciplines

Application Requirements
1. Completed Graduate School Application
2. Curriculum Vita
3. Personal essay (2-3 typed, double-spaced pages) addressing: research interests and experiences, alignment with faculty interests and expertise, and professional goals
4. Three letters of recommendation, at least one from the candidate's master's committee
5. Academic transcripts from Bachelors and Masters degree coursework

Admissions Committee

Faculty in the Department of HHD serving as PhD committee chairs or committee members will collectively serve as the admissions committee to evaluate applications and admit students to the Exercise and Nutrition Sciences PhD program.

Program Requirements:
1. Completion of 60 credits, including 24-28 dissertation credits
2. Completion of comprehensive examination
3. Completion of dissertation
4. Completion of research portfolio including ≥ 3 manuscripts submitted to peer-reviewed journals, ≥ 1 submitted grant application, and ≥ 3 presentations at national or international conferences.

Sequence of Program Requirements

Year 1 – Fall – coursework (6 credits)

Year 1 – Spring – coursework (6 credits); program of study and committee selection

Year 1 – Summer – comprehensive examination preparation; research

Year 2 – Fall – coursework (0-3 credits); comprehensive examination; research

Year 2 – Spring – coursework (0-3 credits); research

Year 2 – Summer - research

Year 3 – Fall – research

Year 3 – Spring – research; dissertation defense

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Committee Requirements:

Doctoral committees will be made up of at least four PhD prepared individuals with appropriate expertise. At least three (a majority) committee member needs to be faculty in the department of Health and Human Development actively participating in the EXNS PhD program.

Comprehensive Examination:

The EXNS PhD program comprehensive exam will be conducted by the students committee, typically in the beginning of the third year of the program. Students will prepare a grant proposal based on one or more elements of his/her proposed dissertation research. The proposal will be prepared according to specifications of a potential funding source (NIH, NSF, USDA, or other comparable funding source). The proposal will be submitted to the committee a minimum of seven days prior to an oral exam. The oral exam will consist of questions relating to the proposal and to the relevant science pertaining to the EXNS program option of the student.

Dissertation Requirements:

Students in the EXNS PhD program will complete dissertations of the Manuscript Format Option of the Montana State University Graduate School, with a minimum of three completed manuscripts for which the candidate is first author. At least two of these manuscripts need to original research.

Exercise Nutrition, Metabolism, and Physiology Curriculum

	Credits
Credits in required courses offered by the department offering the program	42-46
Credits in required courses offered by other departments	12
Credits in institutional general education curriculum	0
Credits of free electives	2-6
Total credits required to complete the program	60

Courses offered by HHD   **42-46 Credits**

At least 3 of the following:
KIN 515 – Exercise Performance and Nutrition	3
KIN 545 – Graduate Exercise Physiology	3
NUTR 511 – Exercise Metabolism and Nutrition	3
NUTR 521 – Macronutrient Metabolism (new course)	3
NUTR 520 – Advanced Diet & Disease (new course, shared with Dietetics MS)	3
KIN 594 – Seminar	6

At least 1 of the following:
KIN 525 – Orthopedic Biomechanics (re-designed existing course)	3
KIN 5XX – Motor Control (new course)	3

KIN 690 – Dissertation	24-28

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Courses offered by other departments   **12 Credits**

At least 2 of the following:

STAT 511: Methods of Data Analysis I	3
STAT 512: Methods of Data Analysis II	3
STAT 425/525: Biostatistical Data Analysis	3
STAT 431: Nonparametric Statistics	3
STAT 437: Introduction to Applied Multivariate Analysis	3
STAT 439: Introduction to Categorical Data Analysis	3
STAT 441/541: Experimental Design (requires M 221)	3
STAT 448: Mixed Effects Models	3

At least 2 of the following:

BCH 521 – Mass Spectrometry	3
BCH 544 – Molecular Biology	3
BCH 543 – Proteins	3
BCH 546 – Metabolomics and Systems Biology	3
BIOB 524 – Ethical Practice of Science	3
BIOE 540 – Analysis of Ecological Communities	3
MB 505 – Host-Associated Microbiomes	3
MB 520 – Microbial Physiology	3
CHTH – 540 Principles of Epidemiology	3

Up to 21 credits from the above list at MSU or equivalent from another university earned for the MS will be considered for credit toward the PhD.

Biomechanics/Motor Control Curriculum
Option 1: Master's and PhD at MSU (5 years to complete PhD)

Existing MS in Exercise and Nutrition Sciences (2 years)

Courses offered by HHD	Credits
KIN 515 - Exercise Performance and Nutrition OR	3
KIN 511 Exercise Metabolism and Health	
KIN 525 - Orthopedic Biomechanics **(redesigned existing)	3
KIN 5XX – Motor Control ** (new course to be created)	3
KIN 545 – Graduate Exercise Physiology	3
HHD 512 – Research Methods	3
KIN 594 – Seminar – 1 credit but may be repeated each semester	4
KIN 590 – Thesis	10

Courses offered by other departments

STAT 511 – Methods of Data Analysis I	3

Electives

Elective	3

Total MS Program	**35**
Transfer to PhD	**18 - 21**

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CURRICULUM PROPOSAL FORM

PhD in Exercise and Nutrition Sciences (3 years)	**39 - 42 credits**
Required Core:	**24 – 34 credits**
KIN 594 – Seminar	6
KIN 690 – Dissertation	18 – 28
Coursework (program developed in consultation with Chair)	**5 – 18 credits**
Courses offered by MIE & HHD	
KIN 592 – Independent Study	3
EMECH/KIN 591A – Kinematics and Kinetics of Human Movement (new course)	3
EMECH/KIN 591B – Modeling and Simulation of Human Movement (new course)	3
EMECH/KIN 591C – Nonlinear Analysis of Human Movement (new, taught by EMECH)	3
Courses offered by other departments	
STAT 511: Methods of Data Analysis I	3
STAT 512: Methods of Data Analysis II	3
STAT 425/525: Biostatistical Data Analysis	3
STAT 431: Nonparametric Statistics	3
STAT 437: Introduction to Applied Multivariate Analysis	3
STAT 439: Introduction to Categorical Data Analysis	3
STAT 441/541: Experimental Design (requires M 221)	3
STAT 448: Mixed Effects Models	3

Total PhD	**60 credits**

Biomechanics/Motor Control Curriculum
Option 2: Master's done elsewhere, start directly into PhD (3 – 4 years depending on prior coursework)

Transfer 12 - 21 credits into PhD (exact courses to be transferred for credit determined by department)

PhD in Exercise and Nutrition Sciences (3 - 4 years)	**39 - 48 credits**
Required Core:	**24 – 34 credits**
KIN 594 – Seminar	6
KIN 690 – Dissertation	18 – 28
Coursework (program developed in consultation with Chair)	**5 – 24 credits**
Courses offered by HHD	
KIN 515 - Exercise Performance and Nutrition	3
KIN 511 Exercise Metabolism and Health	3
KIN 525 - Orthopedic Biomechanics **(re-designed existing course)	3
KIN 5XX – Motor Control ** (new course to be created)	3
KIN 545 – Graduate Exercise Physiology	3
Courses offered by MIE & HHD	
EMECH/KIN 591A – Kinematics and Kinetics of Human Movement (new course)	3
EMECH/KIN 591B – Modeling and Simulation of Human Movement (new course)	3
EMECH/KIN 591C – Nonlinear Analysis of Human Movement (new, taught by EMECH)	3
Courses offered by other departments	
STAT 511: Methods of Data Analysis I	3

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STAT 512: Methods of Data Analysis II	3
STAT 425/525: Biostatistical Data Analysis	3
STAT 431: Nonparametric Statistics	3
STAT 437: Introduction to Applied Multivariate Analysis	3
STAT 439: Introduction to Categorical Data Analysis	3
STAT 441/541: Experimental Design (requires M 221)	3
STAT 448: Mixed Effects Models	3

Total PhD   **60 credits**

Academic Degree Program Proposal - Fiscal Analysis Form

CAMPUS:	Bozeman
AWARD LEVEL:	Grad
PROGRAM NAME:	PhD Exercise and Nutrition Sciences
PROGRAM CODE:	

ENROLLMENT PROJECTIONS	FY2022	FY2023	FY2024	FY2025	FY2026
Headcount					
annual unduplicated headcount of students with declared major or minor within the program	4	6	8	8	10
Credit Hours					
annual avg. credits hours earned per student in program related curriculum	12	12	12	12	12
Student FTE					
Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24	2	3	4	4	5
Completions					
Annual number of program completers	0	0	2	4	6

REVENUE	FY2022	FY2023	FY2024	FY2025	FY2026
Tuition Revenue (net of waivers)	$6,857	$10,177	$13,570	$13,570	$20,354
Institutional Support	$31,884	$86,958	$102,935	$102,935	$135,175
Other Outside Funds (grants, gifts, etc.)					
Program Tuition/Fees					
Total Revenue	$38,740	$97,135	$116,505	$116,505	$155,529
Total Revenue per Student FTE	$19,370	$32,378	$29,126	$29,126	$31,106

EXPENDITURES		FY2022	FY2023	FY2024	FY2025	FY2026
Tenure Track Faculty	FTE	0.0	0.0	0.0	0.0	0.0
	Salary + Benefits	$0	$0	$0	$0	$0
Non-tenure Track Faculty *Includes Adjunct Instructors	FTE	0.0	0.5	0.5	0.5	1.0
	Salary + Benefits	$0	$39,024	$39,024	$39,024	$78,049
Graduate Teaching Assistants	FTE	2.0	3.0	4.0	4.0	4.0
	Salary + Benefits	$38,740	$58,111	$77,481	$77,481	$77,481
Staff	FTE					
	Salary + Benefits					
Total Faculty & Staff	FTE	2.0	3.5	4.5	4.5	5.0
	Salary + Benefits	$38,740	$97,135	$116,505	$116,505	$155,529

	FY2022	FY2023	FY2024	FY2025	FY2026
Operations (supplies, travel, rent, etc)	$0	$0	$0	$0	$0
Start-up Expenses (OTO)					
Total Expenses	$38,740	$97,135	$116,505	$116,505	$155,529

	FY2022	FY2023	FY2024	FY2025	FY2026
Student FTE to Faculty (TT + NTT) Ratio	#DIV/0!	6.0	8.0	8.0	5.0
Net Income/Deficit (Revenue - Expenses)	$0	$0	$0	$0	$0

The signature of the campus Chief Financial Officer signifies that he/she has reviewed and assessed the fiscal soundness of the proposal and provided his/her recommendations to the Chief Academic Officer as necessary.

[signature] 01/14/21

Campus Chief Financial Officer Signature

Chief Financial Officer Comments

The information above outlines the expenditures to run the program and indicates a need for institutional support. Institutional support has not yet been identified or approved. The college may need to reallocate funds internally to fund all, or a portion of, this program.

While NTT faculty won't be delivering this program, they will be utilized to replace TT undergraduate teaching so that appropriately trained tenure-track faculty can teach, mentor, and support the program. In addition to training and completing PhD students, this program will support faculty ability to compete for and successfully secure external grants. --This statement provided by Megan Lasso, MSU Buydget Director

My signature above represents that the information on this form is accurate based on the knowledge I have on the date it is signed. My signature does not represent any form of approval for this program, including approval for institutional funding.

Montana University System
INTENT TO PLAN FORM

Program/Center/Institute Title: **PhD in Exercise and Nutrition Sciences**

Campus, School/Department: **MSU-Bozeman, EHHD/HHD**

Expected Submission Date: **October 2018**

Contact Name/Info: **Mary Miles and James Becker - mmiles@montana.edu; james.becker4@montana.edu**

To increase communication, collaboration, and problem-solving opportunities throughout the MUS in the program/center/institute development process, please complete this form not more than 18 months in advance of the anticipated date of submission of the proposed program/center/institute to the Board of Regents for approval. The completed form should not be more than 2-3 pages. For more information regarding the Intent to Plan process, please visit http://mus.edu/che/arsa/academicproposals.asp.

1) Provide a description of the program/center/institute.

The PhD in Exercise and Nutrition Sciences will provide training for careers focused on research and or teaching based on the STEM foundations of the exercise and nutritional sciences. This program will build on the existing Master of Science program in Exercise and Nutrition Sciences at MSU-Bozeman, or related MS degrees from other institution. The subdisciplines of exercise science that are particularly strong based on coursework and faculty expertise are exercise nutrition/metabolism, exercise physiology, and biomechanics. These subdisciplines are applied sciences built on the foundational sciences of biochemistry, cellular and molecular biology, anatomy, physiology, physics, and mathematics. The PhD in Exercise and Nutrition Sciences will require a minimum of 60 credits, including a minimum of 18-28 credits of dissertation and consideration of up to 21 non-research credits from the MS degree. Coursework for the PhD will be focused in research design and statistical analyses and one of the areas of exercise nutrition/metabolism, exercise physiology, or biomechanics. This program will be housed in the Department of Health and Human Development (HHD), and faculty contributing to the mentoring, coursework, and research training for this program will be from the Departments of HHD (Becker, Heil, McMilin, Miles, and Seifert), Mechanical & Industrial Engineering (Monfort), and other MSU departments as appropriate to the area of focus. Active inter-departmental research collaborations to support student research include the departments of HHD Biochemistry, Mechanical & Industrial Engineering, Microbiology & Immunology, and Animal & Range Sciences.

2) Describe the need for the program/center/institute. Specifically, how the program/center/institute meets current student and workforce demands. (Please cite sources).

Exercise and Nutrition Sciences is a growth area of demand at Montana State University. The undergraduate program in health and human performance currently has over 400 students. Approximately 25 students are enrolled at the masters' level. Demand exists in the state for a Ph.D. in Exercise and Nutrition Sciences and demand exists in the United States for hiring students with completed doctorates, especially in colleges and universities offering degrees in exercise science, kinesiology, exercise physiology, physical therapy, recreation therapy, personal training, ergonomics consulting, coaching, athletic training, sports administration, and in strength and conditioning. Students with Ph.D. degrees work at universities doing teaching and research, but also are active in research with private businesses developing products and

Montana University System
INTENT TO PLAN FORM

services related to human performance and physical well-being. Doctoral students at Montana State would receive training and experience in college teaching and would be active in research laboratories.

3) **Describe how the program/center/institute fits with the institutional mission, strategic plan, and existing institutional program array.**

In addition to advancing the research productivity of faculty and graduate students, the increase in PhD students in this STEM field supports the efforts of the institution to regain the Carnegie ranking as very high in research productivity. Faculty who will work with the doctoral students in this program are research active and the addition of doctoral students will augment the ability of these faculty to secure external funding and research publications. The PhD in Exercise and Nutrition Sciences aligns primarily with the learning and discovery component of the MSU strategic plan. Specifically, MSU Planning Council recommended focusing on five objectives for the strategic plan update in process, including:

- **"Discovery 1:** Elevate the research excellence and recognition of MSU faculty."

  We expect the addition of doctoral students to our research groups to elevate our research quality and productivity of current and future faculty members. Current faculty who will serve as PhD mentors and committee members are research and grant active, however, reliance on master's level students as graduate research assistants is a limitation with respect to the level of responsibility they can be given and their experience level both in the laboratory and for writing. Additionally, the added depth to our research capacity will enhance our ability to compete for external funding.

- **"Discovery 3:** Expand the scale, breadth, and quality of doctoral education."

  Addition of a PhD in Exercise and Nutrition Sciences will expand the scale of doctoral education; however, this particular PhD program will be valuable for the addition of breadth of doctoral education. There are no comparable PhD programs at MSU or in the state of Montana that are aimed at translational research to enhance human health and well-being. The vast majority of the research in Exercise and Nutrition Sciences currently being conducted at MSU is human-focused (as opposed to animal models).

- **"Stewardship 1:** Attract, develop and retain the best faculty and staff to achieve the MSU mission."

  Addition of a PhD program will enhance our ability to recruit and retain faculty members in the area of Exercise and Nutrition Sciences. There is a great deal of research funding available for research relating to prevention and treatment of disease and injury, health and wellness, aging, and other areas. Faculty who have trained at the doctoral and post-doctoral levels to engage in health sciences research are looking for opportunities that will support their research, and doctoral programs are an important aspect of that support.

4) **Describe how the program/center/institute overlaps, complements, or duplicates existing efforts in the MUS. Describe efforts that will be made to collaborate with similar programs at other institutions. If no efforts will be made, please explain why.**

Currently, the only program somewhat similar to the proposed Ph.D. is the Doctorate of Physical Therapy (DPT), which is offered at the University of Montana. The DPT is a clinical degree and not aligned with the research skills taught and

Montana University System
INTENT TO PLAN FORM

experienced within the Ph.D. There are students pursuing the Individual Interdisciplinary PhD (IIP) who have HHD faculty for the proposed program chairing and or co-chairing their committees, thus the proposed program would compliment this program. Unlike the IIP students, the Exercise and Nutrition Sciences PhD students will focus their studies within one area and the supporting sciences.

Signature/Date

College/School Dean: _____ 10/22/18

Chief Academic Officer: _R L Mohun_ 10-23-18

Chief Executive Officer: _Delgado_ October 23, 2018

Flagship Provost*: _R L Mohun_ 10-23-18

Flagship President*: _Delgado_ October 23, 2018

*Not applicable to the Community Colleges.

Date of Final Review:

When submitting the proposal to the BOR, include this signed form with the Level II request.

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

March 2021

ITEM XXX-2015-R0321

Master of Science in Cybersecurity

Institution: Montana State University -Bozeman   CIP Code: 43.0303

Program/Center/Institute Title: Master of Science in Cybersecurity

Includes (please specify below):   Face-to-face Offering: __X__   Online Offering: _____   Blended Offering: _____

Options: Two tracks (Infrastructure Track, and Control Systems Track)

Proposal Summary [360 words maximum]

What: An academic MS in Cybersecurity offered by the College of Engineering at MSU-Bozeman. The degree caters to students with a STEM background and provides a path to doctoral studies.

Why: The proposed MS in Cybersecurity degree meets critical State of Montana and nation-wide employment needs.

Resources: As described in the Curriculum Proposal Form

ATTACHMENTS

- Curriculum Proposal Form
- Fiscal Analysis Form
- Intent To Plan Form

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

____   **A. Level I:**

Campus Approvals

____   **1a. Placing a postsecondary educational program into moratorium** (Program Termination and Moratorium Form)

____   **1b. Withdrawing a postsecondary educational program from moratorium**

____   **2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less**

____   **3. Establishing a B.A.S./A.A./A.S. area of study**

Montana Board of Regents
ACADEMIC PROPOSAL REQUEST FORM

    4. **Offering an existing postsecondary educational program via distance or online delivery**

_____

OCHE Approvals

    5. **Re-titling an existing postsecondary educational program**

_____

    6. **Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)

_____

    7. **Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)

_____

    8. **Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)

_____

    9. **Revising a postsecondary educational program** (Curriculum Proposal Form)

_____

    10. **Establishing a temporary C.A.S. or A.A.S. degree program** _Approval limited to 2 years_

_____

_____ **B. Level II:**

X   1. **Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Request to Plan Form)

    2. **Permanent authorization for a temporary C.A.S. or A.A.S degree program** (Curriculum Proposal and Completed Request to Plan Form)

_____

    3. **Exceeding the 120-credit maximum for baccalaureate degrees** _Exception to policy 301.11_

_____

    4. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)

_____

    5. **Re-titling an academic, administrative, or research unit**

_____

Montana Board of Regents
CURRICULUM PROPOSAL FORM

1. **Overview of the request and resulting changes.** Provide a one-paragraph description of the proposed program. Will this program be related or tied to other programs on campus? Describe any changes to existing program(s) that this program will replace or modify. *[100 words]*

   The MS in Cybersecurity requires 30 post-baccalaureate credits and is designed for students who have earned a baccalaureate degree in Computer Science (CS) or a related program. The degree caters to students with a STEM background and provides a path to doctoral studies. This program allows BS students to take cybersecurity courses as part of their electives while reserving up to 12 credits as they transition into an MS program through our accelerated BS/MS option. Students in a BS or MS could supplement their studies by taking additional/optional courses from MSU's Gallatin College that provide specific cybersecurity certifications.

2. **Relation to institutional strategic goals.** Describe the nature and purpose of the new program in the context of the institution's mission and core themes. *[200 words]*

   This proposal aligns with Montana State University's "Choosing Promise" strategic plan, https://www.montana.edu/strategic plan. Specifically:

   Goal 1.2. Expanding high quality graduate education. The MS in Cybersecurity program will increase the number of graduate students while serving the state of Montana in an area of crucial need. The MS also supports this goal's aim to increase the number of research doctoral degrees (because students who earn the MS will be prepared to undertake a PhD) and the number of Master's degrees.

   Goal 2.1. Enhance the significance and impact of scholarship. The MS in Cybersecurity contributes directly to one of the four grand research challenges articulated in MSU's strategic plan, namely "Securing the future of Montana." The MS in Cybersecurity will also help with the aims of increasing expenditures by 25% by 2022 and increasing the creation/authorship of the number of scholarly products by 10% each year.

   Goal 3.2. Grow mutually beneficial partnerships across Montana. The MS in Cybersecurity will help develop a capable workforce that is able to meet local, state, regional and national needs. Students, industry, and academics from across Montana will benefit.

3. **Process leading to submission.** Briefly detail the planning, development, and approval process of the program at the institution. *[100 words]*

   This proposal has resulted from two years of planning, spearheaded by Dr. Clem Izurieta, a Computer Science professor, and Dr. Brock LaMeres, an Electrical & Computer Engineering professor.   A sampling of stakeholders that have provided feedback include: (1) the Idaho National Laboratories, (2) Will Peteroy, founder of Gigamon IT security company, (3) information that Dr. Izurieta learned by participating in cybersecurity education conferences, (4) faculty from MSU's Department of Electrical and Computer Engineering, (5) faculty from MSU's Gianforte School of Computing, (6) MSU's computer science industry advisory board and (6) numerous MSU administrators that include Provost Mokwa, VPREDGE Carter, Dean Ogilvie and Dean Gunnink.

4. **Program description.** Please include a complete listing of the proposed new curriculum in Appendix A of this document.

   See Appendix A.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

a. List the program requirements using the following table.

	Credits
Credits in required courses offered by the department offering the program	30 – Track I (Inf) 18 – Track 2 (ICS)
Credits in required courses offered by other departments	12 – Track 2
Credits in institutional general education curriculum	0
Credits of free electives	0
Total credits required to complete the program	30

b. List the program learning outcomes for the proposed program. Use learner-centered statements that indicate what students will know, be able to do, and/or value or appreciate as a result of completing the program.

Upon completion of the degree, students will be able to

1. Demonstrate knowledge of major cybersecurity concepts and theoretical perspectives appropriate to the student's track.
2. Utilize current tools of the trade to analyze and interpret complex problems.
3. Incorporate ethical principles into cybersecurity solutions.
4. Communicate cybersecurity issues, analyses, and solutions to both specialists and non-specialists via effective technical writing, presentations and data visualizations.
5. Formulate and execute a research plan.

5. **Need for the program.** To what specific student, regional, and statewide needs is the institution responding to with the proposed program? How will the proposed program meet those needs? Consider workforce, student, economic, societal, and transfer needs in your response as appropriate. *[250 words]*

The proposed MS in Cybersecurity degree meets critical employment and institutional needs.

1. Employment. The advancement of cyber adversaries has led to increased frequency and complexity of cyberattacks on everything from U.S. military systems to the U.S. voting infrastructure. By 2021, it's expected that 3.5 million cybersecurity positions will be unfilled [1] and there will be a great need to more fully automate cybersecurity. According to the Bureau of Labor Statistics, the median annual wage of cybersecurity analysts is $98,350 [6]. The creation of this new MS degree will help meet Montana's workforce demand for cybersecurity expertise.

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The State of Montana, as well as companies such as Hoplite [5], find that a pipeline of qualified cybersecurity workers is not readily available. To support economic development, more qualified workers are needed. The proposed program will generate both scientists and engineers with the necessary skills to address Montana's and the nation's future cybersecurity needs.

2. Student recruitment and retention. For several years, graduate and undergraduate students have expressed interest in more opportunities to learn about cybersecurity. The Gianforte School of Computing has responded by recruiting a tenure track professor who specializes in cybersecurity, by including modules that address cybersecurity aspects in software engineering classes, by commencing relationships with the Idaho National Laboratories, by seeking Department of Homeland Security funding, and by obtaining a National Science Foundation REU grant with a cybersecurity theme. The new courses and opportunities that an MS in Cybersecurity would provide, will allow us to more effectively recruit and retain students who wish to gain expertise in this high demand area.

3. MSU research enterprise support. Montana State University is one of a select few universities that have obtained a Carnegie R1 research ranking. To maintain this ranking, it is imperative to offer relevant programs that can support the MSU research mission. Such recognition helps attract bright Montana students, as well as top faculty teachers and researchers.

As one example, MSU's Advanced Research Laboratory (ARL) has booked more than $20 million dollars from private industry, the Department of Homeland Security and the Department of Defense since 2018. A significant portion of these funds were appropriated to pursue research in developing cybersecurity solutions that will be conducted by faculty in the School of Computing and the Department of Electrical & Computer Engineering. To better support the ARL, a greater number of students and faculty with cybersecurity expertise is needed.

6. **Similar programs.** Use the table below to identify and describe the relationship between any similar programs within the Montana University System.

Institution Name	Degree	Program Title
Gallatin College	Associate of Applied Science (ASS)	Associate of Applied Science in Cybersecurity Information Assurance
Great Falls College	Associate of Applied Science (ASS)	Associate of Applied Science in Cybersecurity
Missoula College	Associate of Applied Science (ASS)	Associate of Applied Science in Cybersecurity
University of Montana (with Missoula College and Excelsior)	Certificate of Technical Skills	Certificate of Technical Studies in Cybersecurity

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a. If the proposed program substantially duplicates another program offered in the Montana University System, provide a rationale as to why any resulting duplication is a net benefit to the state and its citizens. *[200 words]*

   The proposed MS in Cybersecurity is not duplicated by other programs in the MUS.

b. Describe any efforts that were made to collaborate with similar programs at other institutions. If no efforts were made, please explain why. *[200 words]*

   There are no similar programs at other institutions. The MS in Cybersecurity will serve students with a strong background in computer science, engineering or other STEM fields. It is a rigorous academic program and students are expected to have a BS or equivalent degree to participate. Current AAS degrees offered by various colleges in Montana address vocational skills and focus on hands-on and certification skills. Students in the MS degree can optionally choose to take courses from Gallatin College (or others) to address certification needs. Collaboration across these programs is not possible because the programs focus on different level of students pursuing different career paths.

7. **Implementation of the program.** When will the program be first offered? If implementation will occur in phases, please describe the phased implementation plans. *[100 words]*

Before this program can be launched, the following milestones must be reached:

Facilities Milestone

- Space for a lab that is isolated from the internet must be identified
- Funds to furnish the space must be procured
- Funds for recurring expenses must be identified

Faculty Milestone

- A tenure-track faculty member with cybersecurity expertise is hired. Note: Two tenure-track faculty are departing the School of Computing after Academic Year 2019-2020. We plan to use the vacancy savings to search for a faculty member with cybersecurity expertise.
- A non-tenure track faculty member with cybersecurity experience is hired. This position must be authorized by the university and is a growth line to teach and help develop the seven new courses that the MS in Cybersecurity requires.

Course Milestone

- We must develop and gain approval for seven new courses. Some of these courses will be developed and taught by the replacement tenure-track faculty member and/or the new non-tenure track faculty member.

Based on the COVID-19 situation, it might be Fall 2022 or later before we are able to launch the program.

a. Complete the following table indicating the projected enrollments in and graduates from the proposed program.

Fall Headcount Enrollment	Graduates

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CURRICULUM PROPOSAL FORM

AY_23	AY_24	AY_25	AY_26	AY_27	AY_23	AY_24	AY_25	AY_26	AY_27
10	20	20	20	20	0	9	9	9	9

b. Describe the methodology and sources for determining the enrollment and graduation projections above. *[200 words]*

Sites such as Cyberseek [7] describe the demand for cyber positions in the state of Montana, with the latest statistics showing more than 800 openings. We anticipate that the MS in Cybersecurity program will attract 10 new students each year and that 9 of those 10 students will graduate.

There is a growing need in Montana for personnel with cybersecurity expertise. As one example, MSU's Advanced Research Laboratory (ARL) has booked more than $20 million dollars from private industry, the Department of Homeland Security and the Department of Defense since 2018. Like many other companies across the state of Montana such as Hoplite [5], the ARL finds itself in a position where a pipeline of qualifed workers is not available, nor are there enough graduate students with a cybersecurity background to support the numerous research opportunities.

c. What is the initial capacity for the program?

20 students.

8. **Program assessment.** How will success of the program be determined? What action would result if this definition of success is not met? *[150 words]*

The success of the MS in Cybersecurity will be assessed as follows:

1. Student Enrollment. The program should enroll 15 or more students by its third year.
2. Student Graduation. At least 80% of the students who start the program, finish it.
3. Student Post-Graduation Success. At least 90% of the graduates gain relevant employment or continue their studies.

If the program is deemed unsuccessful by its offering departments, as well as MSU administrators, it would be discontinued.

a. Describe the assessment process that will be used to evaluate how well students are achieving the intended learning outcomes of the program. When will assessment activities occur and at what frequency? *[150 words]*

Final projects and exams will require students to demonstrate relevant program outcomes. Every two years, the relevant portions of these final projects and exams that were taken by students in their second year of the program, will be assessed by a cohort of faculty. Because most students will finish the program in two years, focusing on second year students give us better insight into how well the program outcomes for this courses-only M.S. degree are being met.

b. What direct and indirect measures will be used to assess student learning? *[100 words]*

Direct measurements will include student performance on exams, projects, papers and presentations.

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Indirect measurements will include course feedback and student surveys.

c. How will you ensure that the assessment findings will be used to ensure the quality of the program? *[100 words]*

The results of the assessment process will be shared with faculty and with our advisory board to develop improvements that will then be incorporated into the program. In addition to our stated program learning outcomes, we plan to maintain compliance with the NICE framework (a security framework) and CAE-CD accreditation requirements.

d. Where appropriate, describe applicable specialized accreditation and explain why you do or do not plan to seek accreditation. *[100 words]*

We plan to align our curriculum with CAE-CD accreditation requirements. These Department of Homeland Security (DHS), Center of Academic Excellence Cyber Defense (CAE-CD) requirements are available at https://www.nsa.gov/resources/students-educators/centers-academic-excellence/

9. **Physical resources.**

a. Describe the <u>existing</u> facilities, equipment, space, laboratory instruments, computer(s), or other physical equipment available to support the successful implementation of the program. What will be the impact on existing programs of increased use of physical resources by the proposed program? How will the increased use be accommodated? *[200 words]*

Except for the isolated laboratory facility (described below), existing computer labs, classroom space and offices within the Gianforte School of Computing and the Norm Asbjornson College of Engineering can absorb an additional 20 graduate students.

b. List <u>needed</u> facilities, equipment, space, laboratory instruments, etc., that must be obtained to support the proposed program. (Enter the costs of those physical resources into the budget sheet.) How will the need for these additional resources be met? *[150 words]*

Our cybersecurity program will require an isolated laboratory facility that can seat 20 students and enable experimentation with malware for analysis purposes. Although there are options, the most effective solutions are commercial ones that offer a fully functional cyber range. The adoption of a cyber range requires staff to oversee the daily administration of the isolated network and to provision its servers for relevant courses.

Space for the isolated laboratory facility will most likely be identified within existing NACOE space. The source of funds to equip the room initially and to operate it on an ongoing basis have yet to be identified. Possibilities include philanthropic support, grants, IDC returns, Congressional appropriations, the ARL, etc.

10. **Personnel resources.**

a. Describe the <u>existing</u> instructional, support, and administrative resources available to support the successful implementation of the program. What will be the impact on existing programs of increased use of existing personnel resources by the proposed program? How will quality and productivity of existing programs be maintained? *[200 words]*

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The program will primarily be supported by faculty and staff from the Gianforte School of Computing and Department of Electrical and Computer Engineering. Although the new program requires the development and modification of several courses, many of these courses will serve not only MS in Cybersecurity students, but also undergraduate students who can take the new 400-level courses. Absorbing 20 students into these two departments that already collectively serve around 900 students is straight forward, provided that the new personnel described below are hired.

b. Identify <u>new</u> personnel that must be hired to support the proposed program. (Enter the costs of those personnel resources into the budget sheet.) What are the anticipated sources or plans to secure the needed qualified faculty and staff? *[150 words]*

1. A tenure track faculty member with cybersecurity expertise. Existing faculty resources within the School of Computing will be redirected via vacancy savings to fill this position.
2. A non-tenure track faculty member with cybersecurity experience. This will be funded by MSU from M.S. in Cybersecurity enrollment revenues.
3. A 0.5 GTA in year one and a 1.0 GTA in year two and beyond. This will be funded by MSU from M.S. in Cybersecurity enrollment revenues.

11. Other resources.

a. Are the available library and information resources adequate for the proposed program? If not, how will adequate resources be obtained? *[100 words]*

The current library and information resources are adequate.

b. Do existing student services have the capacity to accommodate the proposed program? What are the implications of the new program on services for the rest of the student body? *[150 words]*

Yes.

12. Revenues and expenditures. Describe the implications of the new program on the financial situation of the institution. *[100 words]*

The development of a cybersecurity program in the State of Montana requires the commitment of resources in order to achieve a high-quality experience for students. Specifically, we will need to invest in new faculty and physical resources. Space for the new laboratory can be accommodated in the new engineering building. Finally, the licensing of software will require that we secure approximately $50,000 on a yearly basis for licensing fees. We expect that tuition and program fees will generate approximately $30,000 per year.

a. Please complete the following table of budget projections using the corresponding information from the fiscal analysis form for the first three years of operation of the new program.

	Year 1	Year 2	Year 3
Revenues	$261,863	$345,882	$345,882
Expenses	$261,864	$221,897	$221,897
Net Income/Deficit (revenues-expenses)	-$1	$123,985	$123,985

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b. Describe any expenses anticipated with the implementation of the new program. How will these expenses be met? *[200 words]*

The implementation of the new program will require some startup funds and ongoing support to equip the new laboratory with furniture and workstations as well as funding to license the cybersecurity software. The source of funds has yet to be identified. Possibilities include philanthropic support, grants, IDC returns, Congressional appropriations, the ARL, etc.

i. If funding is to come from the reallocation of existing state appropriated funds, please indicate the sources of the reallocation. What impact will the reallocation of funds in support of the program have on other programs? *[150 words]*

N/A.

ii. If an increase in base funding is required to fund the program, indicate the amount of additional base funding and the fiscal year when the institution plans to include the base funding in the department's budget.

Here is one possible timeline for the program:

- AY 2020-2021: Search and hire the NTT faculty member with cybersecurity expertise. No funds are needed.
- AY 2021-2022: Develop and modify courses for the program. $101,831 is needed to employ the NTT faculty member during Fiscal Year 2022.
- AY 2022-2023: Launch the program. $111,864 is needed to employ the NTT faculty member and to provide GTA support during Fiscal Year 2023.
- AY 2023-2024 and beyond: Sustain the program with full student numbers. $121,897 is needed to employ the NTT faculty member and to provide GTA support.

iii. If the funding is to come from one-time sources such as a donation, indicate the sources of other funding. What are the institution's plans for sustaining the program when that funding ends? *[150 words]*

Many possible sources of funds exist to provide support for an expanded cybersecurity curriculum on an ongoing basis. Possibilities include philanthropic support, grants, IDC returns, Congressional appropriations, the ARL, etc. On the fiscal analysis sheet, we have indicated that we will be able to identify at least $50,000 per year from one-time sources.

iv. Describe the federal grant, other grant(s), special fee arrangements, or contract(s) that will be valid to fund the program. What does the institution propose to do with the program upon termination of those funds? *[150 words]*

Negotiations are in progress regarding a Statement of Work with the Department of Homeland Security to support research in collaboration with MSU's Advanced Research Laboratory. A portion of these funds will be used to cover annual costs for this program. This is expected to be an ongoing collaboration with a duration of 5 years or more.

13. **Student fees.** If the proposed program intends to impose new course, class, lab, or program fees, please list the type and amount of the fee.

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Because of the high demand for cybersecurity expertise, the M.S. in Cybersecurity program can be supported by a program fee of $3,000 per academic year. The fee will be used to help cover the ongoing expenses associated with the isolated laboratory facility.

14. Complete the fiscal analysis form.

Attached.

Signature/Date		12/15/2020 | 4:50 PM MST
College or School Dean:	*Brett Gunnink* — 4D3351D90E3C4F2…	
Chief Academic Officer:	*Robert Mokwa* — 212A28411AC04BD…	12/15/2020 | 4:50 PM MST
Chief Executive Officer:	— 7D6A4CE96C3F415…	12/15/2020 | 4:50 PM MST
Flagship Provost*:	*Robert Mokwa* — 212A28411AC04BD…	12/15/2020 | 4:50 PM MST
Flagship President*:	— 7D6A4CE96C3F415…	12/15/2020 | 4:50 PM MST

*Not applicable to the Community Colleges.

Appendix A – Proposed New Curriculum

MS in Cybersecurity Program Requirements - Infrastructure Track - 30 credits

Note: To enter the program, a student will need to have earned a computer science or closely related bachelor's degree and have the equivalent knowledge of MSU's CSCI 112 (Programming in C), CSCI 466 (Networks) and CSCI 460 (Operating Systems) courses.

Required Courses (that MSU currently offers)

- CSCI 476, Computer Security, 3 credits
- CSCI 532, Algorithms, 3 credits
- CSCI 538, Computability, 3 credits
- CSCI 566, Advanced Networking, 3 credits (must be modified to include cyber modules)

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Required Courses (that must be developed)

- CSCI 576, Advanced Computer Security, 3 credits (Dr. Travis Peters will develop)
- CSCI 4xx/5xx, Systems Security, 3 credits (includes applied or math-based cryptography)
- CSCI 4xx/5xx, Defensive Security, 3 credits (includes Cyber Defense, IA fundamentals, monitoring, event analysis, risk assessment)
- CSCI 4xx/5xx, Software Engineering Cyber Systems, 3 credits (includes reverse engineering, static analysis, vulnerabilities, weaknesses, SecDevOps)
- CSCI 4xx/5xx, Penetration Testing, 3 credits
- CSCI 4xx/5xx, Malicious Code Analysis, 3 credits (prerequisites include operating systems, assembly, portable executable files and requires a lab that is isolated from the internet)

MS in Cybersecurity Program Requirements - Control Systems Track - 30 credits

Note: To enter the program, a student will need to have earned a computer engineering, electrical engineering or closely related bachelor's degree and have the equivalent knowledge of MSU's CSCI 112 (Programming in C), CSCI 466 (Networks), CSCI 460 (Operating Systems) courses, as well as background in control systems.

Required Courses (that MSU currently offers)

- CSCI 476, Computer Security, 3 credits
- CSCI 532, Algorithms, 3 credits
- CSCI 538, Computability, 3 credits
- CSCI 566, Advanced Networking, 3 credits (must be modified to include cyber modules)
- EELE 467, SoC FPGAs I: Hardware-Software Codesign, 3 credits (must be modified to include cyber modules related to ICS)
- EELE 468, SoC FPGAs II: Application Specific Computing, 3 credits (must be modified to include cyber modules related to ICS)
- EELE 528, Advanced Controls and Signals, 3 credits

Required Courses (that must be developed)

- CSCI 576, Advanced Computer Security, 3 credits (Dr. Travis Peters will develop)
- CSCI 4xx/5xx, Systems Security, 3 credits (includes applied or math-based cryptography)
- EELE 4xx/5xx, Embedded Cybersecurity, 3 credits

Academic Degree Program Proposal - Fiscal Analysis Form

CAMPUS:	Bozeman
AWARD LEVEL:	Grad
PROGRAM NAME:	MS in Cybersecurity
PROGRAM CODE:	

	FY2023	FY2024	FY2025	FY2026	FY2027
ENROLLMENT PROJECTIONS					
Headcount					
annual unduplicated headcount of students with declared major or minor within the program	10	20	20	20	20
Credit Hours					
annual avg. credits hours earned per student in program related curriculum	15	15	15	15	15
Student FTE					
Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24	6.25	12.5	12.5	12.5	12.5
Completions					
Annual number of program completers	0	9	9	9	9
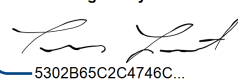
REVENUE					
Tuition Revenue (net of waivers)	$117,941	$235,882	$235,882	$235,882	$235,882
Institutional Support	$63,922				
Other Outside Funds (grants, gifts, etc.)	$50,000	$50,000	$50,000	$50,000	$50,000
Program Tuition/Fees	$30,000	$60,000	$60,000	$60,000	$60,000
Total Revenue	**$261,863**	**$345,882**	**$345,882**	**$345,882**	**$345,882**
Total Revenue per Student FTE	**$41,898**	**$27,671**	**$27,671**	**$27,671**	**$27,671**

EXPENDITURES						
Tenure Track Faculty	FTE					
	Salary + Benefits					
Non-tenure Track Faculty	FTE	1.0	1.0	1.0	1.0	1.0
*Includes Adjunct Instructors	Salary + Benefits	$101,831	$101,831	$101,831	$101,831	$101,831
Graduate Teaching Assistants	FTE	0.5	1.0	1.0	1.0	1.0
	Salary + Benefits	$10,033	$20,066	$20,066	$20,066	$20,066
Staff	FTE					
	Salary + Benefits					
Total Faculty & Staff	FTE					
	Salary + Benefits	**$111,864**	**$121,897**	**$121,897**	**$121,897**	**$121,897**

	FY2023	FY2024	FY2025	FY2026	FY2027
Operations (supplies, travel, rent, etc)	$100,000	$100,000	$100,000	$100,000	$100,000
Start-up Expenses (OTO)	$50,000				
Total Expenses	**$261,864**	**$221,897**	**$221,897**	**$221,897**	**$221,897**

	FY2023	FY2024	FY2025	FY2026	FY2027
Student FTE to Faculty (TT + NTT) Ratio	6.3	12.5	12.5	12.5	12.5
Net Income/Deficit (Revenue - Expenses)	$0	$123,986	$123,986	$123,986	$123,986

The signature of the campus Chief Financial Officer signifies that he/she has reviewed and assessed the fiscal soundness of the proposal and provided his/her recommendations to the Chief Academic Officer as necessary.

DocuSigned by:

5302B65C2C4746C...

Campus Chief Financial Officer Signature

Chief Financial Officer Comments

Montana University System
INTENT TO PLAN FORM

Program/Center/Institute Title: **Request for Authorization to establish a new Master of Science in Cybersecurity**

Campus, School/Department: **Gianforte School of Computing, Montana State University, Bozeman**

Expected Submission Date: **Spring 2020**

Contact Name/Info: **Dr. Clemente Izurieta,** clemente.izurieta@montana.edu **, Dr. Brock LaMeres,** lameres@montana.edu

To increase communication, collaboration, and problem-solving opportunities throughout the MUS in the program/center/institute development process, please complete this form not more than 18 months in advance of the anticipated date of submission of the proposed program/center/institute to the Board of Regents for approval. The completed form should not be more than 2-3 pages. For more information regarding the Intent to Plan process, please visit http://mus.edu/che/arsa/academicproposals.asp.

1) **Provide a description of the program/center/institute.**

   This Intent to Plan provides information regarding a proposal to establish a Master of Science degree in Cybersecurity. The proposed program would be housed under the Gianforte School of Computing in the Norm Asbjornson College of Engineering (NACOE). This proposal would create an academic program that caters to students with a Bachelor of Science background in computer science, computer engineering and possibly other STEM backgrounds.

MSU is proposing a MS (professional level) degree. To understand this proposal, first having the context surrounding bachelor's degrees in this area is helpful. Bachelor's degrees in cybersecurity are almost non-existent, and the ones offered tend to focus on enhancing vocational and operational skills, not foundational CS or engineering knowledge. Most undergraduate level cybersecurity programs tend to focus on operational/vocational skills and are offered though certificates. There are many cybersecurity programs offered at the MS (professional level) from schools like George Mason, NYU and Columbia. Such MS programs tend to focus on either management, policy, or the more IT related topics that complement a technical bachelor's degree. These programs are best described as professional and provide terminal degrees for *established business individuals*, many of whom may not have STEM backgrounds.

MSU's proposed degree caters to students with a STEM background and is not intended to be a terminal degree, but still provides a path to doctoral studies. We argue this is the best alternative to meet Montana's workforce needs in this area. It will be a rigorous academic program with options for certifications and options for further academic pursuit. The MS in cybersecurity would require students to take the same number of credits and fulfill the same requirements as a traditional MS in CS. This program would allow MSU BS students to take cybersecurity courses as part of their electives while reserving up to 12 credits during the BS as they transition into an MS program through our seamless BS/MS (4+1) option. Students in either a BS or MS could supplement their studies by taking additional courses from MSU's Gallatin College that provide specific cybersecurity certifications. Although certifications are not necessary in academic settings, they are a necessity in industry.

best alternative to create positive impact in workforce development in the state of Montana is to offer a

Montana University System
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2) **Describe the need for the program/center/institute. Specifically, how the program/center/institute meets current student and workforce demands. (Please cite sources).**

The advancement of cyber adversaries has led to increased frequency and complexity of cyber-attacks on everything from U.S. military systems to the U.S. voting infrastructure. By 2021 it's expected that 3.5 million cybersecurity positions will be unfilled [1] and there is great need to automate cybersecurity as completely as possible. According to the U.S. Bureau of Labor Statistics (BLS), the median annual wage of cybersecurity analysts is $98,350 [6]. The creation of this new MS degree will help meet workforce demand in the area of cybersecurity in the state of Montana.

The development of the Advanced Research Laboratory (ARL) at Montana State University has been successful at procuring significant funding from private industry, DHS and DoD. More than $20M has been booked since 2018. A significant portion of these funds were appropriated to pursue research in developing cybersecurity solutions in both the Gianforte School of Computing and the Department of Electrical & Computer Engineering at Montana State University. Coupled with local industry such as Hoplite [5], the Montana economy finds itself in a position where a pipeline of qualified workers is not readily available nor is there sufficient graduate students with the necessary background to conduct research in the area of cyber. To complement a lucrative field, the development of qualified workers is needed, and this program will not only generate qualified scientists, but also engineers with the necessary skills to address Montana's and the nation's future cybersecurity needs.

There exists a large amount of information on curricula development and various cybersecurity programs from certificates to the MS level. Our goal with this program is to provide a balance between vocational and academic skills that enable the development of a rigorous academic STEM program in cybersecurity while allowing students the opportunity to earn additional certifications through either MSU's Gallatin College or UM's Missoula College.

We propose to develop a program that serves the Montana workforce well. This entails alignment with certain standards in the field. These standards include:

- Alignment with the NICE framework [2]
- Meets certification criteria from the National Security Agency/Control Security Service (NSA/CSS) and Department of Homeland Security (DHS) –Center of Academic Excellence Cyber Defense (CAE-CD) [3]
- Alignment with curricula recommendations from ACM and IEEE [4].
- Allows students to sit for a subset of certification exams (CompTIA exams)

References
[1] DAU. Defense Acquisition University. Available: https://www.dau.mil
[2] NIST NICE framework. Available: https://www.nist.gov/
[3] Department of Homeland Security (DHS) –Center of Academic Excellence Cyber Defense (CAE-CD) Available: https://www.nsa.gov/resources/students-educators/centers-academic-excellence/
[4] Cybersecurity curricula. ACM, IEEE, AIS SIGSEC, IFIP. Joint Task Force on Cybersecurity Education. Available: https://www.csec2017.org/
[5] Hoplite Industries. Available: https://www/hopliteindustries.com
[6] Bureau of Labor Statistics. Available: https://www.bls.gov/ooh/computer-and-information-technology/information-security-analysts.htm

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3) **Describe how the program/center/institute fits with the institutional mission, strategic plan, and existing institutional program array.**

   This proposal is in alignment with Montana State University's "Choosing Promise" strategic plan (https://www.montana.edu/strategic plan). Specifically:

   i.   Goal 1.2. Expanding high quality graduate education. The MS in Cybersecurity program will increase the number of graduate students while serving the state of Montana in an area of crucial need. An MS in Cybersecurity supports Goal 1.2's aim to increase the number of research doctoral degrees from 66 to 90 and the number of Master's degrees from 566 to 650.

   ii. Goal 2.1. Enhance the significance and impact of scholarship. The MS is Cybersecurity contributes directly to one of the four grand research challenges articulated in the strategic plan, namely "Securing the future of Montana." The MS in Cybersecurity will also help with the aims of increasing expenditures by 25% by 2022 and increasing the creation/authorship of the number of scholarly products by 10% each year.

   iii. Goal 3.2. Grow mutually beneficial partnerships across Montana. The MS in Cybersecurity will help develop a capable workforce that is able to meet local, state, regional and national needs. Students, industry, and academics from all across Montana will benefit.

4) **Describe how the program/center/institute overlaps, complements, or duplicates existing efforts in the MUS. Describe efforts that will be made to collaborate with similar programs at other institutions. If no efforts will be made, please explain why.**

   The MS program described herein does not overlap nor duplicate any other program in the MUS system. Missoula College currently offers a certificate of technical skills in cybersecurity (CTS), the University of Montana, in collaboration with Missoula College, and Excelsior College offer a BS in Cybersecurity for students with an AAS degree, and Gallatin College will begin offering a certificate in the Bozeman campus. These programs would complement the proposed program by allowing our MS students to optionally obtain certifications. These other programs could also serve as a possible source of future students for the proposed MS in Cybersecurity program.

Signature/Date

College/School Dean: _____ 7/10/19

Chief Academic Officer _____ 7-10-19

Chief Executive Officer:

Flagship Provost* _____ 7-10-19

Flagship President* _____ July 16, 2019

*Not applicable to the Community Colleges.

Date of Final Review:

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When submitting the proposal to the BOR, include this signed form with the Level II request.

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

MARCH 2021

ITEM 2901-R0321

Request for permanent authorization of the A.A.S. degree in Cybersecurity

Institution: **Great Falls College Montana State University**   CIP Code: **11.0501**

Program/Center/Institute Title: **Cybersecurity A.A.S.**

Includes (please specify below):   Face-to-face Offering: _____   Online Offering: _____   Blended Offering: __X__

Options: _____

Proposal Summary [360 words maximum]

What: Great Falls College MSU requests permanent authorization for the Associate of Applied Science in Cybersecurity. The temporary A.A.S. was approved by the Office of the Commissioner of Higher Education on October 22, 2018, and the Montana Board of Regents was notified at the November 2018 meeting.

Why:

Cybercrime is rapidly increasing, and the demand for well-trained cybersecurity professionals is rising rapidly. The demand is only going to increase substantially in the next ten years, outpacing the available job force. The A.A.S. in Cybersecurity at Great Falls College MSU is providing a pathway for students to start a lifelong career within a field that will be in high demand. The degree focuses on techniques, policies and procedures which prepare students to defend and secure key components of a data centers network and of infrastructure critical assets. Current trends indicate that in 2022 there will be only one applicant for every 3 jobs available in this field.

Resources:

Courses are covered by full-time faculty and adjunct faculty. No new facilities or equipment are needed.

ATTACHMENTS

    Curriculum Proposal Form
    Fiscal Analysis Form
    Attachment #1 Intent to Plan (March 2018)

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

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ACADEMIC PROPOSAL REQUEST FORM

_____ **A. Level I:**

Campus Approvals

    1a. Placing a postsecondary educational program into moratorium (Program Termination and Moratorium Form)

    1b. Withdrawing a postsecondary educational program from moratorium

    2. Establishing, re-titling, terminating or revising a campus certificate of 29 credits or less

    3. Establishing a B.A.S./A.A./A.S. area of study

    4. Offering an existing postsecondary educational program via distance or online delivery

OCHE Approvals

    5. Re-titling an existing postsecondary educational program

    6. Terminating an existing postsecondary educational program (Program Termination and Moratorium Form)

    7. Consolidating existing postsecondary educational programs (Curriculum Proposal Form)

    8. Establishing a new minor where there is a major or an option in a major (Curriculum Proposal Form)

    9. Revising a postsecondary educational program (Curriculum Proposal Form)

    10. Establishing a temporary C.A.S. or A.A.S. degree program _Approval limited to 2 years_

_____ **B. Level II:**

    1. Establishing a new postsecondary educational program (Curriculum Proposal and Completed Request to Plan Form)

X   **2. Permanent authorization for a temporary C.A.S. or A.A.S degree program** (Curriculum Proposal and Completed Request to Plan Form)

    3. Exceeding the 120-credit maximum for baccalaureate degrees _Exception to policy 301.11_

    4. Forming, eliminating or consolidating an academic, administrative, or research unit (Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)

    5. Re-titling an academic, administrative, or research unit

Montana Board of Regents

CURRICULUM PROPOSAL FORM

1. **Overview of the request and resulting changes.** Provide a one-paragraph description of the proposed program. Will this program be related or tied to other programs on campus? Describe any changes to existing program(s) that this program will replace or modify. *[100 words]*

    Fall 2019 Great Falls College Montana State University began offering a Cybersecurity A.A.S. program under Level 1 temporary approval. This program focuses on techniques, policies and procedures to prepare students to defend and secure key components of a data centers network and infrastructure critical assets. The Cybersecurity program concentrates on network fundamentals, ethics, security and computer forensics along with a foundation for multiple industry certifications such as Security +, CCNA Cyber Ops, and MSCA/E.

    The Cybersecurity C.T.S. program was started Fall 2019. Our existing institutional programs of networking support formed a foundation for the cybersecurity components.

2. **Relation to institutional strategic goals.** Describe the nature and purpose of the new program in the context of the institution's mission and core themes. *[200 words]*

    Mission: Great Falls College MSU provides high quality educational experiences supporting student success and meeting the needs of our community.

    The A.A.S. in Cybersecurity program supports the mission by offering students a high quality educational experience learning how to successfully provide the support, administration, and maintenance necessary to ensure effective and efficient information technology (IT) system performance and security as systems technicians/systems analysts.

    Cybercrime is rapidly increasing, and the demand for well-trained cybersecurity professionals is only going to increase in the future, rapidly outpacing the available job force.

3. **Process leading to submission.** Briefly detail the planning, development, and approval process of the program at the institution. *[100 words]*

    The decision to create this offering resulted from discussions with current students, discussions with Computer Technology faculty, and the desire of the Computer Technology Advisory Board. Additionally, a nationwide initiative highlighted the need for, and lack of, qualified applicants to fill system analyst/computer analyst cybersecurity positions. This program was developed through collaboration with Missoula College and Gallatin College.

    The curriculum was approved by Great Falls College MSU's Curriculum Committee in September 2018. The program was established and approved by OCHE as a Level I in October 2018, and the Board of Regents was notified in November 2018.

4. **Program description.** Please include a complete listing of the proposed new curriculum in Appendix A of this document.

    The curriculum is included in Appendix A.

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CURRICULUM PROPOSAL FORM

a. List the program requirements using the following table.

	Credits
Credits in required courses offered by the department offering the program	52
Credits in required courses offered by other departments	
Credits in institutional general education curriculum	12
Credits of free electives	
Total credits required to complete the program	64

b. List the program learning outcomes for the proposed program. Use learner-centered statements that indicate what students will know, be able to do, and/or value or appreciate as a result of completing the program.

- Conceptualize, design, procure, and/or build secure information technology (IT) systems, with responsibility for aspects of system and/or network development.

- Provide the support, administration, and maintenance necessary to ensure effective and efficient information technology (IT) system performance and security.

- Provide leadership, management, direction, or development and advocacy so an organization may effectively conduct cybersecurity work.

- Identify, analyze, and mitigate threats to internal information technology (IT) systems and/or networks.

- Perform highly-specialized review and evaluation of incoming cybersecurity information to determine its usefulness for intelligence.

- Provide specialized denial and deception operations and collection of cybersecurity information that may be used to develop intelligence.

- Investigate cybersecurity events or crimes related to information technology (IT) systems, networks, and digital evidence.

  **Outcomes are based on the National Institute for Cybersecurity Education (NICE) Outcomes

5. **Need for the program.** To what specific student, regional, and statewide needs is the institution responding to with the proposed program? How will the proposed program meet those needs? Consider workforce, student, economic, societal, and transfer needs in your response as appropriate. *[250 words]*

Cybercrime is increasing at an incredibly fast pace, and the demand for well-trained cybersecurity professionals is rising rapidly. The demand is only going to increase substantially in the next ten years, outpacing the available job force. Employment in this field is projected to grow 31 percent from 2019 to 2029, faster than the average for all occupations. The need for workers to work remotely during the coronavirus pandemic is

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causing additional demand for cybersecurity professionals, who must ensure workers can work safely from home.

The A.A.S. in Cybersecurity program at Great Falls College MSU will provide a pathway for students to start a lifelong career within a field that will be in high demand, as the current trends indicate that in 2022 there will be only one applicant for every three available jobs. The program at Great Falls College MSU will prepare these degree-seeking students to meet that demand.

https://www.bls.gov/ooh/computer-and-information-technology/information-security-analysts.htm#tab-6

https://www.bls.gov/oes/current/oes151212.htm#st

https://www.cnbc.com/2020/09/05/cyber-security-workers-in-demand.html

6. **Similar programs.** Use the table below to identify and describe the relationship between any similar programs within the Montana University System.

Institution Name	Degree	Program Title
Missoula College UM	AAS	IT-Network Administration and Security option
		CTS in Cybersecurity
Gallatin College MSU	CTS	Cybersecurity Information Assurance
City College	Program of study	Cyber Security / Network Technology Associate of Science

a. If the proposed program substantially duplicates another program offered in the Montana University System, provide a rationale as to why any resulting duplication is a net benefit to the state and its citizens. *[200 words]*

Our program will strive to complement other cybersecurity programs throughout MUS, in which we will seek out articulation agreements, curriculum sharing, and statewide cyber competitions which will strengthen all similar MUS programs.

b. Describe any efforts that were made to collaborate with similar programs at other institutions. If no efforts were made, please explain why. *[200 words]*

Missoula College UM, Gallatin College MSU and Great Falls College MSU held a conference call on April 25, 2018, to plan for future collaboration among each of our IT programs to meet current needs in industry across the state, most notably in cybersecurity. Collaboration occurred with other computer technology program directors on curricula development, including rubric assessment to determine possible course changes including subject codes, course numbering, course titles, and learning outcomes. At the time, Clint Reading (Missoula College UM), Sarah Maki (Gallatin College MSU) and Leanne Frost (GFC MSU) led collaboration efforts. Such efforts have continued and are ongoing. This alignment creates opportunity for students to transfer and ensures computer technology and cybersecurity curricula reflect current industry needs across Montana.

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7. **Implementation of the program.** When will the program be first offered? If implementation will occur in phases, please describe the phased implementation plans. *[100 words]*

The program was first offered Fall of 2019 with Level 1 approval.

a. Complete the following table indicating the projected enrollments in and graduates from the proposed program.

Fall Headcount Enrollment					Graduates				
AY 20 - actual	AY 21	AY 22	AY 23	AY 24	AY 21	AY 22	AY 23	AY 24	AY 25
16 year-one students	28	28	28	28	12	12	12	12	12

b. Describe the methodology and sources for determining the enrollment and graduation projections above. *[200 words]*

A 75% retention rate was assumed. AY 20 numbers reflect actual enrollment.

c. What is the initial capacity for the program?

Initial capacity for the program is 30 students.

8. **Program assessment.** How will success of the program be determined? What action would result if this definition of success is not met? *[150 words]*

Program success will be measured by student enrollments, AAS degree completions and successful employment of graduates. If the program does not meet the intended goals, it will be reevaluated. In addition, the program will be evaluated by the college's existing internal program review process.

a. Describe the assessment process that will be used to evaluate how well students are achieving the intended learning outcomes of the program. When will assessment activities occur and at what frequency? *[150 words]*

Each program has a plan to assess program learning outcomes. The assessment plan includes curriculum mapping and course-level assessment rotations with the purpose of assessing program-level outcomes. See the link for the plan and schedule. Assessment Plans | Great Falls College MSU

b. What direct and indirect measures will be used to assess student learning? *[100 words]*

Student learning and skill assessments will be completed by faculty as part of the overall college assessment process. In general, assessment measures include projects, assignments, quizzes, exams, and labs.

c. How will you ensure that the assessment findings will be used to ensure the quality of the program? *[100 words]*

Feedback from instructors will provide input into program assessment. In addition, the program will be evaluated by the college's existing internal program review process and by the Computer Technology advisory board.

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d. Where appropriate, describe applicable specialized accreditation and explain why you do or do not plan to seek accreditation. *[100 words]*

Although no specialized accreditation is required, the college currently has been designated a Center of Academic Excellence by the Department of Homeland Security for its A.A.S. Network Support & Security degree. The college will be seeking the same designation for the A.A.S. Cybersecurity degree after the program has been in existence for three years.

9. **Physical resources.**

a. Describe the <u>existing</u> facilities, equipment, space, laboratory instruments, computer(s), or other physical equipment available to support the successful implementation of the program. What will be the impact on existing programs of increased use of physical resources by the proposed program? How will the increased use be accommodated? *[200 words]*

The college has adequate classroom space, computer labs, and virtual net labs to support the program. Current capacity exists to support additional use.

b. List <u>needed</u> facilities, equipment, space, laboratory instruments, etc., that must be obtained to support the proposed program. (Enter the costs of those physical resources into the budget sheet.) How will the need for these additional resources be met? *[150 words]*

There are no additional physical resources required.

10. **Personnel resources.**

a. Describe the <u>existing</u> instructional, support, and administrative resources available to support the successful implementation of the program. What will be the impact on existing programs of increased use of existing personnel resources by the proposed program? How will quality and productivity of existing programs be maintained? *[200 words]*

Instruction has been delivered by two full-time computer technology faculty who teach in existing programs as well as adjuncts. Current support and administrative resources are sufficient to support the successful implementation of the program.

The addition of the A.A.S. in Cybersecurity strengthens the existing computer technology programs by adding other courses related to cybersecurity that can be taken as electives.

b. Identify <u>new</u> personnel that must be hired to support the proposed program. (Enter the costs of those personnel resources into the budget sheet.) What are the anticipated sources or plans to secure the needed qualified faculty and staff? *[150 words]*

New courses were taught by adjunct faculty. Existing courses are shared with other IT programs; thus this program increases enrollments in existing courses.

The cost of instruction for new courses was offset by Perkins grant funds in AY20 and AY21. The cost is expected to be covered by tuition revenue in future years.

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11. Other resources.

a. Are the available library and information resources adequate for the proposed program? If not, how will adequate resources be obtained? *[100 words]*

Yes, existing resources are adequate for the proposed program.

b. Do existing student services have the capacity to accommodate the proposed program? What are the implications of the new program on services for the rest of the student body? *[150 words]*

Yes. No implications exist; we are in the second year of offering the program.

12. Revenues and expenditures. Describe the implications of the new program on the financial situation of the institution. *[100 words]*

Due to the use of existing courses and adjunct instructors, the proposed program has had a positive financial impact on the institution.

a. Please complete the following table of budget projections using the corresponding information from the fiscal analysis form for the first three years of operation of the new program.

	Year 1	Year 2	Year 3
Revenues	$68,778	$103,914	$90,684
Expenses	$25,700	$25,700	$25,700
Net Income/Deficit (revenues-expenses)	$43,078	$78,214	$64,984

b. Describe any expenses anticipated with the implementation of the new program. How will these expenses be met? *[200 words]*

Instruction for new courses will be taught by adjunct instructors. This cost will be offset by a Perkins grant for the first two years and then covered by tuition revenue.

i. If funding is to come from the reallocation of existing state appropriated funds, please indicate the sources of the reallocation. What impact will the reallocation of funds in support of the program have on other programs? *[150 words]*

There is no reallocation. The cost of instruction for new courses was offset by Perkins grant funds in AY20 and AY21. The cost is expected to be covered by tuition revenue in future years. Other programs have not been impacted.

ii. If an increase in base funding is required to fund the program, indicate the amount of additional base funding and the fiscal year when the institution plans to include the base funding in the department's budget.

There is no increase in base funding.

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    iii. If the funding is to come from one-time sources such as a donation, indicate the sources of other funding. What are the institution's plans for sustaining the program when that funding ends? *[150 words]*

    There are no one-time sources of funding.

    iv. Describe the federal grant, other grant(s), special fee arrangements, or contract(s) that will be valid to fund the program. What does the institution propose to do with the program upon termination of those funds? *[150 words]*

    The cost of instruction for new courses was offset by Perkins grant funds in AY 20 and AY 21. The cost is expected to be covered by tuition revenue in future years.

13. **Student fees.** If the proposed program intends to impose new course, class, lab, or program fees, please list the type and amount of the fee.

    None of the computer technology course fees or pass-through fees are specific to the cybersecurity program.

14. Complete the fiscal analysis form.

Signature/Date

College or School Dean:

Susan Wolff — 12/10/2020

Chief Academic Officer:

Susan Wolff — 12/10/2020

Chief Executive Officer:

Susan Wolff — 12/10/2020

Flagship Provost*:

Flagship President*:

*Not applicable to the Community Colleges.

Appendix A – Proposed New Curriculum

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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.

FIRST YEAR		
FALL		**CREDITS**
CSCI 100	Intro to Programming *,+	3
CSCI 105	Computer Fluency +	3
ITS 164	Networking Fundamentals +	3
M 121	College Algebra **,+	3
Choose one of the following:		
WRIT 101	College Writing I **,+	3
WRIT 121	Intro to Technical Writing **,+	3
	Credits	**15**
SPRING		
COMX 115	Intro to Interpersonal Communc +	3
ITS 210	Network OS - Desktop *,+	3
ITS 218	Network Security *,+	3
ITS 224	Introduction To Linux *,+	4
ITS 280	Computer Repair & Maintenance *,+	4
	Credits	**17**

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SECOND YEAR		
FALL		
ITS 215	Network OS -Dir /Infrastructre *,+	4
ITS 245	Exploring Computer Forensics +	3
ITS 271	Securing Desktop/Mobile Device *,+	4
ITS 275	Border/Perimeter Network Security *,+	4
	Credits	**15**
SPRING		
BGEN 220	Business Ethics and Social Responsibility +	3
ITS 222	Enterprise Security +	3
ITS 274	Ethical Hacking and Network Defense *,+	3
ITS 277	Software Assurance and File System Internals *,+	4
ITS 289	Professional Certification +	1
ITS 299	Capstone *,+	3
	Credits	**17**
	Total Credits	**64**

Plan of Study Grid

*   Indicates prerequisites needed.

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

*** Technical Electives must be approved by program director.

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

Academic Degree Program Proposal - Fiscal Analysis Form

CAMPUS:	GFC MSU
AWARD LEVEL:	UG
PROGRAM NAME:	Cybersecurity A.A.S.
PROGRAM CODE:	CYBA

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
ENROLLMENT PROJECTIONS					
Headcount	Actual	Projected	Projected	Projected	Projected
annual unduplicated headcount of students with declared major or minor within the program	16	28	28	28	28
Credit Hours					
annual avg. credits hours earned per student in program related curriculum	17.6	32	32	32	32
Student FTE					
Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24	9.4	30	30	30	30
Completions					
Annual number of program completers	N/A-first year students only	12	12	12	12

REVENUE	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Tuition Revenue (net of waivers)	$44,032	$77,056	$77,056	$77,056	$77,056
Institutional Support	$8,716	$8,728	$8,728	$8,728	$8,728
Other Outside Funds (grants, gifts, etc.)	$13,230	$13,230			
Program Tuition/Fees	$2,800	$4,900	$4,900	$4,900	$4,900
Total Revenue	**$68,778**	**$103,914**	**$90,684**	**$90,684**	**$90,684**
Total Revenue per Student FTE	**$7,327**	**$3,479**	**$3,036**	**$3,036**	**$3,036**

EXPENDITURES		FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Tenure Track Faculty	FTE	0.0	0.0	0.0	0.0	0.0
	Salary + Benefits					
Non-tenure Track Faculty *Includes Adjunct Instructors	FTE	1.0	1.0	1.0	1.0	1.0
	Salary + Benefits	$25,200	$25,200	$25,200	$25,200	$25,200
Graduate Teaching Assistants	FTE					
	Salary + Benefits					
Staff	FTE					
	Salary + Benefits					
Total Faculty & Staff	FTE	1.0	1.0	1.0	1.0	1.0
	Salary + Benefits	$25,200	$25,200	$25,200	$25,200	$25,200

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Operations (supplies, travel, rent, etc)	$500	$500	$500	$500	$500
Start-up Expenses (OTO)					
Total Expenses	**$25,700**	**$25,700**	**$25,700**	**$25,700**	**$25,700**

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Student FTE to Faculty (TT + NTT) Ratio	9.4	29.9	29.9	29.9	29.9
Net Income/Deficit (Revenue - Expenses)	**$43,078**	**$78,214**	**$64,984**	**$64,984**	**$64,984**

The signature of the campus Chief Financial Officer signifies that he/she has reviewed and assessed the fiscal soundness of the proposal and provided his/her recommendations to the Chief Academic Officer as necessary.

Carmen Roberts

Campus Chief Financial Officer Signature

Chief Financial Officer Comments

Although the actual numbers for the first year of the program show 9.4 FTE for 16 students, the curriculum is set up for students to take an average of 16 credits per semester.

Montana University System
INTENT TO PLAN FORM

Program/Center/Institute Title: **A.A.S. in Cyber Security**

Campus, School/Department: **Great Falls College MSU**   Expected Submission Date: **Sept 2018**

Contact Name/Info: **Dr. Leanne Frost, Director, General Studies Division**

To increase communication, collaboration, and problem solving opportunities throughout the MUS in the program/center/institute development process, please complete this form not more than 18 months in advance of the anticipated date of submission of the proposed program/center/institute to the Board of Regents for approval. The completed form should not be more than 2-3 pages. For more information regarding the Intent to Plan process, please visit http://mus.edu/che/arsa/preparingacademicproposals.asp.

1) **Provide a description of the program/center/institute.**

   Great Falls College MSU proposes an A.A.S. in Cyber Security program that will focus on techniques, policies and procedures which will prepare students to defend and secure key components of a data centers network and infrastructure critical assets. The Cyber Security program area of study will concentrate on network fundamentals, ethics, security and computer forensics along with a foundation for multiple industry certifications such as Security +, CCNA Cyber Ops, and MSCA/E to name a few.

2) **Describe the need for the program/center/institute. Specifically, how the program/center/institute meets current student and workforce demands. (Please cite sources).**

   Cybercrime is increasing an incredibly fast pace, and the demand for well-trained cyber security professionals is rising rapidly and is only going to increase substantially in next 5 years way out pacing the available job force. Introducing an A.A.S. in Cyber Security program at GFC MSU will provide a pathway for students to start a lifelong career within a field that will be in high demand, as the current trends indicate that in 2022 for every 3 jobs available in this field there will only be one applicant. The program at GFCMSU will prepare these degree-seeking students a means to meet that demand.

   https://www.bls.gov/ooh/computer-and-information-technology/information-security-analysts.htm#tab-6
   https://www.bls.gov/oes/current/oes151122.htm#st
   http://peninsulapress.com/2015/03/31/cybersecurity-jobs-growth/

3) **Describe how the program/center/institute fits with the institutional mission, strategic plan, and existing institutional program array.**

   The Mission of GFC MSU is to educate and inspire. This A.A.S. in Cyber Security program fits right into the mission as it will educate and inspire those students to be champions for Cyber Security in the defense of technology assets for their future employers. Our existing institutional programs of networking support already form a foundation for an expanded curriculum and degree program for which students already graduate and gain employment.

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4) **Describe how the program/center/institute overlaps, complements, or duplicates existing efforts in the MUS. Describe efforts that will be made to collaborate with similar programs at other institutions. If no efforts will be made, please explain why.**

1) Our program will strive to complement other Cyber programs throughout MUS, in which we will seek out articulation agreements, curriculum sharing, and statewide Cyber competitions to which will strengthen all similar MUS programs.

Signature/Date

College/School Dean: _Leanne Frost_ 3/12/18

Chief Academic Officer: _Heidi Pasek_ 3.12.18

Chief Executive Officer: _Susan Wolff_ 3/12/18

Flagship Provost*:

Flagship President*:

*Not applicable to the Community Colleges.

Date of Final Review:

When submitting the proposal to the BOR, include this signed form with the Level II request.