

## LEVEL II MEMORANDUM

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**DATE:** August 1, 2018

**TO:** Chief Academic Officers, Montana University System

**FROM:** Clayton Christian, Commissioner of Higher Education

**RE:** September Level II Proposals

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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 August 29th. Issues not resolved at that meeting should be submitted in writing to OCHE by noon on Friday, August 31st. If no concerns are received, OCHE will assume that the proposals have your approval.

### **Level II Items**

#### **Montana State University Billings:**

- Request for authorization to establish a M.S. in Adventure Leadership in Health and Recreation  
[Item #180-2721-R0918](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Intent to Plan](#)

#### **Montana State University Bozeman:**

- Request for authorization to establish a M.A in Teaching degree program  
[Item #180-2010-R0918](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Letters of Support](#) | [Intent to Plan](#)
- Request for authorization to establish an M.S. in Data Science  
[Item #180-2011-R0918](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Intent to Plan](#)
- Request for authorization to establish separately named PhD in Chemical Engineering  
[Item #180-2012-R0918](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Intent to Plan](#)

#### **The University of Montana Missoula:**

- Request for authorization to retitle Department of Communicative Sciences & Disorders to Speech, Language, and Hearing Sciences  
[Item #180-1001-R0918](#) | [Academic Proposal Request Form](#)
- Request for authorization to establish a B.S. in Computational Biochemistry  
[Item #180-1002-R0918](#) | [Academic Proposal Request Form](#) | [Curriculum Proposal Form](#) | [Intent to Plan](#)

September 12-13, 2018

ITEM 180-2721-R0918

**Request for authorization to establish a M.S. in Adventure Leadership in Health and Recreation**

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**THAT**

The College of Allied Health Professions at Montana State University Billings requests authorization to establish a Master of Science in Adventure Leadership in Health and Recreation.

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**EXPLANATION**

This program prepares leaders, educators, and administrators to plan, organize, lead, teach, and evaluate adventure-based wellness programs within commercial, governmental and non-profit sectors. This is accomplished through practical experiences within higher education, the outdoor adventure and recreation wellness/therapeutic industries. This is a multi-entry master's program with overall coursework focusing on contemporary issues in health, wellness and physical activity, advanced concepts in program development and implantation, and applied research/practicums in adventure-based health and wellness programs.

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**ATTACHMENTS**

ACADEMIC PROPOSAL REQUEST FORM  
CURRICULUM PROPOSAL FORM  
CURRICULUM PROPOSAL FORM Appendix A Proposed Curriculum  
CURRICULUM PROPOSAL FORM Appendix B Course Descriptions

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

ITEM **180-2721-R0918**

Submission Month or Meeting: **September 12-13, 2018**

Institution: **College of Allied Health  
Professions, Dept. of Health and  
Human Performance**

CIP Code: **31.999**

Program/Center/Institute Title: **Master of Science in Adventure Leadership in Health and Recreation**

Includes (please specify below): Online Offering  Options **1) Adventure Leadership, 2) Recreation Therapy**

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

**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*

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X **B. Level II:**

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

**Proposal Summary [360 words maximum]**

**What:** MSU Billings seeks authorization to establish this program that prepares leaders, educators, and administrators to plan, organize, lead, teach, and evaluate adventure-based wellness programs within commercial, governmental and non-profit sectors. This is a multi-entry master's program with overall coursework focusing on contemporary issues in health, wellness and physical activity, advanced concepts in program development and implantation, and applied research/practicums in adventure-based health and wellness programs.

**Why:** The B.S. in OAL prepares students for entry-level positions in the industry; however, it does not prepare graduates for positions as program coordinators or directors of operations. According to job search websites and professional association job list services, over 498 jobs for directors/assistant directors in the field required/preferred an M.S. degree. Twelve percent (12%) of the listed jobs were within the Northern Rocky Mountain and Pacific Northwest region.

**Resources:** One .5 FTE Clinical Faculty line (a Certified Therapeutic Recreation Specialist, CTRS), 12 credit hours part-time faculty, 6 summertime credit hours for fulltime faculty, and a \$925 program student fee per semester. Ten students will net \$58,000 per year.

**Relationship to similar MUS programs:** The University of Montana offers a M.S. in Parks, Tourism and Recreation Management (PTRM) within the College of Forestry and Conservation. According to their website one would choose that program if they "... are interested in studying topics like recreation and tourism management, social, political and economic aspects of conservation, or wilderness, parks and protected area studies." The proposed program and UM's program may somewhat overlap with regard to job placement. However, based on the number available we do not feel that the program would unduly competing with UM's program. The proposed program, housed in the College of Allied Health Professions, also prepares students for the wellness/therapy aspects, which UM's program does not. We see prospective students as having different interest, healthcare and education versus forestry and conservation. As such, we do not anticipate drawing from the same pool. For these reasons, this proposed program is not a substantial duplication of UM's program.

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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 proposed Master of Science in Adventure Leadership in Health and Recreation with Options in Recreation Therapy and Adventure Leadership will augment MSU Billings' current BS program in Outdoor Adventure Leadership (OAL) and 2+2 AS in Fire Science to a BS in OAL programs. This program prepares leaders, educators, administrators, and recreation therapist to plan, organize, lead, teach, and evaluate adventure recreation and therapeutic recreation within commercial, governmental and non-profit sectors. The proposed program will not replace any current program and modifications to the current MS in OAL are minor in that the proposed program will offer a 3+2 pathway.

- 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]*

Core Theme One – Cultivating teaching excellence

B: This program will broaden opportunities for faculty/student research through student theses and research projects.

D: Faculty/students will have opportunities to attend and present at professional conferences.

Core Theme Two – Providing an environment for learning

A: MS students will integrate into the BS OAL program as teaching and research assistants.

B: The program will draw undergraduate students interested in completing their BS and MS degrees at one institution and within a compressed timeframe.

C: This program is an opportunity for growth; 16 current Health and Human Performance students indicated a interest in applying to the program.

D: Expansion of the MSUB graduate program.

G: This program focuses heavily on experiential learning and inter-disciplinary approaches.

Core Theme Three – Promoting and engaging in civic responsibility

A: Similar programs in the region (e.g., South Dakota State's MS in Sport and Recreation) focus on municipal sports and recreation. The nearest MS program similar to the proposed Adventure Leadership option is at the University of Idaho and the University of Utah Recreation Therapy.

B & C: By offering this MS, it will position MSU-Billings as a local and regional leader in this emerging field.

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

The process was first driven, bottom-up, by student request for a for a Master's program that prepares them to be program directors within the adventure and recreation therapy industries.

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

This 46 credit Master of Science program in Adventure Leadership in Health and Recreation has two options, one in Adventure Leadership and one in Recreation Therapy. This will be a multi-entry master's program with traditional and a 3+2 pathways. The traditional entry will accepted qualified applicants who hold an appropriate bachelor's degree while the 3+2 pathway will accepted qualified MSUB applicants who are working toward their BS in Outdoor Adventure Leadership. Core coursework focusing on contemporary issues in adventure-based

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wellness and physical activity, advanced concepts in program development and implantation, and applied research/practicums. The Recreation Therapy option will focus on coursework and practicums that prepare students to pass the National Council for Therapeutic Recreation Certification and enter practice as a Certified Therapeutic Recreation Specialist. The Adventure Leadership option will focus on coursework and practicums that prepare students to be program coordinators and operations directors of adventure-based organizations. This will be a hybrid program with both face-to-face online courses.

- a. List the program requirements using the following table  
RT = Recreation Therapy Option, AL = Adventure Leadership Option

Traditional Entry	Credits RT	Credits AL
Credits in required courses offered by the department offering the program	34	41
Credits in required courses offered by other departments	12	5
Credits in institutional general education curriculum	0	0
Credits of free electives	0	0
<b>Total credits required to complete the program</b>	<b>46</b>	<b>46</b>
	Credits RT	Credits AL
3+2 Entry		
Credits in required courses offered by the department offering the program	89	114
Credits in required courses offered by other departments	43	15
Credits in institutional general education curriculum	31	31
Credits of free electives	0	0
<b>Total credits required to complete the program</b>	<b>163</b>	<b>160</b>

- 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.

MS in ALiHR

1. Students will demonstrate safe and effective leadership and planning consistent with professional standards, including risk management.
2. Students will meet or exceed minimal requirements for professional certifications.
3. Recreation Therapy option students will ascertain and demonstrate the required skills for all NCTRC recreation therapy competencies and clinical integration proficiencies.
4. Students will display critical thinking skills and formulate sound decisions in their field experiences.
5. Students will establish professional relationships with governmental and private adventure recreation organizations and/or relevant medical and allied health care providers.
6. Students will develop, design, and execute independent research projects or participated in an extended experiential/clinical internship.

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BS in OAL

1. Demonstrate safe and effective leadership in the skill areas encompassed in the program, consistent with professional standards, including risk management.
2. Plan, implement, and evaluate adventure experiences in areas encompassed in the program.
3. Determine and evaluate participant learning outcomes in outdoor adventure experiences.
4. Professionally communicate knowledge, demonstrate skills, and evaluate participant performance in adventure activities and programming.

- 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]*

According to the Outdoor Industry Association 87% of Montanans, participate in some form of outdoor recreation each year. According to the Bureau of Labor Statistics, there were 71,000 jobs in the recreation industry in Montana generating \$7.1 billion in annual spending resulting in \$2.2 billion in wages and salaries and \$286 million in local and state tax revenue.

The proposed MS in ALiHR Adventure Leadership option will focus on entrepreneurship, program development and management, pedagogy from an educational and healthcare perspective. There are no programs within the Montana University System that prepare students for the Recreation Therapy industry.

A survey of students in the MSUB's College of Allied Health Professions (CAHP) and education students within the Department of Health and Human Performance (HHP) indicated that 16 students would be interested in applying for the MS in ALiHR program.

Internal research revealed over 1000 jobs listed in the United States of those 59 jobs within the Northern Rocky Mountain and Pacific Northwest regions. All jobs listed as "director" or "coordinator" of recreation, outdoor, adventure/wilderness, wellness/therapy within the NRM/PNW region required an MS degree and about half of the others either required or preferred an MS degree.

Education Advisory Board (EAB) researched the market demand for employment opportunities for those who have a master's degree in Adventure Leadership or Recreation Therapist. EAB found 294 job postings within the region. EAB also indicated that over the last 12 months there were 55 job postings within the region for recreation therapist.

- 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
University of Montana	MS	Parks, Tourism and Recreation Management

- 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 University of Montana (UM) offers a MS in Parks, Tourism and Recreation Management (PTRM). One would choose MU's degree if they "... are interested in studying topics like recreation and tourism management, social, political and economic aspects of conservation, or wilderness, parks and protected

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area studies." UM's program is in the College of Forestry and Conservation while ours is in the College of Allied Health Professions. We see prospective students as having different interest (healthcare, education, and therapy versus forestry, conservation, and land management). An examination of each programs' course descriptions clearly indicate that these are two different programs. As such, we do not anticipate drawing from the same prospective student pool.

Job placement from the two programs may overlap, to a limited degree (e.g., owner/operator of an outdoor recreation business); however, based on the number of jobs available and those specific to recreation therapy, we do not feel that the program will unduly compete with UM's program. Our proposed program, being in the CAHP, also prepares students for the wellness/therapy aspects of other jobs; thus, there is no direct overlap.

For these reasons, this proposed program is not a substantial duplication of the UM's 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]*

During the initial Intent to Plan (I2P) process Dean Thomas DeLuca (WA Franke College of Forestry and Conservation) expressed concern that this proposed program may be a duplicate of their Parks, Tourism and Recreation Management MS program. However, after a phone conversation with all the stakeholders Dean was assured that our proposed program (focusing on education as it relates to the health professions and recreation therapy) was in fact different from UM's program. After the conversation MSU Billings revised the I2P to address Dean DeLuca's concerns.

- 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]*

If the program is approved, applications will be reviewed and admission decisions made for the MS in ALiHR program in the spring and summer of 2018 semesters. Students will begin coursework in the fall of 2018 semester.

It is anticipated the initial cohort (Fall 2018) of traditional students will be 8 and 2 3+2 students. It is anticipated the following cohort (Fall 2019) of traditional students will be 10 and 5 3+2 students. Each cohort will begin in the fall semester with 12-15 credits being delivered each semester, practicums and internships will be accomplished during the summer.

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

Fall Headcount Enrollment					Graduates				
AY 18	AY 19	AY 20	AY 21	AY 22	AY 18	AY 19	AY 20	AY 21	AY 22
10	20	20	20	20	0	10	10	10	10

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

An internal survey of MSUB students in the College of Allied Health Professions (CAHP) indicated that 16 undergraduate students would be interested in applying for the MS in ALiHR program.

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- c. What is the initial capacity for the program?

The initial capacity is 10 students for the first cohort and expanding to 15 students for subsequent cohorts.

- 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]*

Data on program effectiveness will be used to foster ongoing program improvement. Data on program effectiveness includes completion rates, pass rate of the NCTRC CTRS exam, employment rates, student learning outcomes, faculty outcomes, and analysis of outcome data for ongoing program improvement.

The ALiHR program will move toward accreditation by the Association of Experiential Education (AEE) and the Commission on Accreditation of Allied Health Education programs (CAAHEP) through the Committee on Accreditation of Recreational Therapy Education (CARTE).

If the program fails to meet the assessment goals the department, college, and university will make a determination as to the continued viability of the program.

- 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]*

Job placement within the industry sector will be used for both options. An initial target job placement of 80% will be used to determine success.

For the Recreation Therapy option pass rates of the NCTRC CTRS exam will be used to evaluate how well these students are achieving the intended learning outcomes of this option. This assessment will occur annually during each NCTRC CTRS exam cycle.

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

Direct measures: 1) Achieving the individual coursework student learning outcomes in accordance with the Graduate Student Manual. 2) Successful completion of and supervisor evaluations of student practicums and internships. 3) Successful completion of their graduate project or thesis. 4) One year post employment surveys.

Indirect measures: 1) Attendance at professional conferences. 2) Being active and collegial member of the program. 3) Student evaluations of the program.

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

Annual reviews of the program will occur for all direct and indirect measures. A working group of stakeholders (student representation, industry representation, and faculty) will provide feedback and make recommendations for program changes.

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

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While accreditation is not mandatory for either options, best practices indicate that it is preferable to be accredited. Therefore, the ALiHR program will move toward overall accreditation from the Association of Experiential Education (AEE). The Recreation Therapy options will seek accreditation from through the Committee on Accreditation of Recreational Therapy Education (CARTE) (a division of the Commission on Accreditation of Allied Health Education programs (CAAHEP)), and the Adventure Leadership option accreditation through Wilderness Education Association.

**9. Physical resources.**

- a. Describe the existing 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]*

Existing facilities include MSUB's Physical Education Building, which includes a small climbing wall, low elements challenge course, indoor gym, and classroom space. Based on the number of anticipated students there should be little to no impact on existing programs.

- b. List needed 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]*

Currently there are no anticipated new facility or equipment requirements.

**10. Personnel resources.**

- a. Describe the existing 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]*

Coordination with all instructional areas has been made and all have determined that a projected student increase of 15 per cohort will have minimal to no impact on current instruction. Administration of the program will be within the Department of Health and Human Performance and will be of minimal impact on current administrative support staff.

- b. Identify new 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]*

**0.5 FTE Clinical Faculty Line:**

A Certified Therapeutic Recreation Specialist (CTRS) faculty member is required to implement the program. This requirement complies with NCTRC requirements which states "The academic [internship] supervisor must be an active CTRS at the start of the internship experience and be formally employed by the sponsoring academic institution for the duration of the internship experience" (p. 13, NCTRC). This will require a summertime commitment of this clinical faculty member due to the nature of the 14-week full time commitment internship. In addition to supervising RT internships this clinical faculty member will also be required to teach 9 credits of recreation therapy specific courses. Projected cost would be \$25,002 per year (\$42,450.38 including benefits).

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**Tenure-Track Full-Time Instructor**

Anticipating the growth of the program (30 students total) an assistant professor will be added in year 2 at an anticipated salary of \$52,000 per year (\$74,632 including benefits). This assistant professor will teach, research and provide service to the department, College and University as specified in the Collective Bargaining Agreement.

**Part-Time Instructor (12 credits):**

This is needed to implement new Core and Adventure Leadership option courses. Projected cost at \$800 a credit is \$9,600 annually (\$11,443.20 including benefits).

**Summertime (6 credits):**

This will be required to oversee Adventure Leadership option internships and project management. Current full-time OAL faculty members will fulfill this role at current summertime rates as specified in the current CBA. Projected cost would be \$8,580 per year (\$10,227.36 including benefits).

**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, available library and information resources are adequate for the 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, existing student services have the capacity to accommodate the program.

**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 budget template for the first three years of operation of the new program.

	Year 1	Year 2	Year 3
Revenues	\$ 58,491	\$ 173,709	\$ 173,709
Expenditures	\$ 54,184	\$171,893	\$168,743
Net Revenue (revenues-expenditures)	\$ 4,307	\$ 1,816	\$ 4,966

- 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]*

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- 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.
- 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]

**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.

To meet the demands placed on the Department of Health and Human Performance and to ensure the best possible learning environment for the students, a program fee of \$925 (per student per semester) will be collected to support the cost of the academic program is being requested. Part of these fees will be used to support student attendance at professional conferences.

Signature/Date

College or School Dean:

*R. H. Hoer*

Chief Academic Officer:

*R. H. Hoer*

Chief Executive Officer:

*Sam Adel* 7/13/18

Flagship Provost\*:

*R L Mahan* 7-24-18

Flagship President\*:

*R L Mahan for President Waded Cruzado* 7-24-18

**Academic Degree Program Proposal - Level II Fiscal Analysis Follow-up Form**

CAMPUS:  
 AWARD LEVEL:  
 PROGRAM NAME:  
 PROGRAM CODE:

	FY 2019		FY 2020		FY 2021		FY 2022		FY 2023	
	Proj.	Actual OR Revised								

**ENROLLMENT PROJECTIONS**

**Headcount**

annual unduplicated headcount of students with declared major or minor within the program	15		30		30		30		30	
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**Credit Hours**

annual avg. credits hours earned per student in program related curriculum	18		28		28		28		28	
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**Student FTE**

Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24	11.25		35		35		35		35	
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**Completions**

Annual number of program completers			15		15		15		15	
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**REVENUE**

Tuition Revenue (net of waivers)	\$39,714		\$136,209		\$136,209		\$136,209		\$136,209	
Institutional Support	\$3,777									
Other Outside Funds (grants, gifts, etc.)										
Program Tuition/Fees	\$15,000		\$37,500		\$37,500		\$37,500		\$37,500	
<b>Total Revenue</b>	<b>\$58,491</b>		<b>\$173,709</b>		<b>\$173,709</b>		<b>\$173,709</b>		<b>\$173,709</b>	
<b>Total Revenue per Student FTE</b>	<b>\$5,199</b>		<b>\$4,963</b>		<b>\$4,963</b>		<b>\$4,963</b>		<b>\$4,963</b>	

**EXPENDITURES**

Tenure Track Faculty	FTE		1.2		1.2		1.2		1.2	
	Salary + Benefits		\$84,859		\$84,859		\$84,859		\$84,859	
Non-tenure Track Faculty <small>*Includes Adjunct Instructors</small>	FTE	0.5	0.7		0.7		0.7		0.7	
	Salary + Benefits	\$42,450	\$59,854		\$59,854		\$59,854		\$59,854	
Graduate Teaching Assistants	FTE	0.3	0.3		0.3		0.3		0.3	
	Salary + Benefits	\$6,000	\$6,000		\$6,000		\$6,000		\$6,000	
Staff	FTE									
	Salary + Benefits									
<b>Total Faculty &amp; Staff</b>	FTE	0.8	2.2		2.2		2.2		2.2	
	Salary + Benefits	<b>\$48,490</b>	<b>\$150,713</b>		<b>\$150,713</b>		<b>\$150,713</b>		<b>\$150,713</b>	
Operations (supplies, travel, rent, etc)	\$4,500		\$18,030		\$18,030		\$18,030		\$18,030	
Start-up Expenses (OTO)	\$1,234		\$3,150		\$3,150		\$3,150		\$3,150	
<b>Total Expenses</b>	<b>\$54,184</b>		<b>\$171,893</b>		<b>\$171,893</b>		<b>\$171,893</b>		<b>\$171,893</b>	
<b>Student FTE to Faculty (TT + NTI) Ratio</b>	<b>22.5</b>		<b>18.4</b>		<b>18.4</b>		<b>18.4</b>		<b>18.4</b>	
<b>Net Income/Deficit (Revenue - Expenses)</b>	<b>\$4,307</b>		<b>\$1,816</b>		<b>\$4,966</b>		<b>\$4,966</b>		<b>\$4,966</b>	

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.

*Trudy Collins by Heather Hanna 7/20/18*

Campus Chief Financial Officer Signature

Chief Financial Officer Comments

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**Appendix A – Proposed New Curriculum**

A. Curriculum description

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

**Master of Science in Adventure Leadership in Health and Recreation**

**Program Description**

Next-door to Montana's largest health care center, the Yellowstone River, and within 45 minutes to the Beartooth Mountains (a gateway to Yellowstone National Park) Montana State University Billings is uniquely positioned to offer a Master of Science program in Adventure Leadership in Health and Recreation (ALiHR) with options in Recreation Therapy (RT) and Adventure Leadership (AL). The program expands one's knowledge and skills as a leader in the Adventure Recreation and Recreation Therapy industry through a variety of classroom, experiential, clinical, and internship opportunities. The staff and faculty are committed to preparing adventure leaders and recreation therapist who evidence the highest ideals of profession.

**Program Core Values**

- Respect for all
- First: Beneficence – do no intentional harm
- Second: Fairness – do not be unfair
- Third: Autonomy – do not violate another's freedom
- Responsibility to others and self
- Service to the profession

**Program Vision**

The vision of the MSUB Adventure Leadership in Health and Recreation program is to be a regional leader in adventure leadership and recreation therapy training and education.

**Program Mission Statement**

The mission of the MSUB ALiHR program is to prepare future masters level recreational therapist and adventure leaders through educational and experiential challenges as well as clinical opportunities. Graduates will then serve and contribute to the Recreation Therapy and Adventure Recreation professions through education, scholarship, clinical service, and professional involvement.

**Program Objectives**

MSUB's ALiHR program fulfills its mission by accomplishing the following objectives:

1. Expose the ALiHR students to a variety of teaching, operational, and clinical experiences that allow them to become experienced practitioners. Experiences will include, but are not limited to, teaching undergraduate adventure leadership courses, internships with municipal parks and recreation, adventure guiding and/or recreation therapy organizations.
2. Affording students opportunities to be involved in professional development. Some examples of professional development include attendance at national association conferences such as, the Association of Outdoor Recreation and Education, the Association of Experiential Education, the Wilderness Education Association, and the American Therapeutic Recreation Association to name a few.

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3. Engaging, challenging, and supporting students to successfully complete the program and for students in the Recreation Therapy option to be eligible and prepared to sit for the National Council for Therapeutic Recreation Certification (NCTRC).

**Program Learning Outcomes**

The National Council for Therapeutic Recreation (NCTRC) has set the benchmarks for education, exam preparation, and professional practice for therapeutic recreation. The MSU Billings ALiHR program seeks to meet and exceed the educational requirements presented in the NCTRC Training Education Competencies. The program further seeks to produce adventure leaders who possess the ability to function as professional in accordance with the current role NCTRC Job Analysis, but also have the ability to conduct and evaluate research in the adventure recreation field.

1. Students will demonstrate safe and effective leadership and planning consistent with professional standards, including risk management.
2. Students will meet or exceed minimal requirements for professional certifications.
3. Recreation Therapy option students will ascertain and demonstrate the required skills for all NCTRC recreation therapy competencies and clinical integration proficiencies.
4. Students will display critical thinking skills and formulate sound decisions in their field experiences.
5. Students will establish professional relationships with governmental and private adventure recreation organizations and/or relevant medical and allied health care providers.
6. Students will develop, design, and execute independent research projects or participated in an extended experiential/clinical internship.

**Program Prerequisites**

Students entering this graduate program are expected to have appropriate academic preparation prior to beginning academic coursework in athletic training. Transcript evaluation will be done by the graduate faculty to determine fulfillment of prerequisite knowledge in these areas. The course description and/or syllabus may be used to determine acceptance.

**Core Prerequisites**

- Methods of Adapted Health Enhancement (HEE 310)
- Foundations of Exercise Science w/Lab (KIN 105/106L)
- Motor Learning w/Lab (KIN 330/331) or Exercise Physiology w/Lab (KIN 320/321)
- Statistics (STAT 216)
- All students must maintain a current 80-hour Wilderness First Responder certification while in the program (ECP 312).

**Recreation Therapy Option Prerequisite Courses**

Human Anatomy and Physiology I w/Lab (Required for NCTRC Certification S4) (BIOH 301/302, pr BIOB 101 & CHMY 121 or BIOB 160 & CHMY 141)

- Developmental Psychology (PSYX 230, pr PSYX 100)
- Abnormal Psychology (Required for NCTRC Certification S3) (PSYX 340, pr PSYX 100)

**Adventure Leadership Option Prerequisite Courses**

- Introduction to Business (BGEN 105)
- Principles of Marketing (BMKT 325)

**Program Admission Requirements**

1. Undergraduate GPA of 3.0 (GPA below 3.0 may be considered)
2. Graduate Record Exam (GRE) or an equivalent exam.
3. Completed graduate application form and application fee.

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4. Three (3) letters of recommendation.
5. Application essay.
6. Official transcripts from each institution attended.
7. Student must complete technical standards and a background check once accepted into the program.

Admission into the ALiHR Program is a competitive process. MSUB ALiHR program will accept applications after the deadline; however, that applicant will be at a disadvantage. A student may be considered for the program after the application deadline if the student meets the requirements and a position exists.

Outcome assessments are conducted in each course and at the conclusion of the research project/thesis or internship.

The ALiHR Program is a two year (5 semester) program with new cohorts beginning in June.

**Program Degree Requirements**

***Core Course Work***

Course	Title	Credits
#ALHR 501	Orientation to ALiHR	1
#ALHR 502	Adventure Skills Training	1
#ALHR 503	Contemporary Issues in Health, RT & AL	3
HHP 502	Research in Exercise and Sport Science	3
^REC 510	Adventure Leadership	3
^REC 511	Adventure Guiding and Instructing	3
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***Recreation Therapy Option***

Course	Title	Credits
#ALTR 520	Therapeutic Recreation Process	3
#ALTR 521	Assessment, Documentation, & Admin of RT	3
#ALTR 522	Therapeutic Recreation Modalities	3
#ALTR 523	Therapeutic Recreation and Disabilities	3
#ALTR 590	Internship	5
KIN 462	Evidence Based Assessment and Treatment	3
SPED 550	Best Practices in Teaching Students with Emotional Disturbances	3
REHA 515	Medical and Psychological Aspects of Disability	3
REHA 507	Professional Orientation and Ethical Practice	3
REHA 519	Human Growth and Development	3
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***Adventure Leadership Option***

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Course	Title	Credits
#ALHR 530	Historical Perspectives and Policy of Outdoor Adventure	3
#ALHR 532	Budgeting, Financing, Facilities Mgt in AR	3
#ALHR 533	Risk Mgt and Communication in AR	3
EDCI 500	Curriculum Development	2
EDF 530	Advanced Human Development and Learning	3
HHP 550	Psychological Principles	3
HHP 594	Clinic	2
^REC 566	Ethical/Legal Aspects in OAL	3
^REC 570	Adventure Program Planning and Development	3
		25

**Graduate Project or Thesis**

Graduate Project Option

HHP 590	Internship	6
#HHP 596	Capstone Project	1
		7

Thesis Option

HHP 590	Internship	1
HHP 599	Thesis	6
		7

Master Requirement (RT Option)	46
Master Requirement (AL Option)	46

^ Cross-listed with undergraduate course.

# New Course

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**Bachelor of Science Major in Outdoor Adventure Leadership/Master of Science in Adventure Leadership in Health and Recreation 3+2 Option**

**Program Description**

The 3+2 between Outdoor Adventure Leadership (OAL) and Adventure Leadership in Health and Recreation (ALiHR) allows students to obtain both a Bachelor's degree in OAL and Master's degree in ALiHR within five years, which is extremely beneficial to the student financially and effectively decreases time spent working towards a degree. Students are required to complete three years in the undergraduate OAL major, obtaining general education requirements as well as prerequisite courses for the ALiHR program. During the third year, the student applies for acceptance into the ALiHR program (February 1). If not accepted, the student may reapply to the ALiHR program and continue to work on coursework for the OAL degree. If accepted, the student will begin specific ALiHR coursework in the beginning of the fourth year, with coursework beginning in June. After successful completion of the fourth year, students are eligible for graduation with the bachelor's degree. At the successful completion of the fifth year, students are eligible for graduation with the master's degree. If the ALiHR student has completed the Recreation Therapy Option they are eligible to take the National Council for Therapeutic Recreation Certification (NCTRC) examination.

**Program Outcomes include:**

***Bachelor of Science***

1. Demonstrate safe and effective leadership in the skill areas encompassed in the program, consistent with professional standards, including risk management.
2. Plan, implement, and evaluate adventure experiences in areas encompassed in the program.
3. Determine and evaluate participant learning outcomes in outdoor adventure experiences.
4. Professionally communicate knowledge, demonstrate skills, and evaluate participant performance in adventure activities and programming.

***Master of Science***

1. Students will demonstrate safe and effective leadership and planning consistent with professional standards, including risk management.
2. Students will meet or exceed minimal requirements for professional certifications.
3. Recreation Therapy option students will ascertain and demonstrate the required skills for all NCTRC recreation therapy competencies and clinical integration proficiencies.
4. Students will display critical thinking skills and formulate sound decisions in their field experiences.
5. Students will establish professional relationships with governmental and private adventure recreation organizations and/or relevant medical and allied health care providers.
6. Students will develop, design, and execute independent research projects or participated in an extended experiential/clinical internship.

**Admission Requirements**

1. Undergraduate GPA of at least 3.0. However, a GPA below a 3.0 may be considered.
2. A standardized graduate admission test (GRE or equivalent) must be on record.
3. Three letters of recommendation from academic and professional references concerning the candidate's potential to succeed in graduate school.
4. For the Recreation therapy Option, it is recommended but not required to obtain a minimum of 25-50 contact hours with a certified recreation therapist.
5. Official transcripts from each institution attended.
6. An essay stating why the student wants to be an athletic trainer, career goals, and the attributes possessed that will make the student successful in life in this profession.
7. Completed application form and submission of application fee. The application deadline is February 1.

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Students will be required to participate in an internet or phone based interview with faculty from the ALiHR program.

**Provisional Acceptance**

Once a student has met all admission criteria and is admitted into the ALiHR program, that student will receive provisional acceptance. In order to gain full acceptance the student will have to successfully complete the following:

1. Technical Standards
2. Criminal Background Check
3. Prerequisite Courses. If a student does not have all the prerequisite courses and has met all other criteria for admission into the ALiHR program, a student will be allowed one (1) year to successfully complete prerequisite courses and to gain admission.

**3+2 Program Degree Requirements**

Course	Title	Credits
	General Education Requirements	31

Students should consult with an academic advisor before registering for General Education courses in order to minimize the number of courses needed to satisfy the requirements of the major.

**Bachelor Skills Requirements**

**Outdoor Adventure Leadership Requirements**

Course	Title	Credits
ECP	312 Wilderness Medicine	4
REC	120 Fundamentals of Backcountry Travel	2
REC	181 Basic Navigation/Orienteering	1
REC	200 Fundamentals of Outdoor Adventure Leadership	3
REC	210 Environment/leave No Trace	2
REC	280 Challenge Course Fundamentals	2
REC	306 Outdoor Living Skills	3
REC	208 Winter Outdoor Living Skills	2
REC	309 People and the Environment	3
^REC	310 Adventure Leadership	3
^REC	411 Adventure Guiding and Leading	3
^REC	466 Ethical/Legal Aspects in OAL	2
^REC	470 Adventure Program Planning and Development	3
REC	498 Internship <b>(RT Option)</b>	2
REC	498 Internship <b>(AL Option)</b>	6
BGEN	105 Introduction to Business	3
BMKT	325 Principles of Marketing	3
ECP	120 Emergency Medical Responder	3
KIN	105 Foundations of Exercise Science	3
KIN	106 Foundations of Exercise Science Lab	1
HEE	310 Methods of Adapted Health Enhancement	2
KIN	330 Motor Learning and Control	3
KIN	331 Motor Learning and Control Lab	1

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	OR		
KIN	320	Exercise Physiology	3
KIN	321	Exercise Physiology Lab	1
STAT	216	Introduction to Statistics	4
		Total (RT Option)	<u>58</u>
		Total (AL Option)	62

**Skills Requirements**

RT Option		
Skills Area Level I		2
Skills Area Level II		2
Rescue Skill		3
		<u>7</u>

**AL Option**

Skills Area Level I		6
Skills Area Level II		12
Rescue Skill		3
		<u>21</u>
	Total	21

**Recreation Therapy Option Core**

Course	Title	Credits
BIOB 101	Discovery Biology	3
BIOB 102	Discovery Biology Lab	1
BIOH 303	Human Anatomy and Physiology	3
BIOH 302	Human Anatomy and Physiology Lab	1
CHMY 121	Introduction to General Chemistry	3
CHMY 122	Introduction to General Chemistry Lab	1
PSYX 100	Introduction to Psychology	3
PSYX 230	Developmental Psychology	3
PSYX 340	Abnormal Psychology	3
	Total	<u>21</u>
	Total (RT Option)	117
	Total (AL Option)	114

**Master Core Requirements**

Course	Title	Credits
ALHR 501	Orientation to ALiHR	1

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ALHR	502	Adventure Skills Training	1
ALHR	503	Contemporary Issues in Health, RT & AL	3
HHP	502	Research in Exercise and Sport Science	3
^REC	510	Adventure Leadership	3
^REC	511	Adventure Guiding and Instructing	3
			<hr/> 14

***Master Recreation Therapy Option***

Course		Title	Credits
#ALTR	520	Therapeutic Recreation Process	3
#ALTR	521	Assessment, Documentation, & Admin of RT	3
#ALTR	522	Therapeutic Recreation Modalities	3
#ALTR	523	Therapeutic Recreation and Disabilities	3
KIN	462	Evidence Based Assessment and Treatment	3
#ALTR	590	Internship	5
SPED	550	Best Practices in Teaching Students with Emotional Disturbances	3
REHA	515	Medical and Psychological Aspects of Disability	3
REHA	507	Professional Orientation and Ethical Practice	3
REHA	519	Human Growth and Development	3
			<hr/> 32

***Master Adventure Leadership Option***

Course		Title	Credits
#ALHR	530	Historical Perspectives and Policy of Outdoor Adventure	3
#ALHR	532	Budgeting, Financing, Facilities Mgt in AR	3
#ALHR	533	Risk Mgt and Communication in AR	3
EDCI	500	Curriculum Development	2
EDL	530	Advanced Human Development and Learning	3
HHP	550	Psychological Principles	3
HHP	594	Clinic	2
REC	566	Ethical/Legal Aspects in OAL	3
REC	570	Adventure Program Planning and Development	3
			<hr/> 25

**Graduate Project or Thesis**

**Graduate Project Option**

HHP	590	Internship	6
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#HHP	596	Capstone Project	<u>1</u>
			7
<b>Thesis Option</b>			
HHP	590	Internship	1
	599	Thesis	<u>6</u>
			7
^ Cross-listed with undergraduate course.			
# New Course			
		Master Requirement (RT Option)	46
		Master Requirement (AL Option)	46
		3+2 B.S. & M.S. in ALiHR(T)	
		Total (RT Option)	163
		Total (AL Option)	160

**Course Descriptions**

**Core Descriptions**

**ALHR 501 Orientation to Adventure Leadership in Health & Recreation (Therapy)**

1 cr. This course is intended orientate new ALiHR(T) students to program requirements and expectations. Students are required to attend the orientation sessions. Orientation is a series of discussions and workshops designed to help students with the transition to this rigorous program, to include, time management, changing roles, activities, resources, internships, projects, and thesis. It also provides an opportunity for the students to meet and interact with faculty.

**ALHR 502 Adventure Skills Training (AST)**

1 cr. In order to meet graduation requirements, ALiHR(T) students must demonstrate competency in backcountry travel/living (both summer and winter), and at least one area of skill concentration (e.g., challenge course, rock-climbing, paddling, skiing, etc.). Completion of AST is accomplished by either documentation or demonstration. Appropriate documentation includes activity log or appropriate letter of reference. Demonstration of AST can be completed by co-teaching the specific skills with one of MSUB's fulltime faculty. Students in need of Adventure Skills Training (AST) should arrange to gain these skills during summer or winter breaks.

**ALHR 503 Contemporary Issues in Health, Recreation Therapy, & Adventure Leadership**

3 cr. This course examines conceptual, theoretical, and practical issues associated with the organization and delivery of Adventure and Therapeutic Recreation services. Using theoretical frameworks and applied practice models, students reflect on and develop informed positions on core values and beliefs that support the profession.

**HHP 502 Research in Exercise and Sport Science**

3 cr. Prerequisite: Admission to M.S. or instructor permission. Covers research and the statistical analysis that support research-specific, evidence-based practice in contexts unique to exercise science and sport.

**REC 510 Adventure Leadership (cross-listed with REC 310)**

3 cr. Acquaints students with the history, philosophy, depth, and scope of Adventure Leadership. Methods discussed will be applied to group development, minimizing risk in the field, teambuilding, decision-making, problem solving, and

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teaching. Students will explore and enhance their own leadership, philosophy and style through participation in group projects, lecture, and activities while taking this class.

REC 511 Adventure Guiding and Instructing (cross-listed with REC 411)

3 cr. Provides students an opportunity to explore teaching methods appropriate for a wide spectrum of adventure guiding and instructing. Examines learning styles, lesson planning, delivery options, risk management, evaluation, and assessment.

***Recreation Therapy Option Descriptions***

ALTR 520 Therapeutic Recreation Process

3 cr. This class examines the multifaceted aspects of the profession and practice of Recreational. Therapy (RT). Course content focuses on an understanding of RT definitions, philosophical and theoretical perspectives, service delivery models, and the RT process.

ALTR 521 Assessment, Documentation, & Administration of Recreational Therapy

3 cr. This class is designed to teach the critical components of assessment, documentation, and evaluation in the recreational therapy process. Components include protocol development, client assessment, (standardized assessment, interview, observation and record review), and the process of treatment planning, documentation and evaluation. Client evaluation will be discussed as it relates to client-assessed outcomes.

ALTR 522 Therapeutic Recreation Modalities

3 cr. In this experiential course, students are exposed to an assortment of activity-based interventions used in therapeutic recreation practice. Students are introduced to modalities, but are not limited to, adventure activities, animal-assisted therapy, horticulture, reminiscence, aromatherapy, massage, juggling, humor, sports, crafts, social skills and relaxation training.

ALTR 523 Therapeutic Recreation and Disabilities

3 cr. This course combines research literature and practical application on issues associated with mental health, developmental disabilities, and/or aging, and the therapeutic recreation process. Students complete an issues paper that synthesizes research literature and any other structured learning activities, and draws implications for TR practice.

KIN 462 Evidence Based Assessment and Treatment

3 cr. Prerequisite: Admission to Human Performance Program. (F, Sp) Provides the foundation for evidence-based practice in exercise science by establishing scientific evidence as the basis for clinical decision making. Clinical practices are questioned and evaluated for alignment with evidence-based decision making. Commonly accepted hierarchies of evidence are used to evaluate the level of scientific support for both assessment and treatment techniques used in exercise science. Objective outcome measures that determine level of success in individual client scenarios in a wide array of exercise applications are used to provide evidence of intervention effects.

REHA 507 Professional Orientation and Ethical Practice

3 cr. *Offered ONLY Online.* (odd F, odd Su) Provides an overview of current legal, ethical, and professional issues, and professional identity development related to the practice of rehabilitation and mental health counseling. Focuses on relevant ethical principles, codes, and decision making, along with regulatory procedures.

REHA 515 Medical and Psychological Aspects of Disability

3 cr. (odd Sp, Su) Provides knowledge of medical terminology and processes, understanding of various disabling diseases and psychological conditions, and the necessary related information needed to carry out service delivery to a consumer.

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The student will also become aware of the range of medical and psychological services utilized by rehabilitation and mental health counselors.

**REHA 519 Human Growth and Development**

3 cr. (odd Sp) Provides students with an overview of theory and research related to human growth and development over the lifespan. Studies the characteristics of human growth at each stage of development. Life-cycle theories of development; developmentally appropriate crisis counseling techniques; developmental tasks; normal-abnormal behavior; and models of moral, intellectual, social, and physical development and learning theories will be explored. Counseling strategies for specific concerns in the life cycle will be emphasized. Counts as NCTRC Supportive Coursework

**SPED 550 Best Practices in Teaching Students with Emotional Disturbance**

3 cr. Offered ONLY Online. Reviews the current literature and recommended instructional strategies and resources for teaching students with emotional

**ALTR 590 Internship**

V1-9 cr. Prerequisite: Approved plan of study and approved internship application. Provides experience in responsible appointment as an assistant in recreation therapy. A minimum 560-hour, 14 consecutive week internship experience in a therapeutic recreation services that uses the therapeutic recreation process as defined by the current NCTRC Job Analysis Study. See ALiHR(T) Internship Handbook for details.

***Adventure Leadership Option Descriptions***

**ALHR 530 Historical Perspectives and Policy of Outdoor Adventure**

3 cr. Examination of the policy issues that affect the adventure recreation field; study of the historical significance of key events and individual contributions from cultural, social and economic points of view.

**ALHR 532 Budgeting, Financing, & Facilities Management in Adventure Recreation**

3 cr. Covers policies and practices involved in budgeting, financing, acquisition, managing adventure recreation agencies and facilities.

**ALHR 533 Risk Management and Communication in Adventure Recreation**

3 cr. This course covers a structured approach to designing, communicating and implementing, and assessing a risk management plan for programs and staff within the adventure recreation industry.

**EDCI 500 Curriculum Development**

2 cr. Prerequisite: Admission to graduate study. (F, Sp, Su) Provides a basic graduate level curriculum course to students seeking teaching licensure. Topics of study include: curriculum goals, objectives and lesson planning, teaching models, and assessment.

**EDF 530 Advanced Human Development and Learning**

3 cr. (F, Sp, Su) Builds upon relevant undergraduate preparation in order to critically examine the major theories developed to understand human learning and development. Inquiry focuses on criticism of the theories themselves, examination of the empirical support or lack of support they receive, and the professional principles and practices derived from each theory.

**EDCI 576 Instructional Materials Design**

3 cr. Prerequisite: Consent of instructor. (odd Su) Provides procedures and practice in designing and developing instructional materials. The principles of visual and graphic design and layout will be stressed.

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**HHP 550 Psychological Principles**

3 cr. Covers the psychological dimension of sport science, focusing on advanced motor learning and applied sport psychology. Special attention is focused on sport psychology interventions with strong research support for their effectiveness.

**HHP 590 Internship**

V1-9 cr. Prerequisite: Approved plan of study and approved internship application. Provides experience in a responsible appointment as an assistant in physical education and/or health settings.

**HHP 594 Clinic**

V1-6 cr. Prerequisite: Consent of Instructor. Provides an opportunity to explore and develop advanced skills with individuals in Health and Physical Education.

**HHP 598 Research Project**

V3-6 cr. (F, Sp) Provides graduate students an opportunity to research a selected topic in athletic training interdisciplinary studies or sport leadership in close consultation with a graduate faculty committee. Students will present their project both in writing and orally.

**HHP 599 Thesis**

6 cr. Prerequisite: EDF 501 or equivalent and an approved plan of study required. (F, Sp) This course may be given the grade of "T" until research and writing is completed and accepted within the time limit of the degree.

**REC 566 Ethical/Legal Aspects in Outdoor Adventure Leadership (cross-listed with REC 466)**

2 cr. Presents the ethical and legal principles and practices recommended and required in outdoor adventure leadership careers. Particular emphasis is on the ethical and legal guidelines that follow national program accreditation standards.

**REC 570 Adventure Program Planning and Development (cross-listed with REC 470)**

3 cr. Examines principles related to planning, scheduling, and implementation of recreational activities and events. Students will be introduced to the procedures involved in development of programs, staffing, budgeting, and managing risks for adventure programs for diverse populations.

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**Appendix B - Course Descriptions**

***Core Descriptions***

**ALHR 501 Orientation to Adventure Leadership in Health & Recreation (Therapy)**

1 cr. This course is intended orientate new ALiHR(T) students to program requirements and expectations. Students are required to attend the orientation sessions. Orientation is a series of discussions and workshops designed to help students with the transition to this rigorous program, to include, time management, changing roles, activities, resources, internships, projects, and thesis. It also provides an opportunity for the students to meet and interact with faculty.

**ALHR 502 Adventure Skills Training (AST)**

1 cr. In order to meet graduation requirements, ALiHR(T) students must demonstrate competency in backcountry travel/living (both summer and winter), and at least one area of skill concentration (e.g., challenge course, rock-climbing, paddling, skiing, etc.). Completion of AST is accomplished by either documentation or demonstration. Appropriate documentation includes activity log or appropriate letter of reference. Demonstration of AST can be completed by co-teaching the specific skills with one of MSUB's fulltime faculty. Students in need of Adventure Skills Training (AST) should arrange to gain these skills during summer or winter breaks.

**ALHR 503 Contemporary Issues in Health, Recreation Therapy, & Adventure Leadership**

3 cr. This course examines conceptual, theoretical, and practical issues associated with the organization and delivery of Adventure and Therapeutic Recreation services. Using theoretical frameworks and applied practice models, students reflect on and develop informed positions on core values and beliefs that support the profession.

**HHP 502 Research in Exercise and Sport Science**

3 cr. Prerequisite: Admission to M.S. or instructor permission. Covers research and the statistical analysis that support research-specific, evidence-based practice in contexts unique to exercise science and sport.

**REC 510 Adventure Leadership (cross-listed with REC 310)**

3 cr. Acquaints students with the history, philosophy, depth, and scope of Adventure Leadership. Methods discussed will be applied to group development, minimizing risk in the field, teambuilding, decision-making, problem solving, and teaching. Students will explore and enhance their own leadership, philosophy and style through participation in group projects, lecture, and activities while taking this class.

**REC 511 Adventure Guiding and Instructing (cross-listed with REC 411)**

3 cr. Provides students an opportunity to explore teaching methods appropriate for a wide spectrum of adventure guiding and instructing. Examines learning styles, lesson planning, delivery options, risk management, evaluation, and assessment.

***Recreation Therapy Option Descriptions***

**ALTR 520 Therapeutic Recreation Process**

3 cr. This class examines the multifaceted aspects of the profession and practice of Recreational. Therapy (RT). Course content focuses on an understanding of RT definitions, philosophical and theoretical perspectives, service delivery models, and the RT process.

**ALTR 521 Assessment, Documentation, & Administration of Recreational Therapy**

3 cr. This class is designed to teach the critical components of assessment, documentation, and evaluation in the

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recreational therapy process. Components include protocol development, client assessment, (standardized assessment, interview, observation and record review), and the process of treatment planning, documentation and evaluation. Client evaluation will be discussed as it relates to client-assessed outcomes.

**ALTR 522 Therapeutic Recreation Modalities**

3 cr. In this experiential course, students are exposed to an assortment of activity-based interventions used in therapeutic recreation practice. Students are introduced to modalities, but are not limited to, adventure activities, animal-assisted therapy, horticulture, reminiscence, aromatherapy, massage, juggling, humor, sports, crafts, social skills and relaxation training.

**ALTR 523 Therapeutic Recreation and Disabilities**

3 cr. This course combines research literature and practical application on issues associated with mental health, developmental disabilities, and/or aging, and the therapeutic recreation process. Students complete an issues paper that synthesizes research literature and any other structured learning activities, and draws implications for TR practice.

**KIN 462 Evidence Based Assessment and Treatment**

3 cr. Prerequisite: Admission to Human Performance Program. (F, Sp) Provides the foundation for evidence-based practice in exercise science by establishing scientific evidence as the basis for clinical decision making. Clinical practices are questioned and evaluated for alignment with evidence-based decision making. Commonly accepted hierarchies of evidence are used to evaluate the level of scientific support for both assessment and treatment techniques used in exercise science. Objective outcome measures that determine level of success in individual client scenarios in a wide array of exercise applications are used to provide evidence of intervention effects.

**REHA 507 Professional Orientation and Ethical Practice**

3 cr. *Offered ONLY Online.* (odd F, odd Su) Provides an overview of current legal, ethical, and professional issues, and professional identity development related to the practice of rehabilitation and mental health counseling. Focuses on relevant ethical principles, codes, and decision making, along with regulatory procedures.

**REHA 515 Medical and Psychological Aspects of Disability**

3 cr. (odd Sp, Su) Provides knowledge of medical terminology and processes, understanding of various disabling diseases and psychological conditions, and the necessary related information needed to carry out service delivery to a consumer. The student will also become aware of the range of medical and psychological services utilized by rehabilitation and mental health counselors.

**REHA 519 Human Growth and Development**

3 cr. (odd Sp) Provides students with an overview of theory and research related to human growth and development over the lifespan. Studies the characteristics of human growth at each stage of development. Life-cycle theories of development; developmentally appropriate crisis counseling techniques; developmental tasks; normal-abnormal behavior; and models of moral, intellectual, social, and physical development and learning theories will be explored. Counseling strategies for specific concerns in the life cycle will be emphasized. Counts as NCTRC Supportive Coursework

**SPED 550 Best Practices in Teaching Students with Emotional Disturbance**

3 cr. *Offered ONLY Online.* Reviews the current literature and recommended instructional strategies and resources for teaching students with emotional

**ALTR 590 Internship**

V1-9 cr. Prerequisite: Approved plan of study and approved internship application. Provides experience in responsible appointment as an assistant in recreation therapy. A minimum 560-hour, 14 consecutive week internship experience in a

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

therapeutic recreation services that uses the therapeutic recreation process as defined by the current NCTRC Job Analysis Study. See ALiHR(T) Internship Handbook for details.

***Adventure Leadership Option Descriptions***

ALHR 530 Historical Perspectives and Policy of Outdoor Adventure

3 cr. Examination of the policy issues that affect the adventure recreation field; study of the historical significance of key events and individual contributions from cultural, social and economic points of view.

ALHR 532 Budgeting, Financing, & Facilities Management in Adventure Recreation

3 cr. Covers policies and practices involved in budgeting, financing, acquisition, managing adventure recreation agencies and facilities.

ALHR 533 Risk Management and Communication in Adventure Recreation

3 cr. This course covers a structured approach to designing, communicating and implementing, and assessing a risk management plan for programs and staff within the adventure recreation industry.

EDCI 500 Curriculum Development

2 cr. Prerequisite: Admission to graduate study. (F, Sp, Su) Provides a basic graduate level curriculum course to students seeking teaching licensure. Topics of study include: curriculum goals, objectives and lesson planning, teaching models, and assessment.

EDF 530 Advanced Human Development and Learning

3 cr. (F, Sp, Su) Builds upon relevant undergraduate preparation in order to critically examine the major theories developed to understand human learning and development. Inquiry focuses on criticism of the theories themselves, examination of the empirical support or lack of support they receive, and the professional principles and practices derived from each theory.

EDCI 576 Instructional Materials Design

3 cr. Prerequisite: Consent of instructor. (odd Su) Provides procedures and practice in designing and developing instructional materials. The principles of visual and graphic design and layout will be stressed.

HHP 550 Psychological Principles

3 cr. Covers the psychological dimension of sport science, focusing on advanced motor learning and applied sport psychology. Special attention is focused on sport psychology interventions with strong research support for their effectiveness.

HHP 590 Internship

V1-9 cr. Prerequisite: Approved plan of study and approved internship application. Provides experience in a responsible appointment as an assistant in physical education and/or health settings.

HHP 594 Clinic

V1-6 cr. Prerequisite: Consent of Instructor. Provides an opportunity to explore and develop advanced skills with individuals in Health and Physical Education.

HHP 598 Research Project

V3-6 cr. (F, Sp) Provides graduate students an opportunity to research a selected topic in athletic training

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interdisciplinary studies or sport leadership in close consultation with a graduate faculty committee. Students will present their project both in writing and orally.

**HHP 599 Thesis**

6 cr. Prerequisite: EDF 501 or equivalent and an approved plan of study required. (F, Sp) This course may be given the grade of "T" until research and writing is completed and accepted within the time limit of the degree.

**REC 566 Ethical/Legal Aspects in Outdoor Adventure Leadership (cross-listed with REC 466)**

2 cr. Presents the ethical and legal principles and practices recommended and required in outdoor adventure leadership careers. Particular emphasis is on the ethical and legal guidelines that follow national program accreditation standards.

**REC 570 Adventure Program Planning and Development (cross-listed with REC 470)**

3 cr. Examines principles related to planning, scheduling, and implementation of recreational activities and events. Students will be introduced to the procedures involved in development of programs, staffing, budgeting, and managing risks for adventure programs for diverse populations.

**Montana University System**  
**INTENT TO PLAN FORM**

Program/Center/Institute Title: **Master of Science in Adventure Leadership in Health and Recreation**

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Campus, School/Department: **MSU Billings, CAHP, HHP**

Expected Submission Date: **SEP 2017**

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Contact Name/Info: **MSU Billings, CAHP, HHP**

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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.**

This program prepares leaders, educators, and administrators to plan, organize, lead, teach, and evaluate adventure-based wellness programs within commercial, governmental and non-profit sectors. This is accomplished through practical experiences within higher education, the outdoor adventure and recreation wellness/therapeutic industries. This is a multi-entry master's program with overall coursework focusing on contemporary issues in health, wellness and physical activity, advanced concepts in program development and implantation, and applied research/practicums in adventure-based health and wellness programs.

**Entry 1:** Traditional - Persons with an appropriate bachelor's degree will enter the program as a traditional graduate student.

**Entry 2:** 3+2 - Undergraduate students who are accepted into this program will work toward their Bachelor of Science (B.S.) degree in Outdoor Adventure Leadership (OAL) or other appropriate B.S. degree programs with a minor in OAL. At the beginning of their fourth year of study, they will transition to graduate level courses as an undergraduate student. During their fifth year, they will complete the M.S. in Adventure Leadership in Health and Recreation (ALHR) program as a graduate student. At the end of the program, they will have earned a B.S. in OAL or other appropriate B.S. degree with a minor in OAL and a M.S. in ALHR.

**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 B.S. in OAL prepares students for entry-level positions in the outdoor adventure industry (e.g., challenge course facilitators and outdoor adventure instructors and/or guides, etc.); however, it does not prepare graduates for positions as program coordinators or directors of operations.

A survey of students in MSU Billings' College of Allied Health Professions (CAHP) and education students within the Department of Health and Human Performance indicated that 16 of those students would be interested in applying for the M.S. in ALHR.

According to job search websites (aee.org, outdoored.com, bluefishjobs.com, and indeed.com) and the job list services of the two professional associations [Association of Outdoor Recreation Education (AORE), and the Association of Experiential Education (AEE)] over 498 jobs for directors or assistant directors in the following areas; outdoor recreation, outdoor education, adventure, or camp, or recreation. All either required a master's

## Montana University System INTENT TO PLAN FORM

degree or listed a M.S. as preferred qualification. Twelve percent (12%) of the listed jobs were within the Northern Rocky Mountain and Pacific Northwest region (Montana, Wyoming, Idaho, Colorado, Utah, North Dakota, South Dakota, Washington, and Oregon).

In addition, over 1000 jobs listed in the United States (e.g., indeed.com, iHireTherapy.com, AEE and the National Council for Therapeutic Recreation Certification) were seeking a “director” or “coordinator” of recreation, outdoor, adventure/wilderness, wellness/therapy. About half required a M.S. with the others preferring a master’s degree.

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

**Institutional mission fit** – This degree fits within MSU Billings’s mission by. 1) Extending excellence in teaching by attracting high quality students and instructors. 2) Supporting individual learning for those students and professionals who are seeking to become leaders in these fields. 3) Engaging in civic responsibility by providing collaborative service providers and education to students and professionals to fill a needed leadership gap in the industry, and 4) intellectual, cultural, social and economic community enhancement through the offering of an advanced degree program.

#### Strategic plan fit:

Core Theme One – Cultivating teaching excellence

A: This program will leverage blended pedagogies to enhance the learning and teaching experience.

B: An M.S. program will broaden the opportunities for faculty and student research through student theses and research projects.

D: Faculty and students will have opportunities to attend and present at professional conferences.

Core Theme Two – Providing an environment for learning

A: M.S. students will be integrated into the B.S. in OAL program as teaching and research assistants.

B: An M.S. program it will draw undergraduate students who are interested in completing their B.S. and M.S. degrees at one institution.

C: By its nature, a master’s program is an opportunity for growth. In a survey of current Health and Human Performance students, 16 indicated they would be likely to apply for the program.

D: Expansion of the MSUB graduate program.

G: This program focuses heavily on experiential learning and inter-disciplinary approaches.

Core Theme Three – Promoting and engaging in civic responsibility

A: While there are similar degrees in the area (e.g., South Dakota State’s M.S. in Sport and Recreation), most focus on municipal sports and recreation. The nearest opportunity to receive a M.S. similar to the one proposed is at the University of Idaho with a M.S. in Movement & Leisure Sciences: Emphasis in Leadership in Physical Activity and Recreation. UI’s degree is housed in the Department of Movement Sciences within the College of Education.

B & C: By offering this M.S., it will position MSU-Billings as a local and regional leader in this emerging field.

**Existing institutional program array fit** – The proposed program is an extension of the B.S. degrees in the Department of Health and Human Performance (i.e., B.S. in OAL and B.S. in Health and Human Performance with options in Health and Wellness, Human Performance, or Health and Physical Education) and the Department of

**Montana University System**  
**INTENT TO PLAN FORM**

Rehabilitation and Human Services (i.e., B.S. in Psychiatric Rehabilitation and the Certificate in Addiction Counseling Education) at Montana State University Billings.

**4) Describe how the program/center/institute overlaps, compliments, or duplicates existing efforts in the MUS.**

The proposed program will focus on the leadership, management, health and wellness aspects of outdoor adventure/recreation education and wellness programs at the coordinator and director level.

The University of Montana offers a M.S. in Parks, Tourism and Recreation Management (PTRM). One would choose MU's M.S. PTRM degree if they "... are interested in studying topics like recreation and tourism management, social, political and economic aspects of conservation, or wilderness, parks and protected area studies" (<http://www.cfc.umt.edu/grad/recreation/default.php>, retrieved 04/04/2017). UM's Graduate Certificate in Protected Area Management "...provides students and professionals with training and expertise in the key topics related to protected area management. Courses cover the history and philosophy of the global protected area system, laws and policy and international conventions" (<http://www.cfc.umt.edu/padep/>, retrieved 04/04/2017).

The proposed program and UM's M.S. in PTRM and Graduate Certificate may overlap, to a limited degree, with regard to job placement (e.g., owner/operator of an outdoor recreation business or municipal parks and recreation). However, based on the number available (see item 2 paragraph 3) we do not feel that the program would be unduly competing with UM's M.S. in PTRM. Our proposed program, being housed in the College of Allied Health Professions, also prepares students for the wellness/therapy aspects of other jobs (see item 2 paragraph 4), UM's PTRM does not; thus, there is no direct overlap.

UM's programs are housed in the College of Forestry and Conservation while ours will be housed in the College of Allied Health Professions. We see prospective students as having different interest (Healthcare and Education versus Forestry and Conservation). As such, we do not anticipate drawing from the same prospective student pool.

For these reasons, this proposed program is not a substantial duplication of the University of Montana's programs.

# Signatures

## Intent to Plan

Program/Institute/Center Title: Master of Science in Adventure Leadership in Health and Recreation

Campus: MSU-Bill, CAHP, HHP

Expected Submission Date: SEP 2017

### Signature/Date

College/School Dean:	<small>DocuSigned by:</small> <i>Diane Duin</i> <small>C5B56A54DC01433...</small>	4/10/2017
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Graduate Dean: <small>(Graduate academic programs only)</small>	<small>DocuSigned by:</small> <i>Diane Duin</i> <small>C5B56A54DC01433...</small>	4/10/2017
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Vice President Research: <small>(Research centers/institutes only)</small>		
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Chief Academic Officer:	<small>DocuSigned by:</small> <i>Robert Hoar</i> <small>AF2927FD8248448...</small>	4/10/2017
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Chief Executive Officer:	<small>DocuSigned by:</small> <i>Ron Larsen</i> <small>E9B7047DE1CA414...</small>	4/10/2017
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Flagship Provost:	<small>DocuSigned by:</small> <i>Robert Mokwa</i> <small>9EDD74A82C3A419...</small>	4/9/2017
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Flagship President:	<small>DocuSigned by:</small> <i>Waded Cruzado</i> <small>A782288C035847B...</small>	4/12/2017
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Date of Final Review: \_\_\_\_\_ May 2017 \_\_\_\_\_

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

September 12-13, 2018

**ITEM 180-2010-R0918**

**Item Name**

Request for authorization to establish a Master's of Arts in Teaching degree program

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**THAT**

Montana State University requests authorization from the Montana Board of Regents to establish a Master's of Arts in Teaching degree program.

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**EXPLANATION**

Recognizing the need to recruit and retain highly qualified teachers in Montana's schools, the Master's of Arts in Teaching (MAT) degree program leads to recommendation for initial licensure in K-8 Elementary Education as well as secondary (5-12) content areas such as social studies, math, and science. Building on students' previous college degree, the MAT coursework focuses on curricular design and pedagogy, field experience, and meeting the learning needs of all students. This provides an opportunity for prospective students who live in Montana and have a bachelor's degree in an area other than education to pursue the teaching profession.

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**ATTACHMENTS**

- Academic Proposal Request Form
- Curriculum Proposal Form
- Letters of Support
- Intent to Plan

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

ITEM 180-2010-R0918 Submission Month or Meeting: September 12-13, 2018

Institution: Montana State University CIP Code: 13.1202, 13.1203, 13.1204

Program/Center/Institute Title: Master of Arts - Teaching

Includes (please specify below): Online Offering X Options \_\_\_\_\_

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

     **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*

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X B. Level II:

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

**Proposal Summary** [360 words maximum]

**What:** A professional graduate degree - Master of Arts in Teaching (MAT) designed for those with earned a bachelor's degrees seeking program leading to recommendation for initial licensure to teach in Montana's public elementary or secondary schools.

**Why:** The call to educate preservice teachers to meet the workforce needs of Montana's rural school districts has risen to a fever pitch. Articles in the Billings Gazette throughout Fall 2016 painted the picture of eager students in some of the state's most rural classrooms waiting; uncertain if a teacher will arrive. Matt Hoffman (December 9, 2016), writing for the Billings Gazette, commented that solutions to address this challenge resemble bricks in a wall: each of them help, but none fixes things on their own." One such solution lies in developing an online Master of Arts in Teaching (MAT) degree program that leads to recommendation for initial licensure in K-8 Elementary Education as well as secondary (5-12) content areas such as social studies, math, and science. This provides an opportunity for prospective students who live in Montana and have a bachelor's degree in an area other than education to pursue the teaching profession.

**Resources:** We will need to hire additional faculty to develop and teach the MAT curriculum. Where possible, we have used pre-existing course rubrics and have given careful consideration to how the proposed MAT curriculum can be taught "in load" by current TT faculty. We request an additional staff position for the identification, management, and supervision of field experiences. This person will also assist with background checks, state standard compliance, and processing recommendations for licensure with the Office of Public Instruction. We also request additional resources (\$300 per enrolled student) to compensate for field experience supervision.

**Relationship to similar MUS programs:** Currently, no institution in the Montana University system offers a comprehensive online program that leads to initial licensure in K-8 Elementary Education or 5-12 secondary education in social studies, math, or science. MSU-Billings offers a K-12 Reading Endorsement online, but this is a program that adds an endorsement to an existing teaching license. The proposed Master of Arts in Teaching (MAT) will lead to initial licensure. All other K-8 Elementary Education programs and secondary (5-12) education programs in the MUS are offered as residential programs. Therefore, the online MAT compliments, rather than duplicates, existing programs that lead to initial licensure.

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**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 Master of Arts in Teaching (MAT) is a professional master's degree designed for those who have earned a bachelor's degrees but seek to complete the pedagogical coursework and field experience to be recommended for initial licensure to teach in Montana's public elementary or secondary schools.

- 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]*

**Access:** "Montana State University is committed to widening access to higher education and ensuring equality of opportunity for all." - MSU Strategic Plan. The online MAT program will promote increased access to continuing higher education for place-bound students.

**Engagement:** "Members of the Montana State University community will be leaders, scholars and engaged citizens of their local, national and global communities, working together with community partners to exchange and apply knowledge and resources to improve the human prospect." The MAT program promotes engagement through the summer youth inquiry camp. This innovative field experience applies MAT students' pedagogical knowledge in a summer camp format to benefit local youth.

**Outreach,** as the land grant university, MSU-Bozeman is committed to responding to the needs of the state. The cry for teachers in rural Montana has risen to a fever pitch. The proposed degree program would provide a pathway for people who have bachelor's degrees in areas outside of education to pursue recommendation for licensure and respond to this critical need in their community.

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

This submission was developed by a committee of faculty and staff who teach and support MSU-Bozeman's current Teacher Education program and are knowledgeable about Montana's requirements for initial teacher licensure. The committee researched MAT programs across the United States, reviewed PEPPS standards that guide initial teacher licensure in Montana, discussed needs of rural Montana with teachers, school leaders, and potential degree candidates, and developed a draft curriculum plan. The degree program proposal was discussed with faculty at several times in August and September 2017 and received a vote of unanimous support at the faculty meeting on September 12, 2017.

- 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	36

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Credits in required courses offered by other departments	0
Credits in institutional general education curriculum	0
Credits of free electives	0
Total credits required to complete the program	36

- 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.

The Interstate New Teacher Assessment and Support Consortium (INTASC) is a consortium of state education agencies and national educational organizations dedicated to the reform of the preparation, licensing, and on-going professional development of teachers. The work of INTASC is guided by one basic premise: An effective teacher must be able to integrate content knowledge with the specific strengths and needs of students to assure that all students learn and perform at high levels.

1. Content Pedagogy - The teacher understands the central concepts, tools of inquiry, and structures of the discipline he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.
2. Student Development - The teacher understands how students learn and develop, and can provide learning opportunities that support their intellectual, social, and personal development.
3. Diverse Learners - The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.
4. Multiple Instructional Strategies - The teacher understands and use a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.
5. Motivation & Management - The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.
6. Communication & Technology - The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
7. Planning- The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.
8. Assessment- The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.
9. Reflective Practice - The teacher is a reflective practitioner who continually evaluates the effects of his or her choices and actions on others (students, parents, and other professionals in the learning community) and actively seeks out opportunities to grow professionally.

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10. School & Community Involvement - The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being

In addition, the State of Montana ARM 10.58.501(1)(a)-(m) requires that successful teacher candidates:

**(a)** demonstrate understanding of and ability to integrate knowledge of the history, cultural heritage, and contemporary status of American Indians and tribes in Montana;

**(e)** demonstrate understanding of personal cultural and socioeconomic biases and teaching style differences that affect one's teaching;

**(m)** demonstrate the ability to foster contextual and experiential learning and to build connections between academic learning and the skills required in the present and future workforce.

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]*

Nationally, the percentage of college students who major in education has declined substantially in the last decade. Couple this national decline with rural Montana's teacher workforce shortage and the need for a creative solution to educate and license new teachers is apparent.

In an effort to understand the challenge of recruitment and retention in rural Montana's school districts, the Office of the Commission of Higher Education convened the Rural Education Task Force to study this issue and make substantive recommendations. The task force is working to develop an Education Pathway that would combine dual enrollment educator prep courses with online and face to face offerings to ensure a seamless pipeline (Montana MUS Recruitment and Retention Task Force White Paper, 2016).

One pathway lies in developing an online Master of Arts in Teaching (MAT) degree program that leads to recommendation for initial licensure in K-8 Elementary Education as well as secondary (5-12) content areas. This provides an opportunity for prospective students who have a bachelor's degree in an area other than education to pursue the teaching profession. Recognizing the value of students' previous college degree, the MAT coursework focuses on curricular design and pedagogy, field experience, and meeting the learning needs of all students. Moreover, this graduate program is primarily online with students engaged in early field experiences and intensive teaching academies limited to 1-week per summer. This delivery format enables students to maintain full-time employment in their home community for the majority of their degree coursework.

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

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Currently, no institution in the Montana University system offers a comprehensive online program that leads to initial licensure in K-8 Elementary Education or 5-12 secondary education in social studies, math, or science. MSU-Billings offers a K-12 Reading Endorsement online, but this is a program that adds an endorsement to an existing teaching license. The proposed Master of Arts in Teaching (MAT) will lead to initial Class 1 licensure. All other K-8 Elementary Education programs and secondary (5-12) education programs in the MUS are offered as residential programs. Therefore, the online MAT compliments, rather than duplicates, existing programs that lead to initial licensure.

- 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]*
- 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]*

Through the Montana Council of Deans of Education regular meetings, we have been in communication with our departmental colleagues at all Montana Education Preparation Provider programs from the earliest stages of development. The proposal has received wide-ranging support, particularly in terms of sharing information on online undergraduate content coursework that we expect many prospective students will likely need to complete in preparation for the MAT.

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]*

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

Fall Headcount Enrollment					Graduates				
AY 19-20	AY 20-21	AY 21-22	AY 22-23	AY 23-24	AY 19-20	AY 20-21	AY 21-22	AY 22-23	AY 23-24
20	30	40	40	40	20	30	40	40	40

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

Initial enrollment numbers were determined by historical enrollment figures in the former Northern Plains Transition to Teaching program enrollment figures, which ranged from 55-90 students per year.

Education Department staff field multiple phone and email inquiries concerning post-baccalaureate teacher licensure options weekly. We currently support approximately 20 in-service teachers who are on a Class V Provisional license through the Office of Public Instruction.

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- c. What is the initial capacity for the program?

The initial capacity is 10 graduate students in the elementary education track and 10 graduate students in the secondary education track. Given the diversified content of the secondary education track, we expect to initially accept students as cohorts in a more narrowly defined set of content areas; for example, 5 secondary students pursuing "General Science Broadfield" stream and 5 secondary students pursuing "Social Studies Broadfield." As the program develops, we will add cohorts for a full compliment of secondary endorsement areas.

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]*

- 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]*

Assessment of the program's effectiveness will be ongoing. Signature assignments, as a measure of formative assessment, will be assessed through the completion of coursework.

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

We will use a number of measures to assess program effectiveness.

- Number of program applicants.
- Enrollment
- Praxis and performance assessments in program.
- Teacher licensure recommendation
- Montana teacher licenses granted
- Job placement in and out of state

Montana State University was one of the Education Preparation Providers to be accredited through the Council for the Accreditation of Educator Preparation (CAEP) IB Pathway on May 10, 2016. As an initial licensure program, the MAT will use formative (signature assignments) and summative assessments (TWS and field performance assessment) as they align with state and national standards. For state accreditation, the MAT will align with the Professional Educator Preparation Program Standards (PEPPS). For national accreditation, we will address the five standards set forth by CAEP.

- Standard 1. Content and Pedagogical Knowledge
- Standard 2. Clinical Partnerships and Practice
- Standard 3. Candidate Quality, Recruitment, and Selectivity
- Standard 4. Program Impact

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

We will initiate a continuous improvement processes similar to the undergraduate Teacher Education Program. This includes surveys and focus groups with students, staff, faculty, school partners and

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cooperating teachers (those who host student teachers) to identify areas for improvement and points of pride.

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

Montana State University-Bozeman will continue have our initial teacher licensure programs accredited nationally through the Council for the Accreditation of Educator Preparation (CAEP) in addition to state accreditation from the Office of Public Instruction.

**9. Physical resources.**

- a. Describe the existing 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]*

As this is an online program, with the exception of the summer camp experience, no existing facilities are needed. During the summer camp experience (4 days in August), we will use space available in Reid Hall as well as outdoor space on campus.

- b. List needed 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.

**10. Personnel resources.**

- a. Describe the existing 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]*

Department of Education and the College of Education, Health & Human Development have supported the development of the proposed curriculum and will continue to support curriculum development in preparation for the first student cohort.

Where possible, we have used pre-existing course rubrics and have given careful consideration to how the proposed MAT curriculum can be taught "in load" by current TT faculty.

- b. Identify new 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]*

We will need to hire additional faculty to develop and teach the MAT curriculum. We request an additional staff position for the identification, management, and supervision of field experiences. This person will also assist with background checks, state standard compliance, and processing recommendations for licensure with the Office of Public Instruction. We also request additional resources (\$300 per enrolled student) to compensate for field experience supervision.

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**CURRICULUM PROPOSAL FORM**

**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 to meet the needs of 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]*

With the exception of the summer camp experience, this program is entirely online. The on-campus student services will not be impacted by program enrollment. Online services (registration, degree auditing, etc.) and technology portals (Brightspace/D2L) will need to be at a level sufficient to meet the needs of 40 additional students. This is a factor germane to any level of increased enrollment.

**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	181,041	276,262	362,082
Expenses	174,289	183,689	258,081
Net Income/Deficit (revenues-expenses)	6,752	92,573	104,001

- 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]*

In the first year, the Department of Education will seek support from the College of Education, Health & Human Development to invest in the program. In subsequent years, the degree program is revenue-generating.

Montana Board of Regents  
CURRICULUM PROPOSAL FORM

- 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.

We request an additional staff position for the identification, management, and supervision of field experiences. This person will also assist with background checks, state standard compliance, and processing recommendations for licensure with the Office of Public Instruction. We anticipate requesting this position as part of base funding in FY20.

- 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]

N/A

- 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.

We expect to impose a fee for student teaching of \$100 which is consistent with the fee associated with the undergraduate Teacher Education Program.

- 14. Complete the fiscal analysis form.

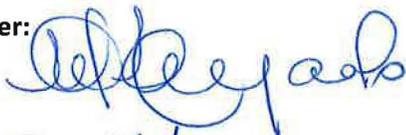
Signature/Date

College or School Dean:



5.15.18

Chief Academic Officer:  5-29-18

Chief Executive Officer: 

Flagship Provost\*:  5-29-18

Flagship President\*:  May 29, 2018  
September 2018 Level II Memorandum

\*Not applicable to the Community Colleges.

Montana Board of Regents  
CURRICULUM PROPOSAL FORM

\*Not applicable to the Community Colleges.

**Appendix A – Proposed New Curriculum**

**MAT Coursework and Schedule**  
**Elementary Program for Review**

**Summer**

EDCI 556: The Legal, Social, and Practical Basis of Schooling	(3 cr)
EDCI 5XX: Language Acquisition, Literacy, and Assessment	(3 cr)
EDCI 5XX: Summer Youth Inquiry	(3 cr)
<u>EDCI 5XX: Linguistic and Cultural Diversity</u>	<u>(3 cr)</u>

Total 12 Credits

**Fall**

**First 8 Weeks:**

EDCI 554: Methods 1: Curriculum Design, Pedagogy and Assessment	(3 cr)
EDCI 551: Education Technology: Teaching, Learning, and Leadership	(3 cr)

**Second 8 Weeks:**

EDCI 558: Methods 2 – Internship: Methods of Teaching	(3 cr)
<u>EDCI 604: Advanced Educational Psychology</u>	<u>(3 cr)</u>

Total 12 Credits

**Spring**

**Semester-Long:**

EDCI 598: Student Teaching	(6 cr)
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**First 8 Weeks:**

EDCI 553: Diversity, Special Needs, and Classroom Discipline	(3 cr)
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**Second 8 Weeks:**

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

EDCI XX: Reflective Inquiry in Rural Education

(3 cr)

Total 12 Credits

Program Total: 36 credits

**Admission standards will include the following:**

- Transcript
- Passing Praxis CASE or Praxis 2
- Background Check
- Writing Sample - Statement of Prof Objectives. (A prompt that asks why they want to teach and/or narrative about their education experiences.)
- Resume
- 2 recommendations -current/previous employer, professor.

For each admitted student, we will use our the MSUS Licensure/Endorsement Assessment Tool to determine applicable coursework from bachelor's degree and recommend supplementary coursework.

**Course Descriptions**

**EDCI 556: The Legal, Social, and Practical Basis of Schooling (3 Cr)**

This is a course on the history of American educational traditions, institutions, practices, policies, and legal rulings as configured within the framework of democratic institutions. This course informs the judgment of teachers by helping them understand schools as integral with the social, political, ideological, economic, and cultural contexts of the societies they serve. Includes practical information on governance structures, unions, school law, ethics, and the culture of the school as a professional workplace.

**EDCI 5XX: Language Acquisition, Literacy, and Assessment (3 Cr)**

The summer prep course serves as a unique introduction to the MSU MAT program for those interested in teaching in elementary schools. This course engages students in the current theory concerning emergent literacy, exploring the structure and function of the English language. Emphasis is on a balanced approach which includes phonics and other cue systems. Using authentic children's literature, students learn developmentally appropriate classroom practices, assessment, and individualization.

**EDCI 5XX: Summer Youth Inquiry Methods of Art, Music, and Health Enhancement (3 Cr)**

The summer prep course serves as a unique introduction to the MSU MAT program focused on teaching in elementary contexts. The course includes an introduction to curriculum and lesson planning, with a special focus on arts education, music education, physical education, and the critical role that literacy instruction plays across all content areas.

**Summer Camp** - MAT students plan and run a four-day inquiry-based, experiential learning summer camp for youth going into grades K-8. MAT students are present on campus at MSU Bozeman for ten days. The course begins six weeks prior online.

- 10 days on campus/6 weeks online to total 8 weeks for MAT students
- 4 days for youth campers (9am-3:30pm)

## Montana Board of Regents

### CURRICULUM PROPOSAL FORM

- Subject Areas Covered: Math, Life/Earth/Phys science (integrated?), Social Sciences/Language Arts - Reading/Writing, Engineering (Applied Math/Sci), Art,
  - Inquiry-based models: project-based inquiry that works in multiple curricular realms.
  - Stations for subject areas of inquiry. Some combined. Teachers construct 4 days of inquiry-based activities within their endorsement area.
  - Daily walking field trips around and near campus. For example: [MSU Space Science and Engineering Lab & http://solar.physics.montana.edu/ypop/Classroom/Lessons/Model/](http://solar.physics.montana.edu/ypop/Classroom/Lessons/Model/)
  - Initial 6 weeks online to develop content-specific activities.

#### **EDCI 5XX: Linguistic and Cultural Diversity (3 Cr)**

Students will learn how to enhance instruction and adapt materials to make their content comprehensible to English Language Learners (ELLs) in regular classroom settings. An examination of second language development and socio-cultural factors that affect academic performance will be conducted. American Indian ELLs, who make up the majority of ELLs in Montana, will be the focus. Best practices for helping linguistically and culturally-diverse learners' development of academic language and literacy skills will be addressed. The SIOP (Sheltered Instruction Observation Protocol) Model, a comprehensive, research-validated approach to making content comprehensible for ELLs, and the 7 Essential Understandings that form the expression of the State of Montana's the Indian Education for All act will be reviewed.

#### **EDCI 554: Methods 1: Curriculum Design, Pedagogy and Assessment (3 Cr)**

Curriculum, Design, Ped, Assessment: This is a course on the pedagogical dimensions of schooling. We cover practical strategies for the design and implementation of curriculum, the design and effective uses of evaluation, alignment of curriculum and assessments with standards, and strategies for meeting the needs of all learners by means of appropriate accommodations, adjustments, and interventions. This course integrates the topics of curriculum design, pedagogy, and assessment. Elementary Program will focus on Math and Science Instruction

#### **EDCI 551: Education Technology: Teaching, Learning, and Leadership (3 Cr)**

This course provides MAT students with a foundation for the skills needed to effectively integrate technology into teaching in order to enhance student learning. A unique component of this course will include the integration of the Montana Office of Public Instruction's Learning Hub, through which MAT students will examine discipline-specific instruction targeted at the content area in which they are seeking licensure. Students will then produce a wide array of digital learning tools for integration aligned to those content-specific pedagogies, and evaluate when and where technology can most effectively be used to motivate and engage students, and deliver effective instruction.

#### **EDCI 558: Internship 2 - Methods of Teaching (3 Cr)**

This course provides a research and classroom based study of general teaching methods and covers topics such as culturally responsive teaching, differentiated instruction, and data-driven decision making. Topics also include strategies to promote student understanding, meeting the needs of ESL students, lesson delivery, motivational techniques for instruction and assessment, and effective work with families and colleagues. Gen Methods w/ internship/practicum. Elementary program will focus on Social Studies and Language Arts instruction.

#### **EDCI 604: Advanced Educational Psychology (3 Cr)**

An examination of theory and research related to the diverse learning, motivation, and health needs of K-12 students.

#### **EDCI 553: Diversity, Special Needs, and Classroom Discipline (3 Cr)**

Through scholarship and in-class practice, each class member will develop a theoretical and practical understanding of behavioral management. The course will also explore categories of exceptionality and implications for educators focusing on the historical, societal, familial and educational attitudes; legal requirements of Preschool Amendments, IDEA and ADA including IEPs, IFSPs, 504s, FBAs, and BIPs.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

**EDCI 5XX: Reflective Inquiry in Rural Education (3 Cr)** The course provides a forum for critical and reflective inquiries into the claims, concerns, issues and questions that affect provisions of educational programs and opportunities for people living in the rural areas of Montana including Indian reservations and other communities in other states. The primary focus of this course will be rural schools and their complexities. Attention will also be paid to the issues and concerns of schools found in rural contexts. This course discusses today's rural-school issues and identifies the needs of the learner and rural communities.

**EDCI 598: Student Teaching (6 cr)**

Student Teaching is 14 week full time engagement where the teacher candidate works side by side with a licensed teacher in a classroom setting. The teacher candidate is enrolled in a companion online course where student teaching assignments and research-based reflective portfolio (TWS) are assessed and teacher candidates connect with each other in discussions. A cooperating teacher, field supervisor and clinical evaluation assist the teacher candidate in completing EDCI 598.

## **MAT Coursework and Schedule**

### **Secondary Program for Review**

**Summer**

EDCI 556: The Legal, Social, and Practical Basis of Schooling (3 cr)

EDCI 5XX: Content Literacy Research (3 cr)

EDCI 5XX: Summer Youth Inquiry Camp (3 cr)

EDCI 5XX: Linguistic and Cultural Diversity (3 cr)

Total 12 Credits

**Fall**

**First 8 Weeks:**

EDCI 554: Methods 1: Curriculum Design, Pedagogy and Assessment (3 cr)

EDCI 551: Education Technology: Teaching, Learning, and Leadership (3 cr)

**Second 8 Weeks:**

EDCI 558: Methods 2 – Internship: Methods of Teaching (3 cr)

EDCI 604: Advanced Educational Psychology (3 cr)

Total 12 Credits

**Spring**

**Semester-Long:**

EDCI 598: Student Teaching (6 cr)

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**CURRICULUM PROPOSAL FORM**

**First 8 Weeks:**

EDCI 553: Diversity, Special Needs, and Classroom Discipline (3 cr)

**Second 8 Weeks:**

EDCI XX: Reflective Inquiry in Rural Education (3 cr)

Total 12 Credits

**Program Total: 36 credits**

Admission standards will include the following:

- Transcript
- Passing Praxis CASE or Praxis 2
- Background Check
- Writing Sample - Statement of Prof Objectives. (A prompt that asks why they want to teach and/or narrative about their education experiences.)
- Resume
- 2 recommendations -current/previous employer, professor.

For each admitted student, we will use our the MSUS Licensure/Endorsement Assessment Tool to determine applicable coursework from bachelor's degree and recommend supplementary coursework.

**Course Descriptions****EDCI 556: The Legal, Social, and Practical Basis of Schooling (3 Cr)**

This is a course on the history of American educational traditions, institutions, practices, policies, and legal rulings as configured within the framework of democratic institutions. This course informs the judgment of teachers by helping them understand schools as integral with the social, political, ideological, economic, and cultural contexts of the societies they serve. Includes practical information on governance structures, unions, school law, ethics, and the culture of the school as a professional workplace.

**EDCI 5XX: Content Literacy Research (3 Cr)**

The summer prep course serves as a unique introduction to the MSU MAT program for those interested in teaching in middle school and high school contexts, with a dual focus on literacy and the content and structure of the discipline/content area in which the student is seeking licensure. More specifically, the course will engage students through readings and discussion in an examination of the role literacy instruction plays in the teaching and learning of that content area. Students will complete research in content pedagogy.

**EDCI 5XX: Summer Youth Inquiry (3 Cr)**

**Summer Camp** - MAT students plan and run a four-day inquiry-based, experiential learning summer camp for youth going into grades 5-12. MAT students are present on campus at MSU Bozeman for ten days. The course begins six weeks prior online.

## Montana Board of Regents

### CURRICULUM PROPOSAL FORM

- 10 days on campus/6 weeks online to total 8 weeks for MAT students
- 4 days for youth campers (9am-3:30pm)
- Subject Areas Covered: Math, Life/Earth/Phys science (integrated?), Social Sciences/Language Arts - Reading/Writing, Engineering (Applied Math/Sci), Art,
  - Inquiry-based models: project-based inquiry that works in multiple curricular realms.
  - Stations for subject areas of inquiry. Some combined. Teachers construct 4 days of inquiry-based activities within their endorsement area. EEd will develop assorted stations within STEAM + health education.
  - Daily walking field trips around and near campus. For example: [MSU Space Science and Engineering Lab & http://solar.physics.montana.edu/ytop/Classroom/Lessons/Model/](http://solar.physics.montana.edu/ytop/Classroom/Lessons/Model/)
  - Initial 6 weeks online to develop content-specific activities.

#### **EDCI 5XX: Linguistic and Cultural Diversity (3 Cr)**

Students will learn how to enhance instruction and adapt materials to make their content comprehensible to English Language Learners (ELLs) in regular classroom settings. An examination of second language development and socio-cultural factors that affect academic performance will be conducted. American Indian ELLs, who make up the majority of ELLs in Montana, will be the focus. Best practices for helping linguistically and culturally-diverse learners' development of academic language and literacy skills will be addressed. The SIOP (Sheltered Instruction Observation Protocol) Model, a comprehensive, research-validated approach to making content comprehensible for ELLs, and the 7 Essential Understandings that form the expression of the State of Montana's the Indian Education for All act will be reviewed.

#### **EDCI 554: Methods 1: Curriculum Design, Pedagogy, and Assessment (3 Cr)**

Curriculum, Design, Ped, Assessment: This is a course on the pedagogical dimensions of schooling. We cover practical strategies for the design and implementation of curriculum, the design and effective uses of evaluation, alignment of curriculum and assessments with standards, and strategies for meeting the needs of all learners by means of appropriate accommodations, adjustments, and interventions. This course integrates the topics of curriculum design, pedagogy, and assessment.

#### **EDCI 551: Education Technology: Teaching, Learning, and Leadership (3 Cr)**

This course provides MAT students with a foundation for the skills needed to effectively integrate technology into teaching in order to enhance student learning. A unique component of this course will include the integration of the Montana Office of Public Instruction's Learning Hub, through which MAT students will examine discipline-specific instruction targeted at the content area in which they are seeking licensure. Students will then produce a wide array of digital learning tools for integration aligned to those content-specific pedagogies, and evaluate when and where technology can most effectively be used to motivate and engage students, and deliver effective instruction.

#### **EDCI 558: Internship 2 - Methods of Teaching (3 Cr)**

This course provides a research and classroom based study of general teaching methods and covers topics such as culturally responsive teaching, differentiated instruction, and data-driven decision making. Topics also include strategies to promote student understanding, meeting the needs of ESL students, lesson delivery, motivational techniques for instruction and assessment, and effective work with families and colleagues. Gen Methods w/ internship/practicum

#### **EDCI 604: Advanced Educational Psychology (3 Cr)**

An examination of theory and research related to the diverse learning, motivation, and health needs of K-12 students.

#### **EDCI 553: Diversity, Special Needs, and Classroom Discipline (3 Cr)**

Through scholarship and in-class practice, each class member will develop a theoretical and practical understanding of behavioral management. The course will also explore categories of exceptionality and implications for educators focusing on the historical,

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

societal, familial and educational attitudes; legal requirements of Preschool Amendments, IDEA and ADA including IEPs, IFSPs, 504s, FBAs, and BIPs.

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**EDCI 598: Student Teaching (6 cr)**

Student Teaching is 14 week full time engagement where the teacher candidate works side by side with a licensed teacher in a classroom setting. The teacher candidate is enrolled in a companion online course where student teaching assignments and research-based reflective portfolio (TWS) are assessed and teacher candidates connect with each other in discussions. A cooperating teacher, field supervisor and clinical evaluation assist the teacher candidate in completing EDCI 598.

**Academic Degree Program Proposal - Fiscal Analysis Form**

**CAMPUS:** Bozeman  
**AWARD LEVEL:** GR  
**PROGRAM NAME:** Master of Science in Data Science  
**PROGRAM CODE:** MADS

ENROLLMENT PROJECTIONS		FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
<b>Headcount</b>						
annual unduplicated headcount of students with declared major or minor within the program		0	15	27	26	32
<b>Credit Hours</b>						
annual avg. credits hours earned per student in program related curriculum		0	15	15	15	15
<b>Student FTE</b>						
Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24		0	9.375	16.875	16.25	20
<b>Completions</b>						
Annual number of program completers		0	0	15	12	14

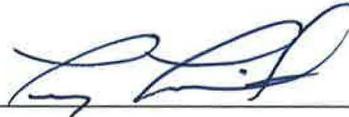
REVENUE		FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Tuition Revenue (net of waivers)			\$20,671	\$45,477	\$53,746	\$66,148
Institutional Support						
Other Outside Funds (grants, gifts, etc.)						
Program Tuition/Fees			\$351	\$421	\$491	\$562
<b>Total Revenue</b>		\$0	\$21,022	\$45,898	\$54,237	\$66,710
<b>Total Revenue per Student FTE</b>		\$0	\$2,242	\$2,720	\$3,338	\$3,336

EXPENDITURES		FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Tenure Track Faculty	FTE					0.4
	Salary + Benefits					\$38,051
Non-tenure Track Faculty <small>*Includes Adjunct Instructors</small>	FTE					
	Salary + Benefits					
Graduate Teaching Assistants	FTE					
	Salary + Benefits					
Staff	FTE				0.3	0.3
	Salary + Benefits				\$10,195	\$10,195
<b>Total Faculty &amp; Staff</b>	FTE	0.0	0.0	0.0	0.3	0.7
	Salary + Benefits	\$0	\$0	\$0	\$10,195	\$48,246

Operations (supplies, travel, rent, etc)			\$2,000	\$2,000	\$2,000	\$3,000
Start-up Expenses (OTO)						\$10,000
<b>Total Expenses</b>		\$0	\$2,000	\$2,000	\$12,195	\$61,246

<b>Student FTE to Faculty (TT + NTT) Ratio</b>	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	50.0
<b>Net Income/Deficit (Revenue - Expenses)</b>	\$0	\$19,022	\$43,898	\$42,042	\$5,464

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.



Campus Chief Financial Officer Signature

Chief Financial Officer Comments

25 January, 2018

Michael Babcock, Ph.D., Chair  
Abigail Richards, Ph.D., Chair-elect  
Faculty Senate  
Montana State University  
Bozeman, MT 59717

Dear Drs. Babcock and Richards:

The University Graduate Council (UGC) of Montana State University has completed its review of the level II proposal for a Master of Arts in Teaching (MAT) submitted by the Department of Education. Below is an overview of the proposal review, which extends into last semester, and some areas of concern.

On November 14, 2017, Dr. Tricia Seifert, Dr. Ann Ewbank and Nigel Waterton of the Department of Education presented the Master of Arts in Teaching (MAT) proposal to the UGC. Following the presentation, UGC discussed the proposal and then asked the applicants to respond to a series of questions. The proposal, along with responses from Education, were again discussed at the November 28th and January 17th meetings. Overall, the Council finds the proposal to have merit in addressing the workforce needs of Montana's rural school districts by providing opportunities for prospective students to pursue the teaching profession. Additionally, by providing a primarily online delivery, it will allow students to maintain employment in their communities, enabling a greater amount of students to participate.

While the UGC is in support of the proposal, it has identified several areas of concern. These include:

1. *The proposal, as described, will be taught, at least initially, by NTT faculty. The Council believes that a transition plan, both programmatically and fiscally, should be included that will allow for the transition, over a specified period, to a program taught primarily by Tenured and TT faculty.*
2. *The proposal does not indicate how a student will acquire any specialized content, in areas including Social Studies, Math and Science, in addition to the MAT coursework.*
3. *The Council is concerned about sufficient funding for both T/TT faculty, as mentioned in #1 above and if funding is included for additional content areas mentioned in #2 above.*

The UGC voted to endorse the proposal, with one abstention, on January 17, 2018 and sent it forward to the Faculty Senate.

Respectfully submitted,

Christopher Livingston, Chair, Dr. Robert Rydell, Dr. James Becker  
UGC Curriculum Committee Sub-Group

Cc: Karlene Hoo, John Borkowski, Tricia Seifert

**School of Architecture**

160 Cheever Hall  
P.O. Box 173760  
Bozeman, MT 59717-3760  
[www.arch.montana.edu](http://www.arch.montana.edu)

Tel (406) 994-4255  
Fax (406) 994-4257  
Email [architect@montana.edu](mailto:architect@montana.edu)



MUS Board of Regents  
PO Box 203201  
2500 Broadway St  
Helena, MT 59620-3201

10/24/2017

Dear Board of Regents,

I am writing in support of the MSU Education Department proposal for a Masters of Arts in Teaching.

As I would hope you have heard we have been facing with a teacher shortage crisis, particularly in rural Montana. The Education Department on the campus of Montana State University has been a leader in the state working to address this issue and their proposed Masters of Arts in Teaching is yet another example of their initiative, innovation, and insight.

There is no one single solution to mitigating this crisis in for rural schools. There is ample research and experience that speaks to a multifaceted approach as the key to success. As noted previously this proposal would become yet another response by the Education Department at MSU and compliments their other work along with work being conducted by other stakeholders in Montana, all of which the leaders at MSU are aware of and in many cases, are at the table with us.

The overarching goals of any work in recruiting and retaining teachers in Montana public schools are two-fold.

- 1) Increase the number of qualified candidates in the overall candidate pool.
- 2) Ensure the quality of qualified candidates entering the candidate pool.

This proposal accomplishes both and to a noteworthy degree. Leaders in the MSU Education Department believe that their first cadre of students in this program would be significant and the plans they have shared with me clearly demonstrate their commitment to the development of quality educators.

In a recent report from the Rural School and Community Trust, Montana is educationally the most rural state in the country with 75% of its public schools in a rural school district and 95% of the school districts being identified as rural. It is clear that rurality in Montana is the rule rather than the exception and teacher recruitment into rural areas in any state, but particularly in Montana, is at a crisis pitch.

On behalf of the Montana Rural Education Association leadership, its members, and the many rural school districts across Montana we ask for your serious consideration of this proposal and are hopeful for your approval.

Respectfully,

Dennis Parman  
Executive Director, Montana Rural Education Association

Dear Dr. Seifert,

I have looked over the MSU proposed plan to add a Master of Arts in Teaching (MAT) degree for elementary and secondary programs. This proposal is the first step in the approval process that will ultimately lead to the Board of Public Education's final action, possibly as early as May 2018. I want to commend the attention the MSU proposal has paid to the teacher shortage in Montana by providing a robust program of study using a blended delivery model: a program that includes in-person and online study. The in-person immersion experience into teaching is exciting and innovation. The Summer Youth Inquiry Summer Camp provides MAT candidates the opportunity to work directly with Montana K-12 kids.

I look forward to the application of this proposal to the Board of Public Education. The Office of Public Instruction supports the proposal and looks forward to working with you as you traverse the approval process.

Sincerely,  
Linda Vrooman Peterson



**Linda Vrooman Peterson, Ph.D.**  
Accreditation & Educator Preparation  
Administrator  
Montana Office of Public Instruction

- Phone: 406-444-5726
- Website: <http://opi.mt.gov/>
- Email: [lvpeterson@mt.gov](mailto:lvpeterson@mt.gov)

## Montana University System

### NOTICE OF INTENT TO PLAN

Program/Institute Title: Master of Arts in Teaching  
Campus, School/Department: MSU-Bz, Department of Education  
Contact Name/Info: Tricia Seifert, tricia.seifert@montana.edu  
Expected Submission Date: MAR 2017

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.

For more information regarding the Intent to Plan process, please visit the Academic and Student Affairs Handbook.

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

The program is a master's degree program that leads to recommendation for Class II Montana Teaching Certification/Licensure (standard licensure). The required coursework comprises 30 graduate credits. Depending on endorsement area, additional undergraduate coursework in subject matter areas or teaching methods may be necessary.

**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 call to educate preservice teachers to meet the workforce needs of Montana's rural school districts has risen a fever pitch. Articles in the Billings Gazette throughout Fall 2016 have painted the picture of eager students in some of the state's most rural classrooms waiting uncertain if a teacher will arrive. One article shares how 7th and 8th grades students from Vida, Montana were bussed 30 miles away to Circle, Montana because of the shortage (Wittpen, September 25, 2016). Another (Hoffman, December 27, 2016) displays teaching areas with the greatest vacancies in 2015-16 according to the Office of Public Instruction. These include Special Education (191), Career & Technical Education (86), Math (80), and Music (65). Nationally, the percentage of college students who major in education has declined substantially in the last decade. Couple this national decline with rural Montana's teacher workforce shortage and the need for a creative solution to educate and license new teachers is apparent.

In an effort to understand the challenge of recruitment and retention in rural Montana's school districts, the Office of the Commission of Higher Education convened the Rural Education Task Force to study this issue and make substantive recommendations. Matt Hoffman (December 9, 2016), writing for the Billings Gazette, commented that solutions to address this challenge resemble bricks in a wall: each of them help, but none fixes things on their own." Some solutions include: higher salaries for beginning teachers (the most recent available national data place Montana beginning teachers as the lowest paid in the nation), bonus pay for beginning teachers who teach in high-needs schools and stay for three years, student loan forgiveness, school-owned housing, offering scholarships to preservice teachers to student teach in rural schools (the recently initiated Rural Educator Fellows Program)

One such solution lies in developing an online Master's of Arts in Teaching (MAT) degree program that leads to recommendation for initial licensure in K-8 Elementary Education as well as secondary (5-12) content areas such as social studies, math, and science. This provides an opportunity for prospective students who live in Montana and have a bachelor's degree in an area other than education to pursue the teaching profession. Recognizing the value of students' previous college degree, the MAT coursework focuses on curricular design and pedagogy, field experience, and meeting the learning needs of all students. Moreover, this program is primarily online with students engaged in early field experiences and intensive teaching academies limited to 1-week per summer. This delivery format enables students to maintain full-time employment in their home community for the majority of their degree coursework.

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

The online Master's of Arts in Teaching (MAT) degree program supports MSU-Bozeman's land-grant mission to serve the citizens of Montana in the following ways. First, it will allow place-bound students in rural areas of Montana to complete the majority of their degree program at a distance, eliminating the need to relocate to Bozeman to further their education. Second, the degree program will address the critical shortage of K-12 teachers in rural areas of Montana by providing an avenue for those who live and work in rural communities to pursue teaching positions in those communities without the expense of relocating to Bozeman to complete their degree program.

The online Master's of Arts in Teaching (MAT) degree program compliments MSU-Bozeman's existing K-8 Elementary Education major and secondary (5-12) content area majors by offering an expanded opportunity for career changers and those who hold a bachelor's degree to pursue the teaching profession. We have excellent faculty in the Department of Education and across the university who can support the development and delivery of the proposed degree program.

**4) Describe how the proposed program/center/institute overlaps, complements, or duplicates existing entities or offerings within the MUS system?**

Currently, no institution in the Montana University system offers a comprehensive online program that

February 2, 2017

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leads to initial licensure in K-8 Elementary Education or 5-12 secondary education in social studies, math, or science. MSU-Billings offers a K-12 Reading Endorsement online, but this is a program that adds an endorsement to an existing teaching license. The proposed Master's of Arts in Teaching (MAT) will lead to initial licensure. All other K-8 Elementary Education programs and secondary (5-12) education programs in the MUS are offered as residential programs. Therefore, the online MAT compliments, rather than duplicates, existing programs that lead to initial licensure.

# Signatures

## Intent to Plan

Program/Institute/Center Title: Master of Arts in Teaching  
 Campus: MSU-Bz, Department of Education  
 Expected Submission Date: MAR 2017

### Signature/Date

College/School Dean: DocuSigned by:  
Alison Harmon 2/2/2017  
09195817BB5D435...

Graduate Dean: DocuSigned by:  
Karlene A. Hoo 2/3/2017  
(Graduate academic programs only) 1F6B90CC1B5B461...

Vice President Research: \_\_\_\_\_  
(Research centers/institutes only)

Chief Academic Officer: DocuSigned by:  
Robert Mokwa 2/2/2017  
9EDD74A82C3A419...

Chief Executive Officer: DocuSigned by:  
[Signature] 2/2/2017  
A782288C035847B...

Flagship Provost: DocuSigned by:  
Robert Mokwa 2/2/2017  
9EDD74A82C3A419...

Flagship President: DocuSigned by:  
[Signature] 2/2/2017  
A782288C035847B...

Date of Final Review: March 26, 2017

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

September 12-13, 2018

**ITEM 180-2011-R0918**

**Request for authorization to establish an M.S. in Data Science**

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**THAT**

Montana State University requests authorization from the Montana Board of Regents to establish a Master's of Science in Data Science degree program

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**EXPLANATION**

The M.S. in Data Science at Montana State University will be an interdisciplinary degree that addresses the growing need for expertise in Data Science. It will draw mostly on the existing course base in three programs: Computer Science, Mathematics, and Statistics. This 30 credit master's degree will serve students with a bachelor's degree with a major in one of these three areas, local professionals with some background in one of these three areas, and individuals from other technical fields seeking a professional degree in the emerging field of Data Science.

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**ATTACHMENTS**

Academic Request form  
Curriculum Proposal Form  
Intent to Plan

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

ITEM 180-2011-R0918 Submission Month or Meeting: September 12-13, 2018

Institution: Montana State University CIP Code: 27.0503

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

Includes (please specify below): Online Offering \_\_\_\_\_ Options \_\_\_\_\_

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

     **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*

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

X **B. Level II:**

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

**Proposal Summary [360 words maximum]**

**What**

The proposal seeks to authorize an interdisciplinary M.S. degree in Data Science at Montana State University, drawing on the existing course base in three programs: Computer Science, Mathematics, and Statistics. The intended audience comes from three pools of anticipated applicants: existing students majoring in one of these three areas at MSU, local professionals with some background in one of these areas, and individuals seeking a professional degree in the emerging field of Data Science.

**Why**

Data Science is the science of extracting meaningful information from the large data sets produced by the current technological revolution in computing. While more traditional approaches to data lie in the purview of statistical science, this new emerging area combines these traditional approaches with the need to handle, store, and represent very large data sets, and newer and more sophisticated statistical and mathematical techniques used to compress such data, analyze it, and extract from it actionable information. The McKinsey Global Institute Study on Big Data (2011) indicates, "The United States alone faces a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts to analyze big data and make decisions based on their findings. The shortage of talent is just beginning." As of 2017, there are 551 data science programs, 77% in the US, with the majority of programs offering a Master's degree. Montana State University should offer this option to our students and to the sizable group of professionals who work in high tech companies in Bozeman and across the region.

**Resources**

The program makes use of existing courses in mathematics, statistics, and computer science and the available capacity in those courses. For the first three years, the demands of the program are expected to be met by existing campus resources.

**Relationship to similar MUS programs**

The University of Montana has an M.S. in Data Science that will begin enrolling students in September 2018. The MSU program differs from the UM program in organizational structure, in that the MSU degree will be jointly managed by the School of Computing and the Department of Mathematical Sciences, and both departments will provide essential input into selection of students and curricular development.

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- 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 proposal seeks to authorize a new interdisciplinary M.S. degree in Data Science at Montana State University. It will draw on the existing course base in three programs: Computer Science, Mathematics, and Statistics. The intended audience will draw from three sources: existing students majoring in one of these three areas at MSU, local professionals with some background in one of these three areas, and individuals seeking a professional degree in the emerging field of Data Science. The degree will be administered jointly by the Department of Mathematical Sciences and the School of Computing.

- 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 program will be interdisciplinary, relying on the existing programs in Computer Science, Mathematics, and Statistics. While it overlaps parts of each of these programs, it provides the combination of the three that is required of those seeking jobs in Data Science. The program contributes to the University's mission in Learning, Discovery, and Integration.

MSU's strategic goals in Learning include: "Prepare students equipped for careers to address global challenges." This program is part of the strategy to "Align graduate programs with careers, national interest and institutional priorities" and to "Create pathways for graduate MSU seniors to transition into graduate programs." MSU's strategic goals in Discovery include: "Raise the national and international prominence of MSU in research, creativity and scholarly achievement." This program is part of the strategy to "Create inter-disciplinary graduate programs."

MSU's strategic goals in Integration include: "By working across disciplines MSU community will improve the world." This program is part of the strategy to "Create new interdisciplinary programs that leverage other strategic priorities."

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

A working group of faculty in computer science, statistics, and mathematics created the program through a cyclic process of seeking feedback from colleagues and adjusting as necessary. Faculty from Business and the Library also reviewed the proposal, along with college-level review in Letters and Science, Engineering, and the Graduate School and Faculty Senate review. The working group members have spoken at length with our colleagues at UM and have mutual support for each other's programs in Data Science.

- 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

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

Credits in required courses offered by the department offering the program	15
Credits in required courses offered by other departments	6
Credits in institutional general education curriculum	0
Credits of free electives	9
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.

The broad educational goals of the program are to produce students with foundational training in data analysis, with equal emphasis on the principles of computer science, mathematics, and statistics, and the ability to apply these principles to a range of data-driven problems. More specifically, the learning outcomes for graduates of the program are:

- Demonstrate knowledge of essential deterministic, randomized and approximation algorithms for data classification and clustering, dimensionality reduction, regression, and optimization.
- Demonstrate knowledge in the principles and practice of statistical experimental design, statistical inference, and decision theory.
- Demonstrate the ability to take a real-world data analysis problem, formulate a conceptual approach to the problem, match aspects of the problem to previously learned theoretical and methodological tools, break down the solution into a step-by-step approach, and implement a working solution in a modern software language.
- Communicate data science problems, analyses, and solutions effectively to both specialists and non-specialists through the use of effective technical writing, presentations, and data visualizations, and teamwork and collaboration.

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]*

A 2011 McKinsey report, <http://www.mckinsey.com/>, estimated there will be 140,000 to 190,000 unfilled positions of data analytics experts by 2018 in the United States. Due to the increasing need, universities across the country are responding by introducing Data Science programs. As Data Science emerges not only as a necessary tool for various businesses on a national and international scale, but also as an essential enabling tool for every science and technology field, every university needs to develop capability in this essential area.

Data Science is a science of extracting meaningful information from large data sets produced by the current technological revolution in computing. While more traditional approaches to data lie in the purview of statistical science, this new emerging area combines these traditional approaches with the need to handle, store, and represent very large data sets, and newer and more sophisticated statistical and mathematical techniques used to compress such data, analyze it, and extract from it actionable information.

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The proposed degree directly addresses the need for interdisciplinarity, focusing across the disciplines of computer science, mathematics, and statistics.

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
University of Montana Missoula	M.S.	M.S. in Data Science
<i>(Note that the Intent to Plan, dated August 2016, for our proposed program indicates no other such programs in the MUS; this program at the University of Montana was established in January, 2017, after our Intent to Plan was approved.)</i>		

- 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 is a shortage of trained professionals in data and computer science both in Montana and nationally. It is to the benefit of industries in Montana and the citizens of Montana that the MUS increase its production of graduates in data science. Due to this demand, multiple data science programs have the ability to grow and succeed across the state.

- 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 is ongoing collaboration between the faculty at UM and the faculty at MSU around Data Science. For example, in Spring 2018, the two Mathematical Science departments are exploring means to make the MSU course M 508 available to students at both campuses using WebEx or other electronic means. Establishing the means to manage logistics of shared courses will strengthen both programs and increase efficiency. The leadership of both Mathematical Science departments are planning regular Data Science workshops for students and faculty in the State who are involved in Data Science programs.

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]

Once the proposal is approved, we anticipate announcing the availability of the program first to existing students in Computer Science, Mathematics, and Statistics at MSU. We anticipate that this may happen in time for initial enrollment in AY2019 and that the initial cohort will be limited to up to 10 students. During the 2018/2019 academic year we will advertise the program more widely, including in the community for professionals desiring continuous education. We expect cohorts of up to 18 students in subsequent years.

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**CURRICULUM PROPOSAL FORM**

Students will enroll into the program by contacting the Department of Mathematical Sciences, which will provide initial screening of the applications. The final admission decision will be done by a Steering Committee including representatives from Applied Mathematics, Computer Science, and Statistics.

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

Fall Headcount Enrollment					Graduates				
AY20	AY21	AY22	AY23	AY24	AY20	AY21	AY22	AY23	AY24
15	27	26	32	32	0	15	12	14	16

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

Estimates for the enrollment projections is based on class enrollment in courses that will be included in the program. For example, M 508, "Machine Learning" is offered for the first time in Spring 2018, and enrollment is at 16 students, making it the most highly enrolled graduate level math course. Seeing this interest allows us to predict that in the first cohort, roughly 5 students will enroll in the program who might otherwise have pursued another degree option at MSU, and roughly 10 new students will choose to pursue an M.S. because the M.S. in Data Science is available.

The program is a two year program, and we expect modest growth of an additional 2 students in each new yearly cohort, leading to the predictions above.

- c. What is the initial capacity for the program?

Initially, demand will be met by filling courses that are running below their enrollment caps. We have predicted that by year 4 the program will have sufficient enrollment to warrant hiring an additional faculty member. It should be noted that ongoing plans for hiring faculty in Mathematical Sciences and School of Computing already align with growth in data science as an emerging research area.

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]*

We will determine success by number of students earning the degree; percent of graduates working in the field after graduation; and percentage of students who achieve the program learning outcomes. Other M.S. programs in the department of mathematical sciences award 6 – 12 degrees per year; once the M.S. Data Science is up and running, we will expect to achieve graduation numbers in that range. If this target is not met, we will examine both our recruiting strategies and the availability of the curriculum for enrolled students. Our target is that at least 80% of graduates achieve employment in the discipline. If this target is not met, we will revise our program learning outcomes and our curriculum so that the program aligns with workforce demand. We will examine the percentage of students who achieve program learning outcomes, and if this is unsatisfactory, we will identify program changes needed to better prepare students to meet the program outcomes.

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- 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]*

Our department assesses learning outcomes for M.S. programs every other year, in even academic years. We will document the number of degrees issued, time to graduation and percentage of students who achieve the program learning outcomes.

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

Direct measures of student learning clearly show what students are learning and will include assessments such as quizzes, lab projects, and exams. Given the hands-on nature of this particular program, student ability to use tools, perform specific tasks, produce a product, and adhere to safety protocols is emphasized. Indirect assessments provide signs that students are learning, but exactly what they are learning is less clear. Indirect measures will include student participation, attendance rates, surveys, and/or grades.

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

After three years, the program will be reviewed by faculty from the three disciplines under the leadership of the Steering Committee to assess any further needed curriculum (especially with how fast data science methods and technology are evolving). As part of this review, the initial cohort(s) of graduating students will be contacted to obtain their experiences with the training they received. An advisory board will be formed to aid in the assessment of the program that will first contain MSU faculty and industry representatives from companies that hire data science students.

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

No plans to seek specialized accreditation for this program, because accreditation of all of our programs occurs through the NWCCU.

**9. Physical resources.**

- a. Describe the existing 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 existing facilities are classrooms and computer labs that are already in use for the courses in the program, and the existing software that is available through university licensing and support. Increased use in classroom space will be managed using the Registrar's classroom scheduling policies, taking advantage of available classroom times and locations.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

- b. List needed 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]*

No initial facilities or space will be needed. As the program grows and adds a faculty member, then standard office space will be required and allocated through the usual modes for new departmental faculty.

**10. Personnel resources.**

- a. Describe the existing 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]*

Courses in the program will be available using existing faculty expertise and course capacity. The program coordinator in Mathematical Sciences will manage the application process and provide other administrative support in the initial years of the program. The Steering Committee will ensure that students are assigned to an advisor in either Applied Mathematics, Computer Science, or Statistics, to align with the student's dominant interest and coursework.

The Graduate Committee in the Department of Mathematical Sciences is charged with maintaining the quality of graduate programs in the department, and they will take responsibility for this program as well. The Department Heads in Mathematical Sciences and the School of Computing will annually review the cross-disciplinary collaboration of the Steering Committee, including how each Department's/School's existing programs are impacted.

- b. Identify new 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]*

We predict adding a .25 FTE staff member in Year 3 of the program to handle program coordination for the additional students enrolling in the new program; we expect to require this when student enrollment reaches 30 students.

We expect to add a tenure track faculty member in year 4 of the program. The faculty member will also teach undergraduate courses as part of the faculty in the Department of Mathematical Sciences. A specialist in Data Science aligns with the anticipated growth areas in Applied Mathematics and Statistics that are already planned as part of the department's hiring plan.

**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]*

Current resources are adequate, and have been reviewed by the Dean of the Library at MSU.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

- 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 student services have the capacity to accommodate the proposed program and there are no expected implications on services for the rest of the student body.

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

We expect the new program to result in net profit to MSU.

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

	Year 1	Year 2	Year 3
Revenues	21,022	45,898	54,237
Expenditures	2,000	2,000	12,195
Net Revenue (revenues-expenditures)	19,022	43,898	42,042

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

Expenses will be modest operations expenses, for initial faculty development and training, met with an additional \$2,000 in operations in the first two years.

- 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]*

Operations are allocated to support faculty development across specialties, so there is negligible impact on other programs because this program will be initially taught by existing faculty and existing courses.

- 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.

Increase of \$2,000 to base in Year 1 and an additional increase to base at \$10,195 in Year 3 (FY22) and an additional \$38,051 in Year 4 (FY23).

- 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]*

Montana Board of Regents  
CURRICULUM PROPOSAL FORM

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]

N/A

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. The existing approved program fee will apply to the 400-level coursework.

14. Complete the fiscal analysis form

Signature/Date

College or School Dean:

*David O. Chung for Nicol Rae.*  
*May 15, 2018*

Chief Academic Officer:

*RL Mohan* 5/29/18

Chief Executive Officer:

*Hayato* May 29, 2018

Flagship Provost\*:

*RL Mohan* 5/29/18

Flagship President\*:

*Hayato* May 29, 2018

\*Not applicable to the Community Colleges.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

**Appendix A – Proposed New Curriculum  
Program Requirements and Curriculum List**

All program requirements pertaining to the Master's of Science degree apply to Master's of Science in Data Science degree.

There are three essential domains in this program: Computer Science, Statistics and Mathematics.

We propose that each student will need to take:

At least 2 courses (=6 credits) in each of the three essential domains.

In each domain one of those courses must be the Foundational Course. These foundational courses are:

1. CSCI 532 Algorithms,
2. STAT 541 Experimental Design,
3. M 508 Mathematical Foundations of Machine Learning.

Other courses: CSCI 440, CSCI 540, CSCI 446, CSCI 447, CSCI 535, CSCI 547, CSCI 548, CSCI 550, STAT 408, STAT 511, STAT 536, STAT 436, STAT 437, M 441, M507 Linear and Nonlinear optimization (a new course currently being proposed).

This program is designed to be truly interdisciplinary. Our vision is to provide ample time for mixing and collaboration in each class. During the course projects we will form diverse groups of students in order for them to develop communication skills as well as appreciation of diversity of approaches that come from different backgrounds. In the current interdisciplinary nature of data science this is crucial skill needed for the successful transition to work force.

Below we offer sample programs for students in the Data Science Master's program. These programs assume that students take the classes-only option. Based on the background and interests of the student we describe here three possible paths to the degree. Clearly, many more combinations are possible.

Program for a student with a dominant interest in Computer Science:

Year 1	CSCI 532, 547, 540	M 441	Stat 408
Year 2	CSCI 535, 550	M 508	Stat 511, 541

Program for a student with a dominant interest in Mathematics:

Year 1	CSCI 532, 547	M 441, M 560	Stat 408
Year 2	CSCI 535, 540	M 508	Stat 511, 541

Program for a student with a dominant interest in Statistics.

Year 1	CSCI 532	M 441	Stat 408, 511, 512
Year 2	CSCI 547	M 508	Stat 541, 537, 536

**Academic Degree Program Proposal - Fiscal Analysis Form**

**CAMPUS:** Bozeman  
**AWARD LEVEL:** GR  
**PROGRAM NAME:** Master of Science in Data Science  
**PROGRAM CODE:** MADS

ENROLLMENT PROJECTIONS		FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
<b>Headcount</b>						
annual unduplicated headcount of students with declared major or minor within the program		0	15	27	26	32
<b>Credit Hours</b>						
annual avg. credits hours earned per student in program related curriculum		0	15	15	15	15
<b>Student FTE</b>						
Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24		0	9.375	16.875	16.25	20
<b>Completions</b>						
Annual number of program completers		0	0	15	12	14

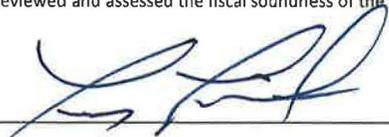
REVENUE		FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Tuition Revenue (net of waivers)			\$20,671	\$45,477	\$53,746	\$66,148
Institutional Support						
Other Outside Funds (grants, gifts, etc.)						
Program Tuition/Fees			\$351	\$421	\$491	\$562
<b>Total Revenue</b>		\$0	\$21,022	\$45,898	\$54,237	\$66,710
<b>Total Revenue per Student FTE</b>		\$0	\$2,242	\$2,720	\$3,338	\$3,336

EXPENDITURES		FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Tenure Track Faculty	FTE					0.4
	Salary + Benefits					\$38,051
Non-tenure Track Faculty <small>*Includes Adjunct Instructors</small>	FTE					
	Salary + Benefits					
Graduate Teaching Assistants	FTE					
	Salary + Benefits					
Staff	FTE				0.3	0.3
	Salary + Benefits				\$10,195	\$10,195
<b>Total Faculty &amp; Staff</b>	FTE	0.0	0.0	0.0	0.3	0.7
	Salary + Benefits	\$0	\$0	\$0	\$10,195	\$48,246

Operations (supplies, travel, rent, etc)			\$2,000	\$2,000	\$2,000	\$3,000
Start-up Expenses (OTO)						\$10,000
<b>Total Expenses</b>		\$0	\$2,000	\$2,000	\$12,195	\$61,246

<b>Student FTE to Faculty (TT + NTT) Ratio</b>	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	50.0
<b>Net Income/Deficit (Revenue - Expenses)</b>	\$0	\$19,022	\$43,898	\$42,042	\$5,464

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.

  
 \_\_\_\_\_  
 Campus Chief Financial Officer Signature

Chief Financial Officer Comments

# Montana University System

## NOTICE OF INTENT TO PLAN

Program/Institute Title: Master of Science in Data Science  
Campus, School/Department: MSU-Bz, Dept. Mathematical Sci./Gianforte School of Computing  
Contact Name/Info: Tomas Gedeon, gedeon@math.montana.edu  
Expected Submission Date: MAR 2017

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.

For more information regarding the Intent to Plan process, please visit the Academic and Student Affairs Handbook.

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

This degree shall be characterized as an M.S. in Data Science and we anticipate a start date of Fall Semester 2018. This M.S. degree will serve students with bachelors' degrees in mathematics, statistics, physics, computer science and engineering who wish to extend their skill set in this fast growing new science which is in great demand by the high tech industry.

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

A 2011 McKinsey report, <http://www.mckinsey.com/>, estimated there will be 140,000 to 190,000 unfilled positions of data analytics experts by 2018 in the United States. Due to the increasing need, universities across the country are responding by introducing Data Science programs. As Data Science emerges not only as a necessary tool for various businesses on a national and international scale, but also as an essential enabling tool for every science and technology field, every university needs to develop capability in this essential area. This Intent to Plan serves notice that Montana State University plans to develop capabilities in the broad area of Data Science and acknowledges that other units in the MUS will also do so.

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

**existing institutional program array.**

The new degree helps support the following parts of Montana State University's strategic plan:

(1) Learning. More students will have the opportunity to earn a degree that prepares them for in-demand careers.

(2) Discovery. Increasingly, all science and engineering research projects rely on input from statistical analysis, mathematical modeling and big data analytics. The M.S. degree in Data Science will produce more students that will be able to contribute to research projects.

(3) Engagement. Because data analytics is becoming more important for businesses in today's competitive landscape, more students will be better prepared to engage with and contribute to our local community and state.

(4) Access. The M.S. degree will enable more MSU students to pursue in-demand, flexible, well-paid, meaningful careers.

(5) Stewardship. The Department of Mathematical Sciences has recently hired four new faculty; two in Applied Mathematics and two in Statistics. These faculty will help design and deliver the new courses needed for the M.S. degree. The M.S. degree can be largely created by leveraging resources already in place, and will focus on cross-department collaboration and expertise.

**4) Describe how the proposed program/center/institute overlaps, complements, or duplicates existing entities or offerings within the MUS system?**

There are currently no M.S degrees in Data Science offered in in MUS system. We anticipate that both flagship campuses will develop a significant presence in Data Science to maintain their status as national research institutions and to satisfy the demand from industry and students. The proposed M.S. degree at MSU-Bozeman will stimulate collaboration between the Department of Mathematical Sciences and the Gianforte School of Computing. We anticipate that this will lead to future Data Science opportunities such as certificates, minors, majors and graduate degrees. Depending on the opportunity, these curriculum offerings might be housed either in the Department of Mathematical Sciences or in the Gianforte School of Computing.

# Signatures

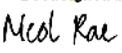
## Intent to Plan

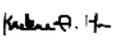
Program/Institute/Center Title: Master of Science in Data Science

Campus: MSU-Bz, Dept. Mathematical Sci./Gianforte School of Computing

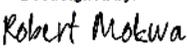
Expected Submission Date: MAR 2017

### Signature/Date

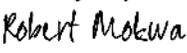
College/School Dean:	DocuSigned by:  <small>B2A500E9B3D847A...</small>	8/26/2016
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Graduate Dean: <small>(Graduate academic programs only)</small>	DocuSigned by:  <small>AD59A485A18B4E1...</small>	8/29/2016
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Vice President Research: <small>(Research centers/institutes only)</small>		
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Chief Academic Officer:	DocuSigned by:  <small>9EDD74A82C3A419...</small>	8/29/2016
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Chief Executive Officer:	DocuSigned by:  <small>7D6A4CE96C3F415...</small>	8/29/2016
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Flagship Provost:	DocuSigned by:  <small>9EDD74A82C3A419...</small>	8/29/2016
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Flagship President:	DocuSigned by:  <small>7D6A4CE96C3F415...</small>	8/29/2016
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Date of Final Review:	November 18, 2016
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When submitting the proposal to the BOR, include this signed form with the Level II request.

September 12-13, 2018

**ITEM 180-2012-R0918**

**Request for authorization to establish separately named PhD in Chemical Engineering**

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**THAT**

Montana State University requests authorization that the standalone PhD in Chemical Engineering be re-established.

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**EXPLANATION**

The PhD program in Chemical Engineering provided by the faculty of the Department of Chemical and Biological Engineering educates graduate students to be key contributors in advanced chemical engineering research and development. Program graduates are equipped to work in either an academic or industrial setting. Individuals who earn a PhD in Chemical Engineering are particularly suited to advanced research and development in many Montana industries including refining, environmental remediation, energy, mining, and pharmaceuticals.

This change is to reflect the growth of the doctoral program in chemical engineering and to assign to the program's doctoral graduates the academic title and credential most appropriate for professional practice in this field. There would be no duplication of existing programs in the MUS. There would be no direct cost attributable to this change. There would be no changes in reporting lines, program mission, faculty assignments, or duplication of administrative activities. The first earned PhD in the state of Montana was awarded in Chemical Engineering (Dr. Fred Baughman, 1956) and MSU offered a standalone PhD in Chemical Engineering, as well as several other engineering disciplines, until 1996.

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**ATTACHMENTS**

Academic Proposal Request Form  
Curriculum proposal form  
Intent to Plan

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

ITEM 180-2012-R0918 Submission Month or Meeting: September 12-13, 2018

Institution: Montana State University-Bozeman CIP Code: 14.0701

Program/Center/Institute Title: CHME-PHD : Ph.D. in Chemical Engineering

Includes (please specify below): Online Offering \_\_\_\_\_ Options \_\_\_\_\_

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

     **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*

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

**B. Level II:**

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

**Proposal Summary [360 words maximum]**

**What**

Re-establishment of a standalone PhD in Chemical Engineering

**Why**

This change is to reflect the growth of the doctoral program in chemical engineering and to assign to the program's doctoral graduates the academic title and credential most appropriate for professional practice in this field.

**Resources**

There would be no direct cost attributable to this change. There would be no changes in reporting lines, program mission, faculty assignments, or duplication of administrative activities.

**Relationship to similar MUS programs**

There would be no duplication of existing programs in the MUS. There are no other programs in Chemical Engineering at any level (BS, MS, or PhD) within the Montana University System. The current chemical engineering option within the Engineering PhD has admitted students with a wide range of backgrounds and undergraduate degrees. The openness to a wide range of undergraduate degrees will not change with the re-establishment of a PhD in Chemical Engineering.

**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 proposal requests permission to offer a separately named PhD program in Chemical Engineering. This change is to reflect the growth of the doctoral program in chemical engineering and to assign to the program's doctoral graduates the academic title and credential most appropriate for professional practice in this field. There would be no duplication of existing programs in the MUS and no direct cost attributable to this change. MSU offered a standalone PhD in Chemical Engineering, as well as several other engineering disciplines, until 1996. At that time, the MSU College of Engineering consolidated its doctoral programs into a single PhD in Engineering.

- 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]*

The PhD program in Chemical Engineering provided by the faculty of the Department of Chemical and Biological Engineering educates graduate students to be key contributors in advanced chemical engineering research and development. Program graduates are equipped to work in either an academic or industrial setting. Individuals who earn a PhD in Chemical Engineering are particularly suited to advanced research and development in many Montana industries including refining, environmental remediation, energy, mining, and pharmaceuticals.

Montana State University is a doctoral university, and increasing the rate of doctoral graduates is a key part of MSU's Strategic Plan (e.g., see Objective D.3: "Expand the scale, breadth and quality of doctoral education."). Re-establishing the separately named PhD program in Chemical Engineering will allow increased recruitment of prospective doctoral students who are best served by a "PhD in Chemical Engineering," which is the academic title and credential most appropriate for professional practice in this field.

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

Until 1996, MSU offered a standalone PhD in Chemical Engineering, as well as several other engineering disciplines. In 1996, following system-wide program review due to a budget reduction, the MSU College of Engineering consolidated its doctoral programs into a single PhD in Engineering that had four options, including Chemical Engineering. MSU established a standalone PhD in Computer Science in 2002 and a standalone PhD in Electrical Engineering in 2017. This proposal requests re-establishment of the standalone PhD in Chemical Engineering. Due to the growth in our current doctoral program option and the support of the MSU administration, this proposal has been prepared.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

**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	49
Credits in required courses offered by other departments	11
Credits in institutional general education curriculum	0
Credits of free electives	0
Total credits required to complete the program	60

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.

At the conclusion of the doctoral program in chemical engineering, students are expected to be able to:

- Effectively apply theories, experimental methods, and scientific knowledge to address fundamental research questions in chemical engineering and related fields.
- Demonstrate a broad mastery of chemical engineering knowledge sufficient to enable effective teaching, advising, mentoring, and assessment of student learning at the college or university level.
- Pursue research of significance to the field of chemical engineering or a closely related interdisciplinary field, demonstrating intellectual independence and scholarly productivity.
- Demonstrate advanced skill in oral and written communication sufficient for successful peer-reviewed scholarly publications, presentations, and grant proposals.
- Understand and follow the principles of ethics in research and scholarly activity.
- Understand and follow standard safety practices in laboratory and industrial settings.

**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 proposal requests permission to offer a separately named PhD program in Chemical Engineering. This change is to reflect the growth of the doctoral program in chemical engineering and to assign to the program's doctoral graduates the academic title and credential most appropriate for professional practice in this field. There would be no duplication of existing programs in the MUS. There would be no direct cost attributable to this change. There would be no changes in reporting lines, program mission, faculty assignments, or duplication of administrative activities. The first earned PhD in the state of Montana was awarded in Chemical Engineering (Dr. Fred Baughman, 1956) and MSU offered a standalone PhD in Chemical

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

Engineering, as well as several other engineering disciplines, until 1996. At that time, the MSU College of Engineering consolidated its doctoral programs into a single PhD in Engineering. Thus, this proposal requests re-establishment of the standalone PhD in Chemical Engineering.

The proposed re-establishment of the standalone ChE PhD also enables Montana State University to improve recruitment of top students from across the country and around the world by offering a degree with a widely recognized title, Ph.D. in Chemical Engineering, rather than the PhD in Engineering with an option in chemical engineering.

- 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
(MSU)	(PhD)	(existing combined PhD in Engineering program)

- 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]*

No duplication

- 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 other programs in Chemical Engineering at any level (BS, MS, or PhD) within the Montana University System. The current chemical engineering option with the Engineering PhD has admitted students with a wide range of backgrounds and undergraduate degrees. The openness to a wide range of undergraduate degrees will not change with the re-establishment of a PhD in Chemical Engineering.

- 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]*

As the existing PhD in Engineering with the chemical engineering option already exists, there will be a seamless and immediate transition to the new standalone degree upon program approval. We will work with the MSU Registrar's Office and Graduate School to implement the required clerical notations. Once the PhD in Chemical Engineering is fully implemented, we will place the Chemical Engineering option for the Engineering PhD in moratorium and it will no longer be available to incoming students.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

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

Fall Headcount Enrollment					Graduates				
AY 19	AY 20	AY 21	AY 22	AY 23	AY 19	AY 20	AY 21	AY 22	AY 23
16	17	18	19	20	2	3	3	3	4

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

Our recent graduate enrollment in the chemical engineering option of the PhD in Engineering and the number of degrees earned (parenthesis), is as follows:

AY14: 12 (4); AY15: 11 (0); AY16: 17 (2)

Our experience is that the students require approximately 5 years to earn the PhD, and so our ongoing enrollment of more than 10 students results in a rate of approximately 2 graduates per year on average. As our enrollment has been growing, and is expected to continue to grow as MSU and the Chemical and Biological Engineering Department place increased emphasis on doctoral education, we anticipate 20 or more students enrolled by AY22, and an average of 3-4 graduates per year.

- c. What is the initial capacity for the program?

The MSU Chemical and Biological Engineering Department currently has 16 tenure-track faculty, and all are assigned a research role as part of their academic assignment and evaluation. We expect that each tenure-track faculty member will have at least one doctoral student, supporting a minimum capacity of 16 students. Many of our faculty support more than one doctoral student, so a target capacity of more than 20 students is expected.

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 three areas: student recruitment, student progress towards the PhD degree, and graduation rate. Student recruiting refers to our ability to attract and admit high-quality applicants. Successful student progress towards the degree refers to the enrolled students passing our Qualifying Exam on schedule, scheduling and successfully passing the Comprehensive Exam within 2 years of passing the Qualifying Exam, preparing a high-quality dissertation, and defending the dissertation within 5-6 years of starting the program. Finally, we consider 2-4 students graduating per year a sustainable rate, given the size of our faculty and the extraordinary amount of time required to supervise and mentor PhD students.

If we find that we are not achieving these outcomes, the faculty will develop and implement a plan for improving performance in any area(s) that are found to be lagging, as these outcomes are largely under faculty control.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

- 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]*

The Chemical Engineering PhD program has a set of built in assessments. First, admitted students must pass a Qualifying Exam, which is a 6-hour written exam covering the fundamental knowledge of an undergraduate program in Chemical Engineering. The exam ensures that the student has the foundation to succeed in graduate-level coursework. Next, the student enrolls in approximately 30 credits of graduate coursework covering both fundamental and advanced topics in the field. Specific course requirements include transport, mathematics, reactor design and thermodynamics. After approximately two and a half years, the student must form a Graduate Committee and work with their faculty research advisor to prepare a dissertation proposal. This proposal is presented as part of the Comprehensive Exam for the doctoral program. The student takes additional, elective coursework while performing the dissertation research. Finally, the student's overall accomplishments and the dissertation are evaluated in the final Dissertation Defense.

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

The student must pass the mandatory written and oral examinations (as described above), meet the minimum course credits and grade requirements of the graduate school (direct measures), and must also meet the research quality expectations and recommendations of the Advisor and the Graduate Committee (indirect measures). For example, doctoral students in the program are generally expected to prepare and present research conference papers and peer-reviewed manuscripts for journal publication while enrolled in the doctoral program.

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

The Chemical and Biological Engineering department has a PhD program coordinator that works with the department head to monitor recruiting of graduate students, assistantship recommendations, preparation and grading of the Qualifying Exam, and many other duties associated with the PhD program. Ultimately, the Department Head is responsible for monitoring the state of the PhD program.

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

Doctoral programs in engineering do not receive a specialized accreditation. MSU's undergraduate chemical engineering and biological engineering programs are accredited by ABET.

**9. Physical resources.**

- a. Describe the existing 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 re-establishment of the Chemical Engineering PhD program will utilize the existing research and teaching space, equipment, and facilities currently used by the Chemical and Biological Engineering department to deliver the Chemical Engineering option in the current PhD in Engineering program.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

- b. List needed 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 incremental needs or costs associated with re-establishing the Chemical Engineering PhD program.

**10. Personnel resources.**

- a. Describe the existing 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]*

The MSU Chemical and Biological Engineering department has 16 tenure-track faculty, 3 instructional faculty, and 3 support staff (administrative assistant, accounting support, and student success coordinator). The department currently provides the following degree programs:

- Chemical Engineering (approximately 450 students)
- Biological Engineering (approximately 150 students)
- MS-Chemical Engineering (approximately 20 students)
- MS-Environmental Engineering (approximately 10 students)
- Master of Engineering (chemical engineering and bioengineering): approx. 3 students
- PhD in Engineering (chemical engineering): 16

- b. Identify new 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]*

No additional personnel or costs are associated with re-establishing the Chemical Engineering PhD program.

**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]*

There are no incremental needs or costs associated with re-establishing the Chemical Engineering PhD 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]*

The change in student headcount will be small. We do not anticipate any capacity issues with student services.

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

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

The students in the re-established Chemical Engineering PhD program pay graduate tuition, which generally comes from their appointment as graduate research assistants funded by external grants and contracts. The cost associated with instruction and support is not impacted by separating the Chemical Engineering PhD from the existing PhD in Engineering.

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

	Year 1	Year 2	Year 3
Revenues	16 students * 18 cr annual tuition+fees = 16*\$6853 = \$109,644	17 students * 18 cr annual tuition+fees = 17*\$6853 = \$116,501	18 students * 18 cr annual tuition+fees = 18*\$6853 = \$123,354
Expenditures	\$109,644 (tuition to MSU)	\$116,501 (tuition to MSU)	\$123,354 (tuition to MSU)
Net Revenue (revenues-expenditures)	0	0	0

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

There are no incremental needs or costs associated with re-establishing the Chemical Engineering PhD 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]

The state appropriated funds that currently support research and graduate teaching in the Chemical and Biological Engineering department for the PhD in Engineering, chemical engineering option, will be continued under the Chemical Engineering PhD program. The source and assignment of the funds will not change.

- 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.

N/A

- 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]

N/A

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

**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.

We plan no new fees. Engineering students are currently subject to the Engineering Program Fee, and this will still be true with the re-established Chemical Engineering PhD.

**14.** Complete the fiscal analysis form.

Signature/Date

College or School Dean:  7/3/18

Chief Academic Officer:  6/28/18

Chief Executive Officer: 

Flagship Provost\*:  6/28/18

Flagship President\*:

\*Not applicable to the Community Colleges.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

**Appendix A – Proposed New Curriculum**

A Chemical Engineering Ph.D. Program of Study must include the following:

Course	Title	Credits
<a href="#">EGEN 505</a>	Advanced Engineering Analysis	3
<a href="#">EGEN 506</a>	Numerical Sol to Engr Problems	3
<a href="#">ECHM 503</a>	Thermodynamics	3
<a href="#">ECHM 533</a>	Transport Phenomena	3
<a href="#">ECHM 510</a>	Reaction Engineering/Modeling	3
<a href="#">ENGR 610</a>	Rsch & Mthds in Engineering	3
<a href="#">ENGR 694</a>	Seminar	1-2
Dissertation		18-25
Other Graded Courses*		15-23

**Qualifying Examination:** The qualifier will be a written examination on undergraduate Chemical Engineering including: mass and energy balances, thermodynamics, separations (mass transfer), heat (energy) transfer, fluids, transport phenomena and chemical reaction engineering. The exam will be 1 hour per topic area question in an open book, open notes format and students will choose 4 subjects which they will solve the problems for, from the 7 problems provided. Each question will be graded by the Faculty member that submitted the question. Students will not be given the test back in order to protect the questions from dissemination. The results will be analyzed by a Committee composed of all Faculty and a grade of Pass (P), Fail (F) or Remediate (R) given each candidate. In cases where remediation in certain topic areas is required, the Ph.D. adviser will develop a problem solving based plan with the PhD candidate to prepare for a retest on the identified topic areas. The retest must occur prior to the next fall semester and will be overseen by the PhD. adviser. The qualifying exam must be completed within two semesters of matriculation into the Ph.D. program. Failure to take the exam in that time period may result in suspension of Ph.D. candidate status, including stipend. The exam will be administered on the second Tuesday in February of the Spring semester to all students required to take the exam in a year.

**Comprehensive Examination:** The proposal will be in the NSF format, in compliance with the current year's grant proposal guidelines (gpg) at [www.nsf.gov](http://www.nsf.gov). A written exam on graduate level thermodynamics, transport phenomena, mathematical methods, and kinetics and reactor engineering will be required of graduate students who have a GPA in graduate coursework of less than 3.5. A public oral seminar of 40 minutes plus 10 minutes of public questions, on the research to date and proposed research to complete the Ph.D., will be given by the Ph.D. candidate. This will be followed by a closed-session oral examination of 45-90 minutes by the student's Ph.D. committee.

\* All credits must also meet the following conditions:

- ≤ 6 credits Independent Study (ECHM 592).
- ≤ 3 credits pass/fail, excluding dissertation.

## Academic Degree Program Proposal - Fiscal Analysis Form

**CAMPUS:** MSU-Bozeman  
**AWARD LEVEL:** PhD  
**PROGRAM NAME:** Chemical Engineering  
**PROGRAM CODE:**

FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
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### ENROLLMENT PROJECTIONS

#### Headcount

annual unduplicated headcount of students with declared major or minor within the program	16	17	18	19	20
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#### Credit Hours

annual avg. credits hours earned per student in program related curriculum	6	6	6	6	6
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#### Student FTE

Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24	4	4.25	4.5	4.75	5
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#### Completions

Annual number of program completers	2	3	3	3	4
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### REVENUE

Tuition Revenue (net of waivers)		\$5,220	\$10,440	\$15,660	\$20,880
Institutional Support	\$0	\$0	\$0	\$0	\$0
Other Outside Funds (grants, gifts, etc.)	\$0	\$0	\$0	\$0	\$0
Program Tuition/Fees	\$0	\$0	\$0	\$0	\$0
<b>Total Revenue</b>	\$0	\$5,220	\$10,440	\$15,660	\$20,880
<b>Total Revenue per Student FTE</b>	\$0	\$1,228	\$2,320	\$3,297	\$4,176

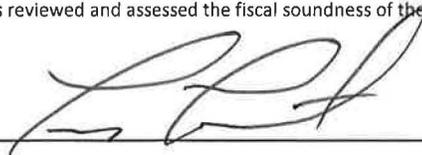
### EXPENDITURES

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 <small>*Includes Adjunct Instructors</small>	FTE	0.0	0.0	0.0	0.0	0.0
	Salary + Benefits	\$0	\$0	\$0	\$0	\$0
Graduate Teaching Assistants	FTE	0.0	0.0	0.0	0.0	0.0
	Salary + Benefits	\$0	\$0	\$0	\$0	\$0
Staff	FTE	0.0	0.0	0.0	0.0	0.0
	Salary + Benefits	\$0	\$0	\$0	\$0	\$0
<b>Total Faculty &amp; Staff</b>	FTE	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
	Salary + Benefits	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

Operations (supplies, travel, rent, etc)	\$0	\$0	\$0	\$0	\$0
Start-up Expenses (OTO)	\$0	\$0	\$0	\$0	\$0
<b>Total Expenses</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

<b>Student FTE to Faculty (TT + NTT) Ratio</b>	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
<b>Net Income/Deficit (Revenue - Expenses)</b>	\$0	\$5,220	\$10,440	\$15,660	\$20,880

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.




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**Campus Chief Financial Officer Signature**

Chief Financial Officer Comments

Montana University System  
INTENT TO PLAN FORM

Program/Center/Institute Title: PhD in Chemical Engineering

Campus, School/Department: MSU-Bozeman, Chemical and Biological Engineering

Expected Submission Date: MAR 2018

Contact Name/Info: Jeffrey Heys, jeffrey.heids@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 proposal requests permission to offer a separately named PhD program in Chemical Engineering. This change is to reflect the growth of the doctoral program in chemical engineering and to assign to the program's doctoral graduates the academic title and credential most appropriate for professional practice in this field. There would be no duplication of existing programs in the MUS. There would be no direct cost attributable to this change. There would be no changes in reporting lines, program mission, faculty assignments, or duplication of administrative activities. The first earned PhD in the state of Montana was awarded in Chemical Engineering (Dr. Fred Baughman, 1956) and MSU offered a standalone PhD in Chemical Engineering, as well as several other engineering disciplines, until 1996. At that time, the MSU College of Engineering consolidated its doctoral programs into a single PhD in Engineering. Thus, this proposal requests re-establishment of the standalone PhD in Chemical 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).**

The PhD program in Chemical Engineering provided by the faculty of the Department of Chemical and Biological Engineering educates graduate students to be key contributors in advanced chemical engineering research and development. Program graduates are equipped to work in either an academic or industrial setting. Individuals who earn a PhD in Chemical Engineering are particularly suited to advanced research and development in many Montana industries including refining, environmental remediation, energy, mining, and pharmaceuticals.

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

Montana State University is a doctoral university, and increasing the rate of doctoral graduates is a key part of MSU's Strategic Plan (e.g., see Objective D.3: "Expand the scale, breadth and quality of doctoral education."). Re-establishing the separately named PhD program in Chemical Engineering will allow increased recruitment of prospective doctoral students who are best served by a "PhD in Chemical Engineering," which is the academic title and credential most appropriate for professional practice in this field.

**4) Describe how the program/center/institute overlaps, compliments, or duplicates existing efforts in the MUS.**



September 12-13, 2018

ITEM 180-1001-R0918

**Request for Authorization to Retitle Department of Communicative Sciences & Disorders to Speech, Language, and Hearing Sciences**

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**THAT**

The University of Montana-Missoula requests authorization from the Montana Board of Regents to retitle the Department of Communicative Sciences & Disorders to Speech, Language, and Hearing Sciences.

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**EXPLANATION**

The Department of Communicative Sciences & Disorders will be renamed the Department of Speech, Language, and Hearing Sciences. This change better reflects the mission of the department, will minimize confusion, and aligns with the national trend of equivalent state university departments across the country.

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**ATTACHMENTS**

Academic Proposal Request Form

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

ITEM 180-1001-R0918 Submission Month or Meeting: September 12-13, 2018

Institution: University of Montana-Missoula CIP Code: 51.0204

Program/Center/Institute Title: Retitle of Department of Communicative Sciences & Disorders to Speech, Language, and Hearing Sciences

Includes (please specify below): Online Offering  Options

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

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

X **B. Level II:**

\_\_\_\_\_ 1. **Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Intent to Plan Form)

\_\_\_\_\_ 2. **Exceeding the 120 credit maximum for baccalaureate degrees** *Exception to policy 301.11*

\_\_\_\_\_ 3. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and Completed Intent to Plan Form, except when eliminating or consolidating)

X \_\_\_\_\_ 4. **Re-titling an academic, administrative, or research unit**

**Proposal Summary [360 words maximum]**

**What**

The Department of Communicative Sciences and Disorders is requesting to change its name to the Department of Speech, Language, and Hearing Sciences.

**Why**

The proposed name will 1) more readily differentiate the department from the Department of Communication Studies and ease campus confusion; 2) more accurately reflect and describe the speech, language, and audiology practice; and 3) is consistent with the national trend of equivalent state university departments across the country (Council for Academic Programs in Communication Sciences).

The department anticipates an increased attraction to the speech-language pathology and audiology fields from students in related field such as education, early childhood, related health professions and human sciences. Currently, the name of the department is confusing and students are not as likely to realize that there is a pre-service speech, language, and hearing undergraduate program as well as a professional speech-language pathology graduate program.

**Resources**

This requested name change will not result in a change to the resources used by the Department.

**Relationship to similar MUS programs**

There are no other Speech, Language, Hearing Sciences programs in the MUS.

September 12-13, 2018

ITEM 180-1002-R0918

**Request for Authorization to Establish a B.S. in Computational Biochemistry**

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**THAT**

The University of Montana-Missoula requests authorization from the Montana Board of Regents to establish a B.S. in Computational Biochemistry.

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**EXPLANATION**

There is currently no program in the MUS that specifically prepares students to work at the interface of biochemistry and computer science – i.e. bioinformatics. With the recent growth of genomic, protein and structural databases, this program would prepare students for a unique niche by training them to be conversant in chemistry, biochemistry, biology and computer science, so that they can bridge these diverse disciplines. The strength of our programs in biochemistry and computer science, particularly with the recent hires of three computer scientists who are experts in bioinformatics, uniquely positions the University of Montana to offer this program.

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**ATTACHMENTS**

Intent to Plan  
Academic Proposal Request Form  
Curriculum Proposal  
Level II Fiscal Plan

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

ITEM 180-1002-R0918 Submission Month or Meeting: September 12-13, 2018

Institution: University of Montana-Missoula CIP Code: 26.1103

Program/Center/Institute Title: Computational Biochemistry B.S.

Includes (please specify below): Online Offering \_\_\_\_\_ Options \_\_\_\_\_

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

**Montana Board of Regents**  
**ACADEMIC PROPOSAL REQUEST FORM**

X **B. Level II:**

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

**Proposal Summary [360 words maximum]**

**What**

B.S. in Computational Biochemistry

**Why**

There is currently no program in the MUS that specifically prepares students to work at the interface of biochemistry and computer science – i.e. bioinformatics. With the recent growth of genomic, protein and structural databases, this program would prepare students for a unique niche by training them to be conversant in chemistry, biochemistry, biology and computer science, so that they can bridge these diverse disciplines. The strength of our programs in biochemistry and computer science, particularly with the recent hires of three computer scientists who are experts in bioinformatics, uniquely positions the University of Montana to offer this program.

**Resources**

All resources – faculty and courses – currently are in place. No new resources are needed.

**Relationship to similar MUS programs**

The proposed program would be a unique offering in the MUS

**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 B.S. in Computational Biochemistry integrates the current biochemistry/chemistry and biological expertise at UM-Missoula with emerging expertise in bioinformatics arising from three recent hires in the Computer Sciences Department. The new major provides undergraduate students a solid foundation in computer science through five core courses and one advanced elective course and broad expertise in the classical biochemical sciences through courses in biochemistry, chemistry and biology. The major prepares students for “cutting edge” careers in bioinformatics including fields such as Big Data Mining, Genomic and Proteomic Sequence Analysis, Metabolomics, Transcriptomics and Systems Biology. No existing program is modified or replaced.

- 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 proposed course aligns with the University’s stated strategic goals. Students in this program will be trained in a unique interdisciplinary field of computational biochemistry, preparing them to contribute to the evolving use of scientific databases to improve human health. Majors graduating with a B.S. in Computational Biochemistry will be much sought-after in the pharmaceutical and biotechnology industries where they will lead and support technological innovation to produce critical innovations for human health in the 21<sup>st</sup> century.

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

The Biochemistry Program, which includes faculty from Chemistry & Biochemistry, the Division of Biological Sciences and the Department of Computer Science, spent the 2016-2017 academic year designing a new major that would blend biochemistry with computer science to prepare students to succeed in the field of bioinformatics. Given the need for foundational coursework in chemistry, biology and computer science, the development of the major required considered decisions regarding essential lower division coursework, so as to allow sufficient room for upper division coursework while staying within 120 credits. We did not proceed with submission in fall 2017 because of the University’s prioritization process.

- 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	68*
Credits in required courses offered by other departments	18
Credits in institutional general education curriculum	21
Credits of free electives	10
Total credits required to complete the program	120

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

\*The Biochemistry Program is a cross-departmental program, so, we are counting all biology, chemistry, biochemistry and computer science courses in this category.

- 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.
- Provide students with a solid working knowledge of the chemical concepts and descriptive chemistry necessary to succeed in computational biochemistry.
  - Provide students with a breadth of knowledge in biological sciences necessary to provide context for their understanding of computational biochemistry.
  - Provide students with the programming skills and database management expertise to succeed in computational biochemistry.
  - Provide students with the laboratory skills that will allow them insight to communicate with biologists and biochemists as they develop bioinformatics tools in the workplace.
  - Produce graduates who are able to synthesize biological, computational and chemical concepts and apply them to computational biochemistry.
  - Produce graduates who are effective at communicating across disciplines so they can provide computational tools that can move the disciplines of biology and biochemistry forward in either industrial or academic environments.
  - Produce graduates who will be sought after by both graduate schools and employers.

**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]*

No B.S. program in computational biochemistry currently exists at any institution in the Montana University System, and which would help the University of Montana in attracting and retaining students. These students will be able to contribute to the effective use of the large databases now available to biochemists and those in medically-related fields. These are dynamic, growing fields that require professionals with this preparation, and UM-M is uniquely positioned to offer this program because of the composition and expertise of our faculty. A fairly recent review of bioinformatics in Science Magazine highlights the opportunities in this new and emerging field "An Explosion of Bioinformatics Careers" <http://www.sciencemag.org/careers/features/2014/06/explosion-bioinformatics-careers>.

In addition, we will be leveraging three hires made by the Computer Science Department in the last three years, all of whom are experts in bioinformatics, in addition to three accomplished faculty in genomics in the Division of Biological Sciences. No other institution in the state of Montana has this sizable level of expertise in this area.

**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
University of Montana	Certificate	Bioinformatics

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

- 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 is no full bachelor's program in the MUS that is similar to the BS in Computational Biochemistry. This program will provide considerably more in depth training in Computational Biochemistry than is currently provided by the bioinformatics certificate 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]

The program is unique for the depth of study it provides in this field.

- 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]

All the courses and faculty expertise needed to offer this degree program are currently in place. There is no need for phased implementation. We expect that a few current Biochemistry majors might elect to pursue this degree rather than the BS in Biochemistry. The first students who would enter planning to pursue this degree would start at the University of Montana in the 19/20 academic year.

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

Fall Headcount Enrollment					Graduates				
AY18-19	AY19-20	AY20-21	AY21-22	AY22-23	AY18-19	AY19-20	AY20-21	AY21-22	AY22-23
3-6	4-8	5-10	8-12	8-12	0	1-2	1-2	3-6	4-8

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

These conservative projections are based on the current number of biochemistry majors and inquiries we have fielded from prospective students, along with what we know to be true about industry hiring trends (see above: <http://www.sciencemag.org/careers/features/2014/06/explosion-bioinformatics-careers>) and the rapid emergence of computational biochemistry and bioinformatics.

- c. What is the initial capacity for the program?

Because all the faculty and courses are in place to offer this program, there is no specific limitation beyond the enrollment sizes of individual courses. We expect to have no difficulty in accommodating the projected number of students in the program.

- 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]

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

The success of the program will be determined by the growth in the number of majors over the next five years. We expect the program will grow as outlined in the above table, which we believe is a conservative estimate. If the numbers of majors do not meet our goals, we will pursue additional efforts to make high school career counselors and math and science teachers aware of this program. We do not expect this to be a problem, given the expected growth in this field over the next generation.

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]*

- We will measure the successful completion of courses.
- For chemistry course work, we will use American Chemical Society Standardized Exams, which assess learning against national standards.
- Alignment with University-wide program-level writing assessment, as appropriate.
- Numbers and quality of presentations and publications by our students.
- Exit Interview/survey.
- Tracking of career progress of our graduates.
- Performance of our majors on the American Society of Biochemistry and Molecular Biology (ASBMB) biochemistry certification exam.

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

As is typical, we engage with our students and follow their progress throughout their pursuits in our programs at the University of Montana. This is done through coursework, advising and informal mentoring by faculty, particularly for students involved in independent research projects.

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

All degrees offered by the Biochemistry program will be recertified on a regular basis by the ASBMB. This is in addition to the biennial assessment process of the University of Montana. Our faculty, of course, review programs on a more routine basis to assure their quality and guide their continual improvement.

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

We are currently the only biochemistry program in the state of Montana accredited by the ASBMB, and we expect to continue this accreditation.

**9. Physical resources.**

a. Describe the existing 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]*

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

All of the courses both lecture and laboratory currently are being taught. The physical resources are all in place.

- b. List needed 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]*

No additional resources are necessary since all courses are currently being taught and all faculty necessary for the program are in place.

**10. Personnel resources.**

- a. Describe the existing 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]*

There are sufficient instructional, support and administrative resources available to the Biochemistry Program and the Department of Computer Science to implement this program. There is no impact on current courses, other than drawing new students to them. This program will make existing courses more productive. There is no impact on personnel requirements.

- b. Identify new 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]*

No new personnel are needed.

**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 library resources currently in place for the departments that contribute to the Biochemistry Program are more than adequate to support this new 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, given that the University needs to attract more students, this unique program can only be beneficial to the institution, and there are ample student services in place to support these additional students.

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

The B.S. in Computational Biochemistry requires no new resources, so, the program provides new revenue in the form of student tuition and fees with no additional expenses.

- 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.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

	Year 1	Year 2	Year 3
Revenues*	\$43,461.60	\$57,948.80	\$72,436.00
Expenses**	0	0	0
Net Income/Deficit (revenues-expenses)	\$43,461.60	\$57,948.80	\$72,436.00

\*Assuming FY 19 tuition and fees, applied to the upper limit of our projected number of students in each of the first three years.

\*\*As all resources are in place, no additional expenditures are needed for this program.

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

This is not applicable, as all resources are in place.

- 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.

N/A

- 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]*

N/A

- 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.

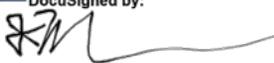
As all courses are already in place, only pre-existing course-specific student fees would be applicable.

- 14.** Complete the fiscal analysis form.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

Signature/Date

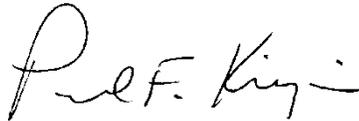
**College or School Dean:**

DocuSigned by:  
  
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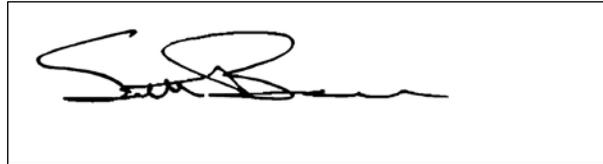
**Chief Academic Officer:**

**Chief Executive Officer:**

**Flagship Provost\*:**



**Flagship President\*:**



\*Not applicable to the Community Colleges.

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

**Appendix A – Proposed New Curriculum*****Bachelor of Science – Computational Biochemistry***

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**College Humanities & Sciences**

**Degree Specific Credits:** 96  
**Required Cumulative GPA:** 2.0

**Catalog Year:** 2017-2018***General Education Requirements***

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Information regarding these requirements can be found in the [General Education Section](#) of the catalog.

***Summary***

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<b>Code</b>	<b>Title</b>	<b>Hours</b>
	Lower Division Core	56
	Biochemistry	
	Biology	
	Computer Science	
	General and Organic Chemistry	
	Physics	
	Mathematics	
	Upper Division Core	30
	Biochemistry	

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Code	Title	Hours
Biology		
Analytical Chemistry		
Physical Chemistry		
Computer Science		
Advanced Electives		
		10
<b>Total Hours</b>		
Course List		<b>96</b>

### Lower Division Core

**Rule:** Must complete the following subcategories  
56 Total Credits Required

Biochemistry

**Rule:** All of the following courses are required

Code	Title	Hours
<u>BCH 110</u>	Intro Biology for Biochemists	3
BCH 111	Intro Biol for Biochemists Lab	1
<b>Total Hours</b>		<b>4</b>

**Montana Board of Regents**  
**CURRICULUM PROPOSAL FORM**

Code	Title	Hours
Course List		

Minimum Required Grade: C-

### Biology

**Rule:** All of the following courses are required

Code	Title	Hours
BIOB 272	Genetics and Evolution	4

<b>Total Hours</b>		<b>4</b>
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Course List		
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Minimum Required Grade: C-

### Computer Science

**Rule:** Students must take one of CSCI 125, CSCI 126 or CSCI 135. CSCI 136 and CSCI 232 are required.

Code	Title	Hours
CSCI 125	Computation in the Sciences	3
CSCI 126	Computation in the Sciences w/calc	3
CSCI 135	Fundamentals of Computer Science I	3
CSCI 136	Fundamentals of Computer Science II	3

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Code	Title	Hours
<u>CSCI 232</u>	Data Structures and Algorithmns	4
<b>Total Hours</b>		<b>10</b>

Course List

Minimum Required Grade: C-

General and Organic Chemistry

**Rule:** All of the following courses are required

Code	Title	Hours
<u>CHMY 141N</u>	College Chemistry I	4
CHMY 142N	College Chemistry I Lab	1
<u>CHMY 143N</u>	College Chemistry II	4
CHMY 144N	College Chemistry II Lab	1
<u>CHMY 221</u>	Organic Chemistry I	3
CHMY 222	Organic Chemistry I Lab	2
<u>CHMY 223</u>	Organic Chemistry II	3
CHMY 224	Organic Chemistry II Lab	2
<b>Total Hours</b>		<b>20</b>

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Code	Title	Hours
Course List		

Minimum Required Grade: C-

Physics

**Rule:** All of the following courses are required

Code	Title	Hours
<u>PHSX 215N</u>	Fund of Physics w/Calc I	4
PHSX 216N	Physics Laboratory I w/Calc	1
<u>PHSX 217N</u>	Fund of Physics w/Calc II	4
PHSX 218N	Physics Laboratory II w/Calc	1
<b>Total Hours</b>		<b>10</b>

Course List		
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Minimum Required Grade: C-

Mathematics

**Rule:** All of the following courses are required

Code	Title	Hours
<u>M 171</u>	Calculus I	4
M 172	Calculus II	4
<b>Total Hours</b>		<b>8</b>

Course List		
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Minimum Required Grade: C-

## Upper Division Core

**Rule:** Must complete the following subcategories  
30 Total Credits Required

### Biochemistry

**Rule:** All of the following courses are required

Code	Title	Hours
<u>BCH 480</u>	Advanced Biochemistry I	3
<u>BCH 482</u>	Advanced Biochemistry II	3
<u>BCH 486</u>	Biochemistry Research Lab	3
<b>Total Hours</b>		<b>9</b>

Course List

Minimum Required Grade: C-

### Biology

**Rule:** The following course is required

Code	Title	Hours
<u>BIOB 486</u>	Genomics	3
<b>Total Hours</b>		<b>3</b>

Course List

Minimum Required Grade: C-

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## Analytical Chemistry

**Rule:** All of the following courses are required

Code	Title	Hours
<u>CHMY 311</u>	Analytical Chem-Quant Analysis	4
CHMY 421	Advanced Instrument Analysis	4
<b>Total Hours</b>		<b>8</b>

Course List

Minimum Required Grade: C-

## Physical Chemistry

**Rule:** The following course is required

Code	Title	Hours
<u>CHMY 373</u>	Phys Chem-Kntes & Thrmdynmcs	4
<b>Total Hours</b>	4	

Minimum Required Grade: C-

## Computer Science

**Rule:** All of the following courses are required

Code	Title	Hours
CSCI 315E	Computers Ethics and Society	3
CSCI 451	Computational Biology	3

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Code	Title	Hours
<b>Total Hours</b>		<b>10</b>
Course List		

Minimum Required Grade: C-

### Advanced Electives

**Rule:** Choose 3 credits of Advanced Computer Science Electives (CSCI) and 7 credits of Advanced Science Electives (CHMY, BCH, BIOB, BIOH or BIOM) from the courses listed below.

**Note:** No more than 3 credits combined of [BIOB 490](#), [CHMY 490](#), [CHMY 498](#) and [BCH 490](#). No more than 3 credits combined of [CHMY 397](#) and [CHMY 494](#).

Code	Title	Hours
Select 10 credits from the following:		10
<a href="#">BCH 490</a>	Undergraduate Research	
<a href="#">BIOB 301</a>	Developmental Biology	
<a href="#">BIOB 375</a>	General Genetics	
<a href="#">BIOB 410</a>	Immunology	
<a href="#">BIOB 411</a>	Immunology Laboratory	
<a href="#">BIOB 440</a>	Biological Electron Microscopy	
<a href="#">BIOB 490</a>	Adv Undergrad Research	

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Code	Title	Hours
BIOH 365	Human AP I for Health Profsns	
<u>BIOH 370</u>	Human AP II for Health Profsns	
BIOH 405	Hematology	
<u>BIOH 462</u>	Principles Medical Physiology	
BIOM 360	General Microbiology	
<u>BIOM 361</u>	General Microbiology Lab	
BIOM 400	Medical Microbiology	
<u>BIOM 410</u>	Microbial Genetics	
BIOM 411	Exprmntl Microbial Genets Lab	
<u>BIOM 427</u>	General Parasitology	
BIOM 428	General Parasitology Lab	
<u>BIOM 435</u>	Virology	
CHMY 371	Phys Chem-Qntm Chm & Spctrscopy	
<u>CHMY 397</u>	Teaching Chemistry	
CHMY 402	Advanced Inorganic Chem Lab	
<u>CHMY 403</u>	Descriptive Inorganic Chem	

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Code	Title	Hours
CHMY 442	Aquatic Chemistry	
<u>CHMY 465</u>	Organic Spectroscopy	
CHMY 466	FT-NMR Optn for Undrgrd Rsrch	
<u>CHMY 490</u>	Undergraduate Research	
CHMY 494	Seminar/Workshop	
<u>CHMY 498</u>	Internship/Cooperative Educ	
<u>CSCI 332</u>	Design/Analysis of Algorithmns	
<u>CSCI 340</u>	Database Design	
<u>CSCI 444</u>	Data Visualization	
<u>CSCI 447</u>	Machine Learning	
<u>PHAR 421</u>	Medicinal Chem I	
<u>PHAR 422</u>	Medicinal Chem II	
<b>Total Hours</b>	<b>10</b>	

Course List

Minimum Required Grade: C-

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**CURRICULUM PROPOSAL FORM**

**Semester by Semester Class Schedule for BS in Computational Biochemistry**

**First Year**

<b>Course Number and Title</b>	<b>Autumn Credits</b>	<b>Spring Credits</b>
CHMY 141N-144N; College Chemistry I and II with labs	5	5
M 171-172; Calculus I and II	4	4
BCH 110-111; Intro to Biology for Biochemistry and Lab	-	4
CSCI 135–136; Fund of Computer Science I and II CSCI 125 Computation in the Sciences or CSCI 126 Computation in the Science w/calc may be substituted for CSCI 135	3	3
Writ 101; Composition*	3	-
<b>Total</b>	<b>15</b>	<b>16</b>

\*Students with last names A–L have priority for the course in the fall, M–Z have priority in spring.

**Second Year**

<b>Course Number and Title</b>	<b>Autumn Credits</b>	<b>Spring Credits</b>
CHMY 221-224; Organic Chemistry I and II with labs	5	5
BIOB 272; Genetics and Evolution	-	4
PHSX 215N-218N; Fundamentals of Physics I and II with Calc	5	5
CSCI 232; Data Structures and Algorithms	4	-
Intermediate Writing Course (must be 300 level of above)**	-	3
<b>Total</b>	<b>14</b>	<b>17</b>

\*\*See approved courses at [http://www.umt.edu/general-education/intermediate\\_writing/default.php](http://www.umt.edu/general-education/intermediate_writing/default.php)

**Third Year**

<b>Course Number and Title</b>	<b>Autumn Credits</b>	<b>Spring Credits</b>
BCH 480-482; Advanced Biochemistry I and II	3	3

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BCH 486; Biochemistry Research Lab	-	3
BIOB 486; Genomics	3	-
CSCI 451; Computational Biology	3	-
CHMY 373; Physical Chemistry-Kntcs &Thrmo	4	-
CSCI 315E; Computers, Ethics and Society	3	-
General Education	-	9
<b>Total</b>	<b>16</b>	<b>15</b>

**Fourth Year**

<b>Course Number and Title</b>	<b>Autumn Credits</b>	<b>Spring Credits</b>
CHMY 311; Analytical Chemistry-Quantitative Analysis	4	-
CHMY 421; Advanced Instrumental Analysis	-	4
Advanced Computer Science Elective***	-	3
Advanced Science Elective ( approved Chem/Biochem/Bio)	7	-
General Education	3	6
<b>Total</b>	<b>14</b>	<b>13</b>

\*\*\*CSCI 332 - Design/Analysis of Algorithms; CSCI 340 - Database Design ; CSCI 447 - Machine Learning; CSCI 444 - Data Visualization; CSCI 464 - Applications Mining Big Data (others, as approved by Advisor)

**Students completing this curriculum are eligible for a minor in Computer Science and a Certificate in Bioinformatics**

**Credits Needed to Graduate**

General Education	18 credits (Ethics Gen Ed satisfied by CSCI 315E)
Writing	6 credits (BCH 482/486 satisfy advanced writing requirement)
Advanced CS elective	3 credits
Advanced Science elective	7 credits
<u>Required Courses</u>	<u>86 credits</u>
<b>Total</b>	<b>120 credits</b>

**Academic Degree Program Proposal - Level II Fiscal Analysis Follow-up Form**

**CAMPUS:** UM - Missoula  
**AWARD LEVEL:** UG  
**PROGRAM NAME:** Computational Biochemistry  
**PROGRAM CODE:** CBCH

FY 2019		FY 2020		FY 2021		FY 2022		FY 2023	
Proj.	Actual OR Revised								

**ENROLLMENT PROJECTIONS**

Headcount	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
annual unduplicated headcount of students with declared major or minor within the program	4	6	8	10	10
Credit Hours					
annual avg. credits hours earned per student in program related curriculum	24	24	24	24	24
Student FTE					
Undergrad: (Headcount x CH)/30 Graduate: (Headcount x CH)/24	3.2	4.8	6.4	8	8
Completions					
Annual number of program completers	0	1	2	4	6

**REVENUE**

Tuition Revenue (net of waivers)	\$17,111	\$25,666	\$34,221	\$42,777	\$42,777
Institutional Support	\$0	\$0	\$0	\$0	\$0
Other Outside Funds (grants, gifts, etc.)	\$0	\$0	\$0	\$0	\$0
Program Tuition/Fees	\$347	\$520	\$694	\$867	\$867
<b>Total Revenue</b>	<b>\$17,457</b>	<b>\$26,186</b>	<b>\$34,915</b>	<b>\$43,644</b>	<b>\$43,644</b>
<b>Total Revenue per Student FTE</b>	<b>\$5,455.44</b>	<b>\$5,455</b>	<b>\$5,455</b>	<b>\$5,455</b>	<b>\$5,455</b>

**EXPENDITURES**

This new major is being accomplished with existing courses that are used in multiple existing programs. So, the BS in Computational Biochemistry comes at no additional cost to the University of Montana.

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	FTE	0.0	0.0	0.0	0.0	0.0
*Includes Adjunct Instructors	Salary + Benefits	\$0	\$0	\$0	\$0	\$0
Graduate Teaching Assistants	FTE	0.0	0.0	0.0	0.0	0.0
	Salary + Benefits	\$0	\$0	\$0	\$0	\$0
Staff	FTE	0.0	0.0	0.0	0.0	0.0
	Salary + Benefits	\$0	\$0	\$0	\$0	\$0
<b>Total Faculty &amp; Staff</b>	FTE	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
	Salary + Benefits	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

Operations (supplies, travel, rent, etc)	\$0	\$0	\$0	\$0	\$0
Start-up Expenses (OTO)	\$0	\$0	\$0	\$0	\$0
<b>Total Expenses</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

<b>Student FTE to Faculty (TT + NTT) Ratio</b>	<b>#DIV/0!</b>	<b>#DIV/0!</b>	<b>#DIV/0!</b>	<b>#DIV/0!</b>	<b>#DIV/0!</b>
<b>Net Income/Deficit (Revenue - Expenses)</b>	<b>\$17,457</b>	<b>\$26,186</b>	<b>\$34,915</b>	<b>\$43,644</b>	<b>\$43,644</b>

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.

*Rozie C Keller*

Campus Chief Financial Officer Signature

Chief Financial Officer Comments

**Montana University System**  
INTENT TO PLAN FORM

Program/Center/Institute Title: Biochemistry Program and Computer Science Department/University of Montana

Campus, School/Department: Missoula Campus, College of Humanities and Sciences

Expected Submission Date: 3/2/18

Contact Name/Info: Prof. Bruce Bowler, Biochemistry Program Director, [Bruce.Bowler@umontana.edu](mailto:Bruce.Bowler@umontana.edu) : 406-243-4022

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.**

The new BS in Computational Biochemistry major is a joint offering between the Computer Science Department and the Biochemistry Program. It is designed to leverage the expertise of current biochemistry, chemistry and biological sciences faculty with the new emerging focus of recently hired computer sciences faculty. The new major will give the undergraduate student a solid foundation in computer sciences through five core courses and one advanced elective course. The student will also gain expertise in the classical biochemical sciences through a series of biochemistry, chemistry and biological sciences courses that will complement the computer science offerings. Successful completion of this curriculum will allow the student to work at the "cutting edge" of this new and exciting area of science and includes fields such as Big Data Mining, Genomic and Proteomic Sequence Analysis as well as many of the new "-omics" research areas such as metabolomics, transcriptomics and systems biology. There is no equivalent major in the MUS system.

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

In all areas of sciences, the advent of high throughput data acquisition and automation has resulted in the ability to quickly collect enormous quantities of data for any given scientific parameter. The downside of this technological approach is that interpreting trends or signals within this tsunami of data has become, at times nearly impossible. This problem has led to the concept of data mining and in the context of biology and biochemistry this new field has become known as bioinformatics which in its most basic form is the marriage of computational approached of data analysis with fundamental biology and chemistry. "Bioinformatics is a field of study that uses computation to extract knowledge from biological data. It includes the collection, storage, retrieval, manipulation and modelling of data for analysis, visualization or prediction through the development of algorithms and software."  
<https://www.nature.com/subjects/bioinformatics>. This new field of science requires knowledge in both the computer sciences and the classical physical/biological sciences.

The BS in Computational Biochemistry that we propose will train students to meet this new and emerging workforce demand while maintaining flexibility for the student to follow alternative paths be it graduate school (either computer sciences or Biochem/Chem) or professional schools such as Medical/Dental Schools. A fairly recent review of bioinformatics in Science Magazine highlights the opportunities in this new and emerging field "An Explosion of Bioinformatics Careers" <http://www.sciencemag.org/careers/features/2014/06/explosion->

Montana University System  
INTENT TO PLAN FORM

[bioinformatics-careers](#). The Computational Biochemistry BS is a novel curriculum that reinforces current interdisciplinary collaborations between the Biochemistry program and the Computer Sciences department. The curriculum is a novel mix of currently offered computer science courses and classical science courses so no new resources will be required to for this new major.

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

The primary institutional mission for The University of Montana is to strengthen and maintain academic standards. The new BS program in Computational Biochemistry will serve to strengthen foundational academics in both the Biochemistry and Computer Sciences Departments. The program will enhance interdisciplinary collaborations between departments and deliver novel, "cutting-edge" science content to the student. Most importantly, this new curriculum will serve as a platform to educate students for the high technological needs of the 21<sup>st</sup> century workforce.

4) Describe how the program/center/institute overlaps, compliments, or duplicates existing efforts in the MUS.

To our knowledge, there is no overlap or duplication within the MUS systems for the Computational Biochemistry Major. Other campuses have computational and/or biochemical areas of expertise but to our knowledge, none have attempted to codify a collaborative effort through an interdisciplinary BS major. Within the University of Montana campus, the new BS in Computational Biochemistry will complement our existing areas of biochemical/chemical/biological expertise and augment recent faculty hires in the Computer Science Department that have focused on bioinformatics expertise.

Signature/Date

College/School Dean:

 2/27/18

Chief Academic Officer:

Chief Executive Officer:

Flagship Provost\*:

 3/12/18

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.