LEVEL I AND LEVEL II APPROVAL MEMORANDUM

Compiled here is the Level I and Level II memorandum containing items approved since the September 2026 Board of Regents Meeting. This memorandum from March and April contains items for which approval authority has been designated by the Board of Regents to the individual institutions or the Commissioner of Higher Education. The items before you have been approved and are now being shared with you for your notification.

- September 2026 Level I & Level II Memorandum
- October 2026 Level I & Level II Memorandum

MONTANA UNIVERSITY SYSTEM
OFFICE OF COMMISSIONER OF HIGHER EDUCATION

560 N. Park – PO Box 203201 – Helena, Montana 59620-3201
(406) 449-9124 - FAX (406) 449-9171

November 3, 2026

To: Chief Academic Officers

From: Joe Thiel
Deputy Commissioner for Academic, Research, and Student Affairs

RE: Approval of September 2026 Academic Items

The following September 2026 academic items have been approved:

LEVEL I ITEMS:

The University of Montana:

- Request authorization to terminate the Montana Geriatric Education Center
  Item #1003-LI0926

Sincerely,

Joe Thiel
Deputy Commissioner for Academic, Research, and Student Affairs

ACADEMIC ITEMS MEMORANDUM

DATE: September 29, 2026

TO: Chief Academic Officers, Montana University System

FROM: Joe Thiel, Interim Deputy Commissioner for Academic, Research, and Student Affairs

RE: September 2026 Academic Items

Contained within this memorandum are Level I and Level II proposals submitted by the institutions of the Montana University System in September 2026. These proposals include items for which approval authority has been designated by the Board of Regents to the individual institutions or the Commissioner of Higher Education. These Level I items are being sent to you for your review. If you have concerns about a particular proposal, you should share those concerns with your colleagues at that institution and try to come to some understanding. Issues not resolved should be submitted in writing to OCHE by noon on Friday, October 2, 2026. You will be notified of approved proposals by October 7, 2026. The Board of Regents will be notified of the approved proposals at the November 2026 meeting of the Board.

LEVEL I ITEMS:

The University of Montana:

- Request authorization to terminate the Montana Geriatric Education Center
  Item #1003-LI0926

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

September 2026

ITEM 1003-LII0926

Request authorization to terminate the Montana Geriatric Education Center

Institution: **University of Montana-Missoula** CIP Code: **NA**

Program/Center/Institute Title: **Montana Geriatric Education Center**

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

Options: _____

Proposal Summary [360 words maximum]

What: The University of Montana requests authorization to terminate this research centers and institutes. This unit was established via Board of Regents action and requires formal termination through the same process.

Why: This unit meets the threshold for termination due to loss of funding or leadership. Faculty and staff worked over the course of the last academic year to explore avenues for restored funding and revitalization. None were brought forward by the deadline set for this summer. Termination is consistent with the university's commitment to a coherent, sustainable research portfolio. That said the mission of this center fills an important need in a state with an aging population. Should opportunities present themselves the center may be reconstituted via the usual MUS processes.

Resources: The unit has already ceased operations, there are no active budgets, positions, dedicated facilities, or enrolled students.

ATTACHMENTS

Attachments

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

_____ **A. Level I:**

OCHE Notification

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

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

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

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

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

OCHE Approvals

4. **Re-titling an existing postsecondary educational program**
5. **Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)
6. **Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)
7. **Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)
8. **Revising a postsecondary educational program** (Curriculum Proposal Form)
9. **Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years**
10. **Withdrawing a postsecondary program from moratorium**
11. **Establishing a campus certificate of 29 credits or less (Curriculum Proposal Form)**

B. Level II:

1. **Establishing a new postsecondary educational program** (Curriculum Proposal and Completed Request to Plan Form)
2. **Requesting Permanent authorization for a temporary C.A.S. or A.A.S degree program** (Curriculum Proposal and Completed Request to Plan Form)
3. **Requesting a variation of the 120-credit baccalaureate degrees** *Exception to policy 301.11*
4. **Forming, eliminating or consolidating an academic, administrative, or research unit** (Curriculum or Center/Institute Proposal and completed Request to Plan, except when eliminating or consolidating)

X

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

MONTANA UNIVERSITY SYSTEM
OFFICE OF COMMISSIONER OF HIGHER EDUCATION

560 N. Park – PO Box 203201 – Helena, Montana 59620-3201
(406) 449-9124 - FAX (406) 449-9171

November 3, 2026

To: Chief Academic Officers

From: Joe Thiel
Deputy Commissioner for Academic, Research, and Student Affairs

RE: Approval of October 2026 Academic Items

The following October 2026 academic items have been approved:

LEVEL I ITEMS:

Montana State University Billings:

- Request for authorization to terminate Psychology, BA
  Item #2702-LI1026
- Request for authorization to terminate Earth Science, Minor
  Item #2701-LI1026

Montana State University:

- Request to retitle the program "Master of Science in Data Science" to "Master of Science in Statistics, Data Science Option"
  Item #2013-LI1026
- Request to retitle the program "Bachelor of Science in Health Enhancement K12 Broadfield (Health and Teaching) to "Bachelor of Science in Physical Education and Health"
  Item #2012-LI1026
- Request to establish an undergraduate Certificate of Food Security
  Item #2011-LI1026
- Request approval for consolidating two BS in Biological Science options into one
  Item #2010-LI1026

LEVEL II ITEMS:

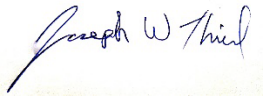
Montana State University:

- Request authorization to establish the Applied Quantum (QCORE) Center
  Item #2010-LII1126

MONTANA UNIVERSITY SYSTEM
OFFICE OF COMMISSIONER OF HIGHER EDUCATION

560 N. Park – PO Box 203201 – Helena, Montana 59620-3201
(406) 449-9124 - FAX (406) 449-9171

Sincerely,



Joe Thiel
Deputy Commissioner for Academic, Research, and Student Affairs

ACADEMIC ITEMS MEMORANDUM

DATE: October 26, 2026

TO: Chief Academic Officers, Montana University System

FROM: Joe Thiel, Interim Deputy Commissioner for Academic, Research, and Student Affairs

RE: October 2026 Academic Items

Contained within this memorandum are Level I and Level II proposals submitted by the institutions of the Montana University System in October 2026. These proposals include items for which approval authority has been designated by the Board of Regents to the individual institutions or the Commissioner of Higher Education. These Level I items are being sent to you for your review. If you have concerns about a particular proposal, you should share those concerns with your colleagues at that institution and try to come to some understanding. Issues not resolved should be submitted in writing to OCHE by noon on Friday, October 30, 2026. You will be notified of approved proposals by November 10, 2026. The Board of Regents will be notified of the approved proposals at the November 2026 meeting of the Board.

LEVEL I ITEMS:

Montana State University Billings:

- Request for authorization to terminate Psychology, BA
  Item #2702-LI1026
- Request for authorization to terminate Earth Science, Minor
  Item #2701-LI1026

Montana State University:

- Request to retitle the program "Master of Science in Data Science" to "Master of Science in Statistics, Data Science Option"
  Item #2013-LI1026
- Request to retitle the program "Bachelor of Science in Health Enhancement K12 Broadfield (Health and Teaching) to "Bachelor of Science in Physical Education and Health"
  Item #2012-LI1026
- Request to establish an undergraduate Certificate of Food Security
  Item #2011-LI1026
- Request approval for consolidating two BS in Biological Science options into one
  Item #2010-LI1026

LEVEL II ITEMS:

Montana State University:

- Request authorization to establish the Applied Quantum (QCORE) Center
  Item #2010-LII1126

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

October 2026

ITEM 2702 L1 1026

Request for Authorization to Terminate Psychology, BA

Institution: **Montana State University Billings** CIP Code: 42.0101

Program/Center/Institute Title: **Psychology BA**

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

Options: _____

Proposal Summary [360 words maximum]

What: Montana State University Billings requests authorization from the Montana Board of Regents to terminate the Psychology, BA program.

Why: The Department of Psychology requests the termination of the Psychology BA program due to low enrollment. A significant majority of Psychology majors were in our Bachelor of Science program, and the University administration asked us to discontinue this program through conversations during 7-year Academic Program Review. Students can now meet the same criteria that was previously required for a Bachelor of Arts to earn a Bachelor of Science.

Resources:

ATTACHMENTS

Program Termination Form

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

X **A. Level I:**

OCHE Notification

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

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

_____ **3. Offering an existing postsecondary educational program via distance or online delivery**

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

OCHE Approvals

_____ **4. Re-titling an existing postsecondary educational program**

X **5. Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)

_____ **6. Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)

_____ **7. Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)

_____ **8. Revising a postsecondary educational program** (Curriculum Proposal Form)

_____ **9. Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years**

_____ **10. Withdrawing a postsecondary program from moratorium**

_____ **11. Establishing a campus certificate of 29 credits or less (Curriculum Proposal Form)**

_____ **B. Level II:**

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

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

_____ **3. Requesting a variation of the 120-credit baccalaureate degrees** *Exception to policy 301.11*

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

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

Montana University System

PROGRAM TERMINATION/MORATORIUM FORM

Please complete the following questionnaire prior to submission of a program for termination or placement into moratorium. Please add additional comments beneath each question where applicable.

Program Title: Psychology, BA

Program is being ____ **Placed into moratorium** **X** **Terminated**

1. **Are there currently students enrolled in the program? (If yes, please answer questions a - c below.)** **Y:** ____ **N:** **X**

   a.) **Have all students currently enrolled in the program been met with and informed of the impending termination/moratorium?** **Y:** ____ **N:** ____

   b.) **What is the expected graduation date of all students from the program?**

   c.) **Have course offerings been planned to allow for students in the program to complete the degree in a reasonable fashion?** **Y:** ____ **N:** ____

2. **Will any faculty layoffs or changes in working conditions occur because of the termination/moratorium? (If yes, please answer questions a - b below.)** **Y:** ____ **N:** **X**

   a.) **Have the faculty affected by the program termination/moratorium been notified?** **Y:** ____ **N:** ____

   b.) **Please describe any layoffs that will occur including the date expected?**

Montana University System
PROGRAM TERMINATION/MORATORIUM FORM

3. The following parties, where applicable, have been notified of the impending program termination/moratorium. (Please mark X for completed, NA for not applicable):

a.) Internal Curriculum Committees X

b.) Faculty Senate X

c.) Program Public Advisory Committee NA

d.) Articulation Partners NA

4. Has there been any negative feedback received from students, faculty, or other constituents regarding the impending termination/moratorium? (If yes, please explain below.) Y: ____ N: X

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

October 2026

ITEM 2701 L1 1026

Request for Authorization to Terminate Earth Science, Minor

Institution: **Montana State University Billings** CIP Code: _____

Program/Center/Institute Title: **Earth Science Minor**

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

Options: _____

Proposal Summary [360 words maximum]

What: Montana State University Billings requests authorization from the Montana Board of Regents to terminate the Earth Science Minor.

Why: The Department of Biological and Physical Sciences requests the termination of the Earth Science Minor due to lack of consistent enrollment and a redesign of departmental program offerings. This program was placed on moratorium during a campus-wide strategic program alignment. The department has since made additional program changes related to earth science curriculum, including placing the Broadfield Science program on moratorium. This was prompted due to lack of enrollment as well as the resignation of the sole earth science faculty member.

Resources:

ATTACHMENTS

Program Termination Form

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

x A. Level I:

OCHE Notification

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

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

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

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

OCHE Approvals

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

X 5. **Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)

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

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

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

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

10. **Withdrawing a postsecondary program from moratorium**

11. **Establishing a campus certificate of 29 credits or less (Curriculum Proposal Form)**

B. Level II:

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

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

3. **Requesting a variation of the 120-credit baccalaureate degrees** *Exception to policy 301.11*

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

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

Montana University System

PROGRAM TERMINATION/MORATORIUM FORM

Please complete the following questionnaire prior to submission of a program for termination or placement into moratorium. Please add additional comments beneath each question where applicable.

Program Title: Earth Science, Minor

Program is being ____ **Placed into moratorium** **X** **Terminated**

1. **Are there currently students enrolled in the program? (If yes, please answer questions a - c below.)** **Y:** ____ **N:** **X**

   a.) **Have all students currently enrolled in the program been met with and informed of the impending termination/moratorium?** **Y:** ____ **N:** ____

   b.) **What is the expected graduation date of all students from the program?**

   c.) **Have course offerings been planned to allow for students in the program to complete the degree in a reasonable fashion?** **Y:** ____ **N:** ____

2. **Will any faculty layoffs or changes in working conditions occur because of the termination/moratorium? (If yes, please answer questions a - b below.)** **Y:** ____ **N:** **X**

   a.) **Have the faculty affected by the program termination/moratorium been notified?** **Y:** ____ **N:** ____

   b.) **Please describe any layoffs that will occur including the date expected?**

Montana University System
PROGRAM TERMINATION/MORATORIUM FORM

3. The following parties, where applicable, have been notified of the impending program termination/moratorium. (Please mark X for completed, NA for not applicable):

a.) Internal Curriculum Committees X

b.) Faculty Senate X

c.) Program Public Advisory Committee NA

d.) Articulation Partners NA

4. Has there been any negative feedback received from students, faculty, or other constituents regarding the impending termination/moratorium? (If yes, please explain below.) Y: ____ N: X

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

October, 2026

ITEM 2023-LI1026

ITEM TITLE: Request to Retitle the program "Master of Science in Data Science" to "Master of Science in Statistics (Data Science Option)"

Institution: **Montana State University** CIP Code: **27.0599**

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

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

Options: _____

Proposal Summary [360 words maximum]

What: Request to **r**etitle the program "Master of Science in Data Science" to "Master of Science in Statistics (Data Science Option)"

Why: The proposed change reflects student interest and enrollment patterns. The current Master of Science in Data Science program has experienced limited enrollment, with many students ultimately transitioning to the Master of Science in Statistics while pursuing additional coursework in computer science. Students consistently indicate a preference for a stronger statistical foundation combined with data science training. Because the majority of students are seeking this combination of skills, retitling the program as a Master of Science in Statistics (Data Science Option) will better align the degree with student demand, academic pathways, and career preparation. The data science option will continue to provide specialized training in data science while maintaining the rigorous statistical preparation students value.

Resources: No additional resources are needed to implement this change. The Department of Mathematical Sciences already administers the program and supports the vast majority of currently enrolled students. The School of Computing, the program's collaborating unit, supports the proposed change. Students interested in a more computing-focused pathway can be readily accommodated through the existing Master of Science in Computer Science program. As a result, the proposed retitling can be implemented using existing faculty expertise, curriculum, and administrative structures.

ATTACHMENTS

Attachments

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X A. Level I:

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

OCHE Notification

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

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

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

_____ **3. Offering an existing postsecondary educational program via distance or online delivery**

OCHE Approvals

__X__ **4. Re-titling an existing postsecondary educational program**

_____ **5. Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)

_____ **6. Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)

_____ **7. Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)

_____ **8. Revising a postsecondary educational program** (Curriculum Proposal Form)

_____ **9. Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years**

_____ **10. Withdrawing a postsecondary program from moratorium**

_____ **11. Establishing a campus certificate of 29 credits or less (Curriculum Proposal Form)**

_____ **B. Level II:**

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

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

_____ **3. Requesting a variation of the 120-credit baccalaureate degrees** *Exception to policy 301.11*

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

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

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

October, 2026

ITEM 2012-LI1026

ITEM TITLE : Request to Retitle "Bachelor of Science in Health Enhancement K-12 Broadfield (Health and Teaching)" to "Bachelor of Science in Physical Education and Health"

Institution: **Montana State University** CIP Code: **19.0101**

Program/Center/Institute Title: Bachelor of Science in Health Enhancement K-12 Broadfield (Health and Teaching)

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

Options: _____

Proposal Summary [360 words maximum]

What: Request to Retitle "Bachelor of Science in Health Enhancement K-12 Broadfield (Health and Teaching)" to "Bachelor of Science in Physical Education and Health"

Why: The Department seeks to restore the program title Health and Physical Education (HPE) to better reflect its purpose and align with widely recognized professional terminology. The name was changed to Health Enhancement in the 1980s in response to concerns that the traditional title carried unfavorable perceptions at the time. Although the change was intended to modernize the program, it has created longstanding confusion about the program's identity and goals.

The term Health Enhancement is not widely recognized as a teacher preparation program in health and physical education. Prospective students, educators, and stakeholders often misunderstand the program as being focused on wellness or personal health rather than preparing future health and physical education teachers. As a result, students searching for pathways to become Health and PE teachers may overlook the major entirely because its title does not clearly communicate its purpose.

Reinstating the name Health and Physical Education would provide greater clarity, accurately describe the program's mission, and align with terminology used throughout the state and nation. The traditional designation is immediately recognizable and directly reflects the professional roles for which students are being prepared.

The proposed change is not simply a rebranding effort but a return to a clear and established title that better supports student recruitment and understanding. MSU's Physical Education Teacher Education (PETE) and Health Education Teacher Education (HETE) programs have become among the strongest in the nation, producing highly qualified educators who are well prepared for the profession. Restoring the Health and Physical Education title will more effectively showcase the quality of the program, eliminate ambiguity, and ensure that prospective students can readily identify the pathway leading to careers as health and physical education teachers.

Resources: MSU has staff resources available to retitle the program throughout the next catalog. No additional resources are needed to continue the program under the new title.

ATTACHMENTS

Attachments

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

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

X **A. Level I:**

OCHE Notification

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

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

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

_____ **3. Offering an existing postsecondary educational program via distance or online delivery**

OCHE Approvals

X **4. Re-titling an existing postsecondary educational program**

_____ **5. Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)

_____ **6. Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)

_____ **7. Establishing a new minor where there is a major or an option in a major** (Curriculum Proposal Form)

_____ **8. Revising a postsecondary educational program** (Curriculum Proposal Form)

_____ **9. Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years**

_____ **10. Withdrawing a postsecondary program from moratorium**

_____ **11. Establishing a campus certificate of 29 credits or less (Curriculum Proposal Form)**

_____ **B. Level II:**

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

_____

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

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

3. Requesting a variation of the 120-credit baccalaureate degrees *Exception to policy 301.11*

_____

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

_____

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

_____

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

October 2026

ITEM 2011-LI1026

ITEM TITLE : Request to establish an undergraduate Certificate of Food Security

Institution: **Montana State University** CIP Code: **30.3301**

Program/Center/Institute Title: **Certificate of Food Security**

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

Options: _____

Proposal Summary [360 words maximum]

What: The undergraduate certificate in Food Security at MSU is a 17-credit program designed to equip students with the content knowledge and skills needed to address the complex topic of food security at local, national, and global levels. By integrating coursework focused on food policy, nutrition, food systems, social determinants of health, agriculture, and community health, students gain a comprehensive understanding of the social, economic, and environmental factors influencing food security. The program integrates experiential learning opportunities, including partnerships with local organizations, addressing community food insecurity and food surplus repurposing, providing hands-on opportunities for students to engage in food security solutions. This program prepares students for careers in nutrition, food system enterprises, public health, community health, non-profit programming, social services, and health advocacy where they can contribute to building resilient and sustainable food networks.

Why: MSU is responding to a critical need for food security expertise in Montana and beyond by developing a Food Security certificate program. Food insecurity remains a persistent challenge in many Montana communities and beyond, where consistent access to healthy, affordable, and culturally appropriate food is limited. In Montana, approximately 14% of the population is facing hunger, including 1 in 6 Montana children. Simultaneously, the agricultural and food systems workforce is evolving, requiring professionals who understand the intersections of food production, nutrition, policy, agroecosystem resilience and nutrition related health outcomes. The certificate curriculum ties together content from four different undergraduate programs to provide an in-depth and comprehensive examination of food security challenges and the public, private and non-profit programming deployed to address these challenges.

Resources: The only additional resources needed for this program are course fees associated with a new practicum course, SFBS295 – Food Upcycling. Please see attached for the itemized course fee estimate. Instructional support for the Food Security Certificate will be provided by existing faculty from the participating programs, including Food & Nutrition/Dietetics, Sustainable Food and Bioenergy Systems, Hospitality Management, and Community Health. The Food Security Certificate program will utilize existing university facilities and instructional spaces, as three out of four classes included in the program are currently taught by MSU faculty within regularly scheduled classrooms on campus.

ATTACHMENTS

Curriculum Proposal Form

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

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x A. Level I:

OCHE Notification

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

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

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

_____ **3. Offering an existing postsecondary educational program via distance or online delivery**

OCHE Approvals

_____ **4. Re-titling an existing postsecondary educational program**

_____ **5. Terminating an existing postsecondary educational program** (Program Termination and Moratorium Form)

_____ **6. Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)

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_____ **9. Establishing a temporary C.A.S. or A.A.S. degree program Approval limited to 2 years**

_____ **10. Withdrawing a postsecondary program from moratorium**

X **11. Establishing a campus certificate of 29 credits or less (Curriculum Proposal Form)**

_____ **B. Level II:**

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

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

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

_____

3. Requesting a variation of the 120-credit baccalaureate degrees *Exception to policy 301.11*

_____

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

_____

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

_____

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

October, 2026

ITEM 2010-LI1026

ITEM TITLE Request approval for consolidating two BS in Biological Sciences options into one

Institution: **Montana State University** CIP Code: **26.0101**

Program/Center/Institute Title: **BS in Biological Sciences**

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

Options: 1) Conservation Biology and Ecology 2) Fish and Wildlife Ecology and Management

Proposal Summary [360 words maximum]

What: The Ecology Department is proposing to combine two of our current undergraduate degree options within the Biological Sciences BS degree (Conservation Biology and Ecology: BLBE-BS; Fish and Wildlife Ecology and Management: BLFM-BS). This effort will create one new degree option called BS in Biological Sciences (Ecology, Conservation, and Fish and Wildlife Biology option). The Organismal Biology option and Biology Teaching option will remain as is currently.

Why: The two current options within the Biological Sciences degree offered by the Ecology Department overlap in their content as well as in the professors who teach courses. The new combined option will streamline advising, reduce confusion among undergraduates about differences across the two very similar options, and provide a unified and competitive curriculum that trains students for careers in universities, state and federal agencies, the private sector, and non-governmental organizations.

Resources: A committee of four faculty (Albertson, Cross, Litt, and Willey) from the Department of Ecology have allocated service hours to developing the new combined curriculum. Because the number of students will not change, no additional resources are needed for advising, instruction, student services, and infrastructure.

ATTACHMENTS

Curriculum Proposal Form (Ecology options merge CPF Form 2026.pdf)

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

X A. Level I:

OCHE Notification

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

Montana Board of Regents

ACADEMIC PROPOSAL REQUEST FORM

1b. Withdrawing a postsecondary educational program from moratorium

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

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

OCHE Approvals

4. Re-titling an existing postsecondary educational program

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

X **6. Consolidating existing postsecondary educational programs** (Curriculum Proposal Form)

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

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

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

10. Withdrawing a postsecondary program from moratorium

11. Establishing a campus certificate of 29 credits or less (Curriculum Proposal Form)

B. Level II:

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

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

3. Requesting a variation of the 120-credit baccalaureate degrees *Exception to policy 301.11*

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

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

Montana Board of Regents

CURRICULUM PROPOSAL FORM

Certificate of Food Security

1. **Institutional Accreditation.** Is the proposal considered a minor or major substantive change per NWCCU Guidelines? Consult the institutional Accreditation Liaison Officer for more information. *[Choose one]*

   Not Substantive_____ Minor Change_X____ Major Change_____

2. **Program Accreditation.** If applicable, describe specialized program accreditation requirements that inform this proposal, including the specific accrediting body and a summary of the standards being met. *[300 words]*

   Not applicable

3. **Program Summary:** List the program learning outcomes for the proposed program. Use assessable learner-centered statements that indicate what students will know and be able to do, upon completing the program.

1	Demonstrate effective communication skills to diverse audiences through written and oral formats to articulate the multifaceted complexities of food security, including social, economic, and environmental factors.
2	Employ practical food security strategies by engaging in hands-on, community-based experiential learning projects that address real-world challenges in food access and sustainability.
3	Analyze the root causes of food insecurity using critical thinking and evidence-based research to evaluate policies, programs, and interventions aimed at improving food security outcomes.

   a. List the aggregate credits required to complete the program using the following table.

	Credits
Credits in required courses offered by the department offering the program	14
Credits in required courses offered by other departments	3
Credits in institutional general education curriculum	0
Credits of free electives	0
Total credits required to complete the program	17

   b. Please include a complete listing of the proposed new curriculum in Appendix A of this document.

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

Montana Board of Regents
CURRICULUM PROPOSAL FORM

The food security certificate is available for undergraduate students at Montana State University interested in developing a comprehensive understanding of food security with an emphasis on food surplus repurposing.

The certificate complements existing programs within the MUS system in that it provides interested students the opportunity to gain a deeper understanding of a topic that is introduced in several food and health-centered academic programs, including food and nutrition, dietetics, sustainable food and bioenergy systems, hospitality management, and community health. In addition to academic coursework, the certificate stands out by incorporating hands-on, experiential learning opportunities that engage students in real-world food security efforts through community-based projects and partnerships.

MSU is responding to a critical need for food security expertise in Montana and beyond by developing a Food Security certificate program. Food insecurity remains a persistent challenge in many Montana communities and beyond, where consistent access to healthy, affordable, and culturally appropriate food is limited. In Montana, approximately 14% of the population is facing hunger, including 1 in 6 Montana children. Simultaneously, the agricultural and food systems workforce is evolving, requiring professionals who understand the intersections of food production, nutrition, policy, agroecosystem resilience and nutrition related health outcomes. The certificate curriculum ties together content from four different undergraduate programs to provide an in-depth and comprehensive examination of food security challenges and the public, private and non-profit programming deployed to address these challenges.

5. **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	What is the program enrollment for the last three academic years?
<none>			

a. Describe how this program's learning outcomes are related or tied to other programs on campus or within the Montana University System. *[100 words]*

This proposed Food Security Certificate is unique within the Montana University System. A keyword search was conducted for the MUS program inventory and no duplicative program was found. The keywords used in the search included: food security, food insecurity, hunger, food upcycling, food surplus, and food waste.

Montana Board of Regents
CURRICULUM PROPOSAL FORM

b. 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]*

Not applicable

c. Describe any efforts that were made to collaborate with similar programs at other institutions, including specific contacts and their institutional affiliations. If no efforts were made, please explain why. *[200 words]*

No efforts were made because this is a program unique within the MUS.

6. Program assessment.

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? Refer to specialized program accreditation assessments where appropriate. *[150 words]*

Students completing the certificate program are expected to meet an 80% proficiency level in each of the three program learning outcome (PLO) areas. Proficiency at this threshold level is as follows:
- PLO1: Communicate: Clearly articulates food security complexities (social, economic, environmental) in well-organized formats; demonstrates ability to engage diverse audiences.
- PLO2: Implement: Identifies key stakeholders in emergency and community food security services, and actively collaborates to achieve practical food security strategies in community projects.
- PLO3: Analyze: Uses critical thinking, learned practical skills and research to analyze root causes of and solutions for addressing food insecurity and repurposing surplus food; evaluates policies and interventions with sound reasoning.

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

ASSESSMENT PLANNING CHART		
Program Learning Outcomes	**Course Alignments: Include rubric, number and course title**	**Identification of Assessment Artifact**
1 (Communicate)	SFBS146: Intro to Sustainable Food and Bioenergy Systems	Food security essay within the "Eat Montana" assignment.
	SFBS466: Food System Resilience	Design and lead in-class topical discussion.
2 (Implement)	SFBS246: Practicum: Food Upcycling	Methods Write-Up: Food Upcycling Lab at HRDC
	SFBS466: Food System Resilience	Essay assignment: Global food security solutions in a changing climate

Montana Board of Regents
CURRICULUM PROPOSAL FORM

3 (Analyze)	SFBS246: Practicum: Food Upcycling	Lab Report Discussion: Sustainability Analysis of Rescued/Upcycled Food				
	NUTR351: Community Nutrition	Case study: Root causes and policy interventions in a community experiencing food insecurity				
ASSESSMENT SCHEDULE						
		Year to be assessed				
PLO	**Course**	2026-2027	2027-2028	2028-2029	2029-2030	2030-2031
1	SFBS146	X			X	
1	SFBS466		X			X
2	SFBS246	X			X	
2	SFBS466			X		
3	SFBS246		X			X
3	NUTR351			X		

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

Faculty review and report on program assessments annually to the MSU Assessment and Outcomes Committee.

Signature/Date

College or School Dean:

Chief Academic Officer:

Montana Board of Regents

CURRICULUM PROPOSAL FORM

Appendix A – Proposed New Curriculum

Required Courses

NUTR 221CS	Basic Human Nutrition	3
NUTR 351	Nutrition and Society	3
SFBS 146	Introduction to Sustainable Food and Bioenergy Systems	3
SFBS 295		2
Choose one of the following:		3
CHTH 428	Health Disparities	
SOCI 325	Social Stratification	
Choose one of the following:		3
SFBS 451R	Food Systems Research	
SFBS 466	Food System Resilience	
Total Credits		17

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents

CURRICULUM PROPOSAL FORM

1. **Institutional Accreditation.** Is the proposal considered a minor or major substantive change per NWCCU Guidelines? Consult the institutional Accreditation Liaison Officer for more information. *[Choose one]*

   Not Substantive__x___ Minor Change_____ Major Change_____

2. **Program Accreditation.** If applicable, describe specialized program accreditation requirements that inform this proposal, including the specific accrediting body and a summary of the standards being met. *[300 words]*

   N/A

3. **Program Summary:** List the program learning outcomes for the proposed program. Use assessable learner-centered statements that indicate what students will know and be able to do, upon completing the program.

   The goal of the Ecology, Conservation, and Fish and Wildlife Biology option is to give students a clear understanding of basic principles of ecology and evolution, and the conservation and management of species and ecosystems. The curriculum provides a strong background in concepts, tools, and approaches for developing ecological literacy and pursuing careers within universities, state and federal agencies, the private sector, and non-governmental organizations.

   Program Learning Outcomes as listed in the catalog. Students will be able to:

   1) explain basic principles of biology and associated sciences (e.g., chemistry, physics, mathematics)

   2) address conservation and management challenges using their understanding of ecological and evolutionary principles

   3) think critically, solve problems, and demonstrate scientific literacy

   4) engage with and apply interdisciplinary concepts (e.g., social science) reflecting the broad scope of ecological and societal themes relevant to sustaining nature

   a. List the aggregate credits required to complete the program using the following table.

	Credits
Credits in required courses offered by the department offering the program	62
Credits in required courses offered by other departments	18
Credits in institutional general education curriculum	31
Credits of free electives	28
Total credits required to complete the program	120

   *department offerings counted above include any rubrics BIOB, BIOE, BIOO, and WILD

   b. Please include a complete listing of the proposed new curriculum in Appendix A of this document.

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents
CURRICULUM PROPOSAL FORM

4. **Need for the program.** 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]*

   This proposal is to combine two already-established undergraduate options into one option. The new combined curriculum was created by an Options and Curriculum Committee in the Ecology Department (Drs. Albertson, Cross, Litt, and Willey) with substantial input from other faculty in the department. We anticipate that taking this step will help us meet several institutional goals, including increasing retention, streamlining advising and increasing academic support services from within the Department of Ecology, encouraging graduation, and preparing students for the workforce in Montana and beyond.

5. **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	What is the program enrollment for the last three academic years?
Montana State University	BS	Biological Sciences (Conservation Biology and Ecology option)	Total over 3 years: 332 Average per year: 111
Montana State University	BS	Biological Sciences (Fish and Wildlife Ecology and Management option)	Tota over 3 years: 1,007 Average per year: 336
Combined for both degrees from the Ecology Department			Total over 3 years: 1,339 Average per year: 447

   a. Describe how this program's learning outcomes are related or tied to other programs on campus or within the Montana University System. *[100 words]*

We are combining two already-established undergraduate options within the Ecology Department at MSU. The learning outcomes of the combined program reflect the learning outcomes of the separate programs.

   b. 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 consolidated option will not substantially duplicate other programs within the MUS in the same manner that the original options did not duplicate other programs within the MUS.

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents
CURRICULUM PROPOSAL FORM

c. Describe any efforts that were made to collaborate with similar programs at other institutions, including specific contacts and their institutional affiliations. If no efforts were made, please explain why. *[200 words]*

MSU Ecology faculty consulted with faculty at the University of Montana regarding the consolidation of the MSU options to ensure that the consolidated program remained substantially different from the Biological Sciences and Wildlife Biology programs at the respective universities.

6. Program assessment.

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? Refer to specialized program accreditation assessments where appropriate. *[150 words]*

The Ecology Department conducts assessment on an annual basis with program assessment reporting to the MSU Assessment and Outcomes committee in October. An Assessment Committee of three faculty manages assessment in collaboration with the Department Head. All faculty are provided the opportunity to review and discuss the assessment measures and outcomes.

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

Our current primary mechanism of assessment is a test that incoming freshman and graduating seniors take to quantify knowledge gains. All faculty in the Ecology Department have had an opportunity to contribute to the questions included on that test.

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

Ongoing faculty discussions led by the Assessment Committee are currently working on these specifics.

Signature/Date

College or School Dean: Signed by: William G. Thomas III A79DBF91F6EA4BB... 10/21/2026 | 3:27 PM EDT

Chief Academic Officer: Signed by: Elizabeth Burroughs 212A28411AC04BD... 10/21/2026 | 1:27 PM MDT

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents

CURRICULUM PROPOSAL FORM

Appendix A – Proposed New Curriculum

Freshman Year	Credits	
	Fall	Spring
BIOE 103CS - Environmental Science and Society	3	
Take one of the following series. Students leaning toward careers requiring biochemistry are encouraged to take the 141/142 series	4	
CHMY 121IN - Introduction to General Chemistry & CHMY 122IN - Introduction to General Chemistry Lab		
CHMY 141 - College Chemistry I & CHMY 142 - College Chemistry I Lab		
new course BIOE 101 to replace WILD 201	1	
COMX 111US - Introduction to Public Speaking or CLS 101US - Knowledge and Community	3	
University Core (see Course List below for recommendations)	3	
BIOB 104 - Scientific Thinking		1
BIOB 160 - Principles of Living Systems		4
M 161Q - Survey of Calculus		4
University Core (WRIT 101W is encouraged as 3 of these credits)		6
Year Total:	14	15
Sophomore Year	**Credits**	
	Fall	Spring
BIOB 170IN - Principles of Biological Diversity	4	
STAT 216Q - Introduction to Statistics (note, the Capstone class: Conservation Biology [BIOE 440R] requires both STAT 216Q and STAT 337 as pre-requisites.) or BIOB 318 - Biometry	3	
BIOB 375 - General Genetics	3	

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents

CURRICULUM PROPOSAL FORM

University Core	**3**	
Additional electives (student selected based on interests)	**3**	
Take one of the following series. Students leaning toward careers requiring biochemistry are encouraged to take the 143/144 series		**4**
CHMY 123 - Introduction to Organic Chemistry and Biochemistry & CHMY 124 - Introduction to Organic and Biochemistry Lab		
CHMY 143 - College Chemistry II & CHMY 144 - College Chemistry II Lab		
PHSX 205 - College Physics I		**4**
WRIT 201 - College Writing II		**3**
Additional electives (student selected based on interests)		**4-6**
Year Total:	**16**	**15-17**

Junior Year	**Credits**	
	Fall	**Spring**
BIOE 370 - General Ecology	**3**	
BIOB 420 - Evolution	**3**	
Take one of the following. Note, pay attention to prereqs for future classes; BIOE 491 "Quantitative Method in Ecology" will eventually have a new hard number	**3**	
STAT 337 - Intermediate Statistics with Introduction to Statistical Computing or STAT 411 - Methods for Data Analysis I or BIOE 491 - Special Topics or ENSC 311 - Fundamentals of Environmental Data Analysis		
Take one of the following. (note, BIOO 310 is required for Mammalogy [BIOO 475] and Ornithology [BIOO 470], and BIOO 412 is required for Ecological Physiology of Aquatic Organisms [BIOO 418].)	**3-4**	
BIOO 310 - Comparative Vertebrate Anatomy or BIOO 412 - Animal Physiology		

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents
CURRICULUM PROPOSAL FORM

note, Plant Physiology [BIOO 433] can also be used to meet this requirement, but it is offered in the Spring.		
One upper division (300-400 level) elective from Directed Electives or AEE (for degree requirements, see Course Lists below)	**3**	
Two upper division (300-400 level) classes from AEE (for degree requirements, see Course List below)		**6**
One class from SSPM (see Course List below)		**3**
Additional electives (student selected based on interests)		**6**
Year Total:	**15-16**	**15**
Senior Year	**Credits**	
	Fall	**Spring**
One upper division (300-400 level) class from AEE (Group A or Group B depending on prior coursework. For degree requirements, see Course List below.)	**3**	
Two upper division (300-400 level) electives from Directed Electives or AEE	**6**	
Take one of the following Capstone classes; can also be taken in senior year Spring if available; we are in the process of proposing to change some of these rubrics and all of these numbers to 499R: BIOB 499R, BIOE 499R, BIO499R, WILD 499R	**3**	
BIOE 440R - Conservation Biology or BIOE 427RN - Research in Freshwater Ecology or BIOE 499 - Senior Thesis/Capstone or WILD 401RN - Fish and Wildlife Capstone		
Additional electives (student selected based on interests)	**3**	
Three upper division (300-400 level) electives from Directed Electives or AEE		**9**
Additional electives (student selected based on interests)		**6**
Year Total:	**15**	**15**
Total Program Credits:	**120-123**	

Advanced Ecology & Evolution (AEE)

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents

CURRICULUM PROPOSAL FORM

Take a total of at least 9 credits (3 classes): at least 3 credits (one class) from each group		
Group A		
BIOE 408	**Rocky Mountain Vegetation**	
BIOE 420	**Field Ornithology**	
BIOO 230	**Identification of Seed Plants**	
BIOO 315	**Aquatic Insects**	
BIOO 415	**Ichthyology**	
BIOO 470	**Ornithology**	
BIOO 475	**Mammalogy**	
Group B		
BIOB 480	**Conservation Genetics**	
BIOE 375	**Ecological Responses to Climate Change**	
BIOE 405	**Behavioral and Evolutionary Ecology**	
BIOE 416	**Alpine Ecology**	
BIOE 421	**Yellowstone Wildlife Ecology**	
BIOE 428	**Freshwater Ecology**	
BIOE 445	**Macrosystems Ecology: Linking Plants, Animals, and Ecosystems Across Scales**	
BIOE 455	**Plant Ecology**	
BIOE 491 Fish and Wildlife Techniques (hard number will change)		
BIOE 491 Tanzania, Kilimanjaro (hard number will change)		
BIOE 491 Ecological Applications in Conservation Planning (hard number will change)		
BIOO 418	**Ecological Physiology of Aquatic Organisms**	

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents
CURRICULUM PROPOSAL FORM

Directed Electives		
Take 16 credits (~5-6 classes) from the list below or any class listed above that you didn't use to meet prior requirements; except additional CHMY which must be discussed with your advisor. Additional elective credits from this list are advised for ecology careers.		
Plant Electives (because of interests, or Federal job requirements [wildlife biologist = 9 credits with titles that include "plant", "botany", or "vegetation"])		
ENSC 210	**Role of Plants in the Environment**	
BIOO 230	**Identification of Seed Plants**	
BIOO 433	**Plant Physiology**	
BIOO 435	**Plant Systematics**	
BIOO 437	**Plant Development**	
BIOE 408	**Rocky Mountain Vegetation**	
BIOE 455	**Plant Ecology**	
Physical & Chemical Science Electives		
BCH 380 & BCH 381	**Biochemistry and Biochemistry Lab**	
CHMY 211 & CHMY 212	**Elements of Organic Chemistry and Elements of Organic Chemistry Lab**	
ECIV 231	**Introduction to Engineering Hydrology**	
ENSC 245IN	**Soils**	
ENSC 272CS	**Water Resources**	
ENSC 444	**Watershed Hydrology**	
ENSC 445	**Watershed Analysis**	
GEO 211	**Earth History and Evolution**	
ERTH 101IN	**Earth System Sciences**	

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents
CURRICULUM PROPOSAL FORM

ERTH 303	Weather and Climate	
ERTH 307	Principles of Geomorphology	
GPHY 411	Biogeography	
PHSX 103IN	The Physics of How Things Work	
PHSX 111CS	The World of Quantum Physics	
Advanced Ecology & Evolution Electives		
BIOE 422	Insect Ecology	
BIOE 424	Ecology of Fungi	
BIOE 494	Seminar/Workshop	
BIOM 415	Microbial Diversity, Ecology, and Evolution	
BIOO 262IN	Introduction to Entomology	
BIOO 465	Insect Identification	
ENSC 468	Ecosystem Biogeochem and Global Change	
WILD 438	Wildlife Habitat Ecology & Management	
GEO 411	Vertebrate Paleontology	
GEO 401R	Phylogenetics	
GEO 310	Invertebrate Paleontology	
GEO 413	Macroevolution/Fossil Record	
GEO 491 Molecular Paleontology (hard number will change)		
Tools, Quantitative Skills, and Inference Electives		
BIOB 305	Science Communication in Ecology	
BIOM 419	Programming for Biologists	

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents
CURRICULUM PROPOSAL FORM

GPHY 284	Intro to GIS Science & Cartog	
GPHY 384	Adv GIS and Spatial Analysis	
GPHY 426	Remote Sensing	
PHL 236Q	Logic	
STAT 408	Statistical Computing and Graphical Analysis	
STAT 411	Methods for Data Analysis I	
Social Science, Policy, & Management Electives		
ECNS 332	Econ of Natural Resources	
GPHY 402	Water and Society	
NRSM 430	Natural Resource Law	
NRSM 455	Riparian Ecology & Management	
WILD 420	Range & Wildlife Policy and Planning	
WILD 426	Wild Habitat Management	
Environmental Science & Restoration Electives		
ENSC 353	Environmental Biogeochemistry	
ENSC 407	Environmental Risk Assessment	
ENSC 410R	Biodiversity Survey and Monitoring Methods	
ENSC 448	Stream Restoration Ecology	
ENSC 461	Restoration Ecology	
NRSM 330	Fire Ecology and Mgmt	
Independent Research & Internship Electives		
BIOE 490R	Undergraduate Research	

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents

CURRICULUM PROPOSAL FORM

or ENSC 490R	Undergraduate Research
or NRSM 490R	Undergrad Research
or WILD 490R	Undergrad Research
BIOE 492	Independent Study
or WILD 492	Independent Study
BIOE 498	Internship
or WILD 498	Internship

Social Science, Policy, & Management (SSPM)

Take one of the following. Classes not on list can be approved by an Advisor

ECNS 101IS	Economic Way of Thinking
ECNS 332	Econ of Natural Resources
ENSC 110	Land Resources and Environmental Sciences
GPHY 329	Environment and Society
GPHY 402	Water and Society
NRSM 101	Natural Resource Conservation
NRSM 430	Natural Resource Law
NRSM 455	Riparian Ecology & Management
SOCI 311	Criminology
SOCI 313	Principles of Criminal Law and Procedure
SOCI 401	Animals and Society
SOCI 470	Environmental Sociology
WILD 301	Princ of Fish & Wildlife Mgmt

Docusign Envelope ID: BA664C61-C8A4-83A2-80BD-2B7518BBEF85

Montana Board of Regents
CURRICULUM PROPOSAL FORM

WILD 420	Range & Wildlife Policy and Planning	
WILD 426	Wild Habitat Management	
University Core. If a specific course is listed below, the Core requirement (e.g., US; W; Q) will already be satisfied by the degree requirements. See this website for classes that meet other Core requirements: https://www.montana.edu/msu-core/msu_core_courses.html		
Core 2.0 Requirements - Must be a grade C- or better		
COMX 111US	Introduction to Public Speaking	
or CLS 101US	Knowledge and Community	
WRIT 101W	College Writing I	
M 161Q	Survey of Calculus	
or STAT 216Q	Introduction to Statistics	
BIOE 103CS	Environmental Science and Society	
BIOB 170IN	Principles of Biological Diversity	
BIOE 440R	Conservation Biology (we are in the process of proposing to change some of these rubrics and all hard numbers to499R)	
or BIOE 427RN	Research in Freshwater Ecology	
or BIOE 499	Senior Thesis/Capstone	
or WILD 401RN	Fish and Wildlife Capstone	
Diversity (D)		
Arts (IA or RA)		
Humanities (IH or RH)		
Social Science (IS or RS)		

Montana Board of Regents

RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

Research Centers and Institutes differ from one another in focus, scope, and staffing, but each contributes in unique ways to the common goals of expanding knowledge, generating new discoveries and/or having a positive impact on society through informing policy and systemic change. Communities of researchers and staff in Research Centers and Institutes provide a stimulating environment that encourages early researchers and challenges experienced researchers. Research Centers and Institutes also contribute to the education and training of the researchers of the future by serving as learning environments for students. Interdisciplinary collaboration is promoted by Research Centers and Institutes both within the Institution and among MUS Institutions. Research Centers and Institutes do not provide didactic coursework, confer academic degrees or academic certificates or require accreditation by external accrediting bodies. Research Centers and Institutes frequently provide a portal for obtaining external funding in response to federal and/or state research priorities. As such, apparent duplication of mission between MUS research centers and institutes is not generally problematic as with academic programs due to the different sources of funding.

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

Montana State University proposes to establish a center for **Q**uantum **Co**llaborative **R**esearch and **E**ducation (QCORE) with the primary aim of advancing research and education in quantum systems and advancements in enabling technologies. Consistent with the values of MSU's land-grant mission, QCORE will build on existing strengths to empower Montana's quantum future with cutting-edge research and development, by fueling industry partnerships, growing community engagement and training Montanans for leadership in the rapidly emerging quantum industry.

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

A. State the Institute/Center's mission.

QCORE's mission is to expand access to cutting-edge infrastructure, foster the translation of quantum and adjacent innovations for societal impact, and develop a quantum workforce. Through partnerships with Montana's growing quantum industry, QCORE will prepare students for careers in quantum and quantum-enabling systems. QCORE will help faculty grow research programs in quantum and adjacent technology systems by providing access to critical research and testbed infrastructure, strengthening partnerships with industry and growing collaborations with innovators to create shared opportunities and innovations that benefit the common good.

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

QCORE's vision is to lead Montana's research, technology development, education and cross-sector partnerships for a sustainable quantum ecosystem. Serving as a research and innovation center at MSU, QCORE will provide access to leading-edge research and technology development infrastructure and foster a shared sense of community to enable breakthrough ideas and shape the future of quantum innovation in the state. Collaborations established within and through QCORE will make MSU more competitive for larger, multiple-PI research grants.

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

Five-year goals for the creation of QCORE are to be a **nationally recognized leader by**:

- Establishing best-in-class research and development for quantum networking and sensing.
- Demonstration of quantum information systems-enabled applications.
- Fostering quantum workforce development (K-12, 2year, undergraduate and graduate programs and upskilling for professionals and technician training).
- Embodying a deeply integrated innovation ecosystem that supports the translation of quantum and adjacent technologies across the state of Montana.

Establishing QCORE as a center will mobilize interdisciplinary research on quantum physics, materials science, engineering, computing, and business. These efforts will span and create opportunities for research and foster a shared vision for quantum educational excellence spanning all Colleges across MSU with a focus on Norm Asbjornson College of Engineering, College of Letters and Science, Gianforte School of Computing, Gallatin College, Jake Jabs College of Business and Entrepreneurship, College of Education, Health & Human Development and its Science Math Resource Center, MSU Extension, Technology Transfer Office, University Information Technology and the Research Cyber Infrastructure (RCI), High Performance Computing (HPC) facility, MonArk Quantum Foundry, OpTeC and Spectrum Lab.

QCORE will steward the development of transformative quantum technologies in service to the common good. Current program activities utilize the substantial existing research infrastructure investments across MSU's main campus and the QCORE facility on MSU's Innovation Campus. QCORE will expand access, mobilize collaboration and fuel innovation through cross-cutting strategies aimed at the following:

Priority 1: Strategically Advance Quantum and Adjacent Technology Research & Development
Demonstrate nationally recognized, best-in-class research and development for quantum networking and sensing by 2030. Research programs will initially target advancements on novel materials for quantum sources, memory and transduction critical to implementation of the quantum networking testbed. Quantum memory devices store and recall quantum states (qubits) for future use, serving as a critical component in quantum computing, repeaters, and long-distance quantum networks. Unlike classical memory, they utilize quantum superposition to hold complex, parallel information in atomic or solid-state systems, such as rare-earth-ion-doped crystals. Building on past grant success to establish the MonArk Foundry, QCORE will provide opportunities to develop and demonstrate novel materials development for 2D applications. Growing on past innovations under Spectrum Lab and OpTeC, QCORE will provide the infrastructure for rapid and secure quantum state transport and opportunities to integrate quantum and hybrid information networks essential to building the next-generation internet. Finally, capabilities created to demonstrate networked or distributed quantum computational systems will be fully integrated with MSU's High Performance Computing Cluster (HPC) to provide unique and highly sought quantum computation for a range of optimization problems relevant to agriculture, chemistry, ecosystems, resilient infrastructure, as well as advanced cyber secure systems.

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

Priority 2: Accelerate Quantum Workforce Development: Quantum workforce needs require building a diverse, multidisciplinary talent pipeline to address the growing industry talent gap. QCORE will sustain a commitment to growing quantum scientists, engineers, technicians, and "quantum-literate" entrepreneurial business professionals. Current industry and government partners have articulated key needs for specialized training in areas where MSU and Gallatin College are uniquely qualified, including quantum hardware (cryogenics, photonics), and rapid upskilling in quantum technologies at the graduate, undergraduate, one- and two-year workforce programs and K-12 engagement. Long-term success and sustainability of the quantum industry are improved by intentional efforts to foster diversity and inclusivity in this workforce. Each effort by QCORE surrounding quantum technologies research also includes robust efforts to support education and workforce development across Montana, including our rural and Tribal communities.

Priority 3: Provide confidence and leadership through product testing, and services: QCORE infrastructure and testbed resources will be expanded to provide critical services to advance quantum technologies with industry and government partners. QCORE-affiliated faculty and staff bring a wide array of expertise to understand, measure, and evaluate technology performance, or processes that are of value to quantum and adjacent technology developers. The testbeds will simultaneously serve as innovation engines for researchers and industry partners, sparking new ideas, technologies and intellectual property for entrepreneurial pursuits.

Cross-cutting strategy 1- Develop strong and enduring partnerships: QCORE's long-term sustainable business model depends on our ability to transform cutting-edge discovery into measurable economic, societal, and policy impact in quantum systems by serving as a strategic bridge between academia, industry, and government. QCORE has signed MOUs with industry partners to de-risk innovation, accelerate time-to-market, co-develop intellectual property, and access top-tier talent. QCORE has received sponsored research funding to enable government partners (Air Force Research Lab) to advance national research goals, strengthen quantum supply chains and economic competitiveness, and understand unique opportunities to build resilient innovation ecosystems in rural, Tribal and micropolitan places. QCORE will mobilize interdisciplinary expertise through transparent partnership models with a focus on real-world outcomes, to convert research and educational excellence into deployable solutions, sustainable growth, and public value—turning collaboration into tangible impact.

Cross-cutting strategy 2 – Foster Montana's quantum innovation ecosystem development and grow engagement: QCORE's efforts will **i**nclude facilitating conversation and collaboration across MSU, Montana's industry and global partners. Building off the highly successful launch of QCORE in August 2025 and the Supply Chain Summit in November 2024, QCORE will host an annual *Grand Challenges in Quantum Summit* in partnership with national and global leaders in industry, government and academia. These summits will ask the hard questions around successfully integrating quantum systems for the common good, mobilizing unique technology and policy solutions and standards development, while simultaneously growing engagement. The QCORE Seminar Series will be research and innovation focused, featuring MSU faculty-produced research and pedagogy on quantum systems as well as technology innovations from diverse researchers and

industry. The seminars are structured to encourage and facilitate interdisciplinary collaborations in both STEM and non-STEM areas.

Cross-cutting strategy 3- Focus on opportunities for technology translation: QCORE can maximize innovation impact by prioritizing research translation and technology transition as core missions alongside discovery. This means designing projects with end users in mind, aligning research agendas with industry and public-sector needs, and embedding pathways for commercialization, policy uptake, or operational deployment from the outset. By integrating translational infrastructure—such as the QCORE prototyping facilities, validation testbeds, Catalyst Incubator, industry co-working spaces, and supportive technology transfer expertise—QCORE will systematically move breakthroughs from lab to market or mission applications. Acceleration of technology transition is possible by reducing risk for adopters through engaging with QCORE's strategic partnerships program, coupled with milestone-driven development of sponsored research, clear intellectual property frameworks, and workforce training programs. QCORE will treat translation not as an afterthought but as a structured, supported process, to convert knowledge into scalable solutions that drive economic growth, societal benefit, and long-term innovation leadership.

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

Quantum computers have the potential to break our current highest level of encryption used for communications and, conversely, quantum information systems can provide unbreakable encryption. Therefore U.S. leadership in this field is considered critical to national security[i]. Leadership in this field will be dependent on developing friendly nation and domestic sources for the quantum supply chain and necessary quantum adjacent technologies including photonics, electronics, cryogenics, vacuum technologies, and materials[ii,iii]. A Quantum Economic Development Consortium (QED-C, formed by the US government under the National Quantum Initiative Act of 2018) report identified "Reliable access to key hardware subcomponents" as their top critical choke point for quantum computer development[iv]. While the Boston Consulting Group has estimated quantum computing could create $450 billion to $850 billion of economic value globally, sustaining a $90 billion to $170 billion market for hardware and software providers by 2040s[v], a McKinsey study indicates risk of a large talent gap to meet that potential with a need for 350,000 graduates in quantum and quantum related fields[vi].

Quantum computing and systems are fundamentally different than classical systems, placing quantum system developers and integrators in a position of simultaneously scaling computation while reducing system footprint and easing manufacturability. Montana's ecosystem is uniquely positioned to help solve challenges in hardware development, integration and manufacturing at scale. Creation of the proposed center would help MSU and Montana be a valuable contributor to this national need and help produce more technology-based jobs in the state, much as MSU's OpTeC (Optical Technology Center) helped spur the growth of photonics in the state. For example, MSU is the world leader in the engineering of rare-earth materials and Spectrum Lab has pioneered their extensive use in photonic signal processing for defense applications. These same rare earth materials hold great promise for quantum memory and transduction critical to development of quantum networking. Montana photonics companies are developing quantum materials and hardware as well as other enabling technology industries such as cryogenics and electronics. These

companies will partner with QCORE and Spectrum Lab to apply project results to innovate commercial quantum technology and products.
MSU offers a unique interdisciplinary team with diverse expertise in quantum and quantum adjacent systems. The Air Force Research Laboratory (AFRL) has recognized MSU's research and technology innovation in the field through multiple grants and recently sponsored research[vii,viii]. The effort also leverages classified research opportunities offered by the recently established Applied Research Laboratory (ARL) at MSU, which is the first TOP SECRET/Q-level laboratory in Montana. This laboratory supports the growing portfolio of classified work at MSU and throughout the region. The nearest similar facility is the Space Dynamics Lab in Utah.

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

Becoming a research and innovation center within MSU will create pathways for skill development, research projects, student education and professional training programs to advance knowledge in this critical and expanding industry sector. As a center, QCORE will provide additional research coordination and MSU brand development in the quantum community. QCORE will enhance faculty and student recruitment, build and strengthen relationships with external partners including governments (state, local and federal governments in the US and UK and other partner nations), national laboratories, and related industry. QCORE will grow opportunities for faculty research and student experiences through established partnerships that bring real-world needs to MSU and Montana. QCORE will impact a wide swath of researchers and academic areas including quantum and quantum adjacent (photonics, optics, and materials) (e.g. as of February 2026, QCORE has signed MOUs with 27 companies from MT, the US and abroad).

As a center, QCORE will build on success with grants and sponsored research programs to enhance the breadth and number of support mechanisms and recruit additional industry and philanthropic support to expand academic research and program collaborations between multiple colleges and departments (Physics, Chemistry and Biochemistry, Materials Science and Engineering, Mathematical Sciences, Computer Science, Electrical and Computer Engineering, Mechanical Engineering, Gallatin College and the Department of Education, the Business School). QCORE will continue to foster collaborations with existing research centers and projects (OpTeC, Spectrum Lab, and the MonArk Quantum Foundry) and research core facilities (ICAL, RCI, ARL, and the Montana Microfabrication Facility) to provide easy onboarding to university resources, expertise and infrastructure. Additional expertise and collaboration on national security-related activities will be possible through INSRE, MilTech, TechLink, and utilizing the infrastructure at the ARL.

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

MSU's central mission is as a land-grant university focused on advancing scientific, humanistic, agricultural, business and professional knowledge for the benefit of communities and people in the State of Montana. QCORE will continue to contribute to several *Choosing Promise* goals: *INTENTIONAL FOCUS 1: Drive Transformational Learning Experiences Creating Outstanding Educational Outcomes for All Students and INTENTIONAL FOCUS 2: Improve Lives and Society through Research, Creativity, and Scholarship.* Specific effort will be placed to impact *GOAL 2.1: Enhance the significance and impact of scholarship, and Grand Challenge 4: ·Securing the future of Montana: cybersecurity, photonics and optics, defense, governance and public policy.* QCORE

research may directly impact the national security challenge mentioned under item 2) above and multiple components of the Plan's fourth Grand Challenge. *INTENTIONAL FOCUS 3*: Expand Mutually Beneficial and Responsive Engagement for the Advancement of Montana, specifically GOAL 3.1: Increase mutually beneficial collaborations with Tribal nations and partners and GOAL 3.2 Grow mutually beneficial partnerships across Montana. QCORE will work with the Science Math Resource Center and MSU Extension to provide education, outreach, collaboration and workforce development opportunities to Montana's 12 tribal nations and 7 tribal colleges as well as K-12 education partners, particularly those in Montana's most rural areas.

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

Activities are grouped below, following the areas outlined in section 2B, above.

QCORE will steward the development of transformative quantum technologies in service to the common good. Current program activities utilize the substantial existing research infrastructure investments across MSU's main campus and the QCORE facility on MSU Innovation Campus.

Research & Innovation Infrastructure:

- **Serve as a cornerstone for laboratory infrastructure access and research coordination to recruit and empower faculty.** QCORE will ensure that quantum research supports economic opportunities across sectors, including the noted impacts in quantum hardware and systems integration. QCORE supports several testbeds including cryogenics, networking, communication, and computing. The **Quantum Cryogenics Testbed** will provide the test environments for materials and hardware characterization to include quantum/classical interfacing, qubit characterization and noise reduction as well as benchmarking and software development at temperatures critical to quantum system performance. The **Quantum Networking Testbed** is focused on developing multimodal quantum memories, quantum signal processing, tunable on-demand single photon emitters and other communication components that support quantum transport and networking. The **Quantum Communication** testbed incorporates UAV and airborne communication links that will augment fiber/free-space communication systems for long-haul hybrid transmission over a wide spectral range including sub-THz frequencies. The **Quantum Computing Testbed** with quantum hardware and simulation resources to use diverse, well-characterized qubits for the testing of quantum components. This emerging Q-CORE testbed facility is designed to host diverse computing candidates (trapped ion-based, photonic, or superconducting) and a quantum simulator. Research and tenure track faculty hires as well as college and department leadership across the university will benefit from the unique computing and networking facility already available through QCORE. QCORE will provide quantum computational capabilities to address challenges in key Montana economic sectors, including agriculture, advanced manufacturing, energy, and healthcare.
- **Build on existing research strengths in advanced materials, networking and quantum sensing applications** to position Montana's research and innovation enterprise for strategic leadership in the global quantum ecosystem. Hardware technology development

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

and system integration require extensive innovation aligned with the assets and expertise and coordination offered by QCORE.

- **Facilitate collaboration** so that discoveries in one field (e.g., quantum computing or novel materials and device development) can inform and impact others (e.g., agriculture, manufacturing, ecology, chemistry and pharmacology).

Innovation across the University:

- **Advance innovation and support industry.** The **Catalyst Lab Incubator** supports early-stage MSU technology ventures as they move from research and ideas to prototypes to scalable companies. It integrates structured startup incubation with hands-on prototyping resources to accelerate commercialization.
- **New Course Development.** Courses include: Phsx 491 QIS course by Dr. Hang Yu. New courses are being developed by faculty members including Phsx 491/591 Quantum Technology hardware by Dr. Matt Jaffe, and Honors seminar proposal on quantum computing. QCORE will work to enable instructors, faculty, Departments and Colleges to create graduate and undergraduate certificates in quantum technologies and other fields as the community workforce demand grows.
- **New student groups.** A graduate student organization, QBITs, has started regular meetings in Sp 2026 and Dr. Colin Shaw will develop a quantum focused pilot for a new Vertically Integrated Program (VIP) to support undergraduate research.
- **Cross-disciplinary collaboration.** We will use quantum as a nucleating theme to grow collaborations among MSU's strengths in computer science, mathematics, engineering, business, education, philosophy, history, literature, linguistics, ecology, biology, chemistry, art, and applied professional workforce programs.
- **Research funding.** Develop and expand sponsored research through industry and government partnerships and support the development of competitive research proposals for large multidisciplinary grants from external funding agencies and foundations.
- **Outreach and engagement.** Engage with partners to identify, shape and create workforce and talent pathways. QCORE will develop K-12 resources and educator professional development along with expanding access to existing one and two-year programs (e.g. photonics and optics programs) and developing new programs, training bootcamps, and undergraduate and graduate courses. Programs targeting K-12 include Quantum Scholars (scholarship support for future teachers) and a quantum digital badge for future educators and other non-technical majors, robust high school career fair presence across Montana, student programs for K–12 including Quantum Girls for middle school girls and quantum kits (already supplied to over 70 schools across Montana). QCORE will support Tribal college curriculum coordination and augmentation with the QCORE computing facility. QCORE has demonstrated impact in growing public awareness and quantum literacy, youth development, educator professional development across the state of Montana and fostered higher education partnerships and pathways.
- **Identify faculty expertise available for participation in the Institute/Center's activities.**

Below is a current list of faculty, research faculty and professional staff engaged in delivering QCORE activities. These will expand as the quantum computing systems come online and algorithm development enables QCORE to offer the computer access for a range of optimization

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

problems and use cases in agriculture, chemistry, pharmacology, critical infrastructure, cyber critical systems, etc.

- College of Engineering and Gianforte School of Computing: Andrew Lingley (Engineering), Brock LaMeres (Electrical Engineering), Joe Shaw (Electrical & Computer Engineering), David Dickensheets (Electrical & Computer Engineering, Director, Montana Nanotechnology Facility (MONT))
- College of Letters and Science: Jayne Morrow (Physics), Brian D'Urso (Physics), Li He (Physics), Craig Ogilvie (Physics), Erik Grumstrup (Chemistry), Chris Lemon (Chemistry) , Charles Thiel (Physics), Eric Sproles (Earth Sciences), Martin Mosquera (Chemistry), Yves Idzerda (Physics/Monark), Nicholas Childs (Physics), Matthew Jaffe (Physics), Prasanta Bandyopadhyay (Philosophy), David Ayala (Mathematical Sciences), Jaroslaw Kwapisz (Mathematical Sciences), Tomas Gedeon (Mathematical Sciences), Shinjini Nandi (Mathematical Sciences), Sam Gunningham (Mathematical Sciences), Ryan Grady (Mathematical Sciences)
- Spectrum Lab: Krishna Rupavatharam (Director, Spectrum Lab, QCORE, CTO, Physics), Joshua Dugre, Owen Wolfe, Trent Jackson, Samuel Fritsch
- Department of Education: Suzi Taylor (Director, SMRC), Laura Seitz, Molly Iversen, Jeanette Chipps, Tricia Seifert (Dean)
- Gallatin College: Mark Craig, Stephanie Gray (Dean)
- Jake Jabs College of Business: Brian Gilespie (Dean), Trevor Huffmaster (Director, Blackstone Launchpad), Andreas Thorsen, Agnieska Kwapisz, Brent Rosso, Christine Sung
- College of Arts and Architecture: student opportunities for an artist in residence will be expanded in collaboration with faculty across the college. Bruce Barnhart, Jack Schnepf (QCORE)
- Office of the Vice President of Research and Economic Development: Lee Spangler (Associate VPR), Michael Veselik (Assistant VPR), Daniel Juliano (Director, Technology Transfer Office), Magali Eaton (Research Translation, QCORE CIO)

As a center, QCORE will expand outreach to include:

- MSU Extension and Agricultural Experiment Stations: Extension offices and agents serve every reservation and county in Montana helping to address the digital/technology divide in rural MT while uplifting local and Indigenous knowledge.
- Materials Science and Engineering Program.
- Other institutions across the MUS where the increased computational capacity offered by the quantum systems can advance strategic research and innovation agendas.

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

QCORE will create opportunities for research and foster a shared vision for quantum educational excellence spanning MSU's Norm Asbjornson College of Engineering, College of Letters and Science, Material Science and Engineering program, Gianforte School of Computing, Gallatin College, Jake Jabs College of Business and Entrepreneurship, College of Education, Health & Human Development, Science Math Resource Center, Technology Transfer Office, University Information

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

Technology and the Research Cyber Infrastructure (RCI), High Performance Computing (HPC) facility, MonArk Quantum Foundry, OpTeC, and Spectrum Lab.

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

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

The QCORE program has been operating under the College of Letters and Science. Once QCORE has been approved as a BOR center it will be operated under the Vice President for Research and Economic Development. Participating units will include MSU's Norm Asbjornson College of Engineering, College of Letters and Science, Gianforte School of Computing, Gallatin College, Jake Jabs College of Business and Entrepreneurship, College of Education, Health & Human Development, Science Math Resource Center, Technology Transfer Office, University Information Technology and the Research Cyber Infrastructure (RCI), High Performance Computing (HPC) facility, MonArk Quantum Foundry, OpTec and Spectrum Lab.

B. Identify advisory council information.

QCORE will report to the Vice President for Research and Economic Development of Montana State University. The Co-PIs are Dr. Jayne Morrow and Dr. Krishna Rupavatharam. The Co-PIs working in partnership with the VPRED will have shared responsibility for the effective and sustained implementation of QCORE.

The **Faculty Committee** will guide the QCORE development plan, coordinate opportunities for research careers and student engagement including cluster hires for new faculty and research personnel, infrastructure investment and access, and recommend initiatives for sustained research growth through regular meetings. The Faculty Committee will be composed of 7-10 members focused on quantum and quantum adjacent technology research and technology innovation. The Faculty Committee will routinely communicate center progress toward strategic goals, fiscal status and strategic advancements in program and research development to the VPRED. Additional representatives may be sought to form a balanced representation as needed to sustain inclusive innovation and diversity of thought in scientific, engineering and research excellence. Representatives will be selected by College Deans and Departments Heads and leaders from across the university with an interest in promoting QCORE's success.

A QCORE External Advisory Council will be formed to provide expert advice in the fields of quantum computing and networking, quantum supply chain needs, and industry needs. QCORE has had extensive interactions with key players in the quantum industry, government agencies and government offices that will enable us to constitute an engaged and highly expert board. These leaders will provide input and direction to MSU's the QCORE leadership team and affiliated quantum researchers. Input will advance both fundamental and applied research in the quantum field and promote entrepreneurship and economic opportunity for Montanans and their fellow Americans. Participants will be recruited from existing strategic partnership program as well as others from global and national engagements as is optimal for QCORE's continued success. Additional representation from stakeholders will include representatives from MSU Innovation Campus and members of the MSU Alumni Foundation. Meetings of the External Advisory Council will be attended by a representative from the QBITs student group.

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

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

First year and continuing finances will be provided through sponsored research that build on the QCORE infrastructure investments funded through the *Applied QCORE Grant* (FA8750-24-1-1019) which was a 20-month, $26.7 M grant with the Air Force Research Laboratory (AFRL) in Rome, New York, (completed, 31 DEC 2025). The work builds on the successful quantum 2D materials research program, MonArk Quantum Foundry, funded by the U.S. National Science Foundation Q-AMASE-i program (NSF award No. DMR-1906383) and Spectrum Lab led programs in quantum communications and networking. QCORE recently secured a $31.5 M contract with the AFRL, *Expand QCORE* (FA8750-25-C-B027) with Air Force Research Laboratory in Rome, New York, Technical POP: 31 JUL 2025 to 30 JULY 2028.

QCORE will continue to pursue funding from other sponsored research opportunities by working in partnership with industry. Faculty affiliated with QCORE will also submit research grants with QCORE as a resource to strengthen the proposal. Educational grants being considered include from the NSF (REU, Advanced Technological Education, STEM Education, workshop funding) and Navy (STEM Educational and Workforce Program). Some funding will be provided from institutional resources to cover facility costs and perform necessary facility upgrades (e.g. renovations of laboratories in Barnard Hall) and to hire faculty in key areas to ensure the university is well-positioned for future growth in research and teaching needs.

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

As outlined in section 3, QCORE will work with College and Department leadership to support and recruit faculty in quantum systems, materials science and engineering. A faculty cluster hire in quantum science, engineering, and business would catalyze MSU's research, education, and economic impact, placing it at the forefront of a transformative technology revolution—while staying true to our Land Grant mission of service to Montana. QCORE will expand efforts to foster greater engagement across MSU and the MUS to provide access to the unique research infrastructure available for growing research and impact in the rapidly growing economy. Expansion of MSU's faculty will enable new and innovative research questions, leverage the unique quantum infrastructure at MSU and help position Montana in this emerging economy with technology innovation, and the associated economic opportunities. Expansion of MSU's faculty will also contribute significantly to MSU's education mission. There is a strong interest in quantum computing among both undergraduate and graduate students. Faculty hired with quantum expertise will add critically needed courses in quantum algorithms, atom optics,, 2D materials, manufacturing strategies for quantum technology, and entrepreneurial courses in emerging high-tech industry. A faculty cluster hire coupled with coordinated recruitment and communication of research success will augment MSU's visibility and impact as a leader in quantum and adjacent technologies research and education serving the state of Montana.

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

Potential areas for faculty include

- Quantum algorithms including error correction. MSU does not have any faculty with this expertise, so this is a critical gap. The faculty hire could be in an overlap area between quantum computing and AI which is currently generating new research opportunities in low power data centers, finance, aerospace, and healthcare sectors.
- Quantum Computing design and hardware. MSU has considerable strength in photonics and atom optics, growing expertise aligned with OpTeC and Spectrum Lab, and new faculty could lead us to international excellence in quantum information science, and distributed quantum systems
- Manufacturing strategies for quantum devices. A critical challenge facing the quantum industry is how to manufacture components at scale and fabricate devices that customers can reliably use. Faculty with this expertise can be of immediate and immense help to the nascent but rapidly evolving quantum ecosystem in Montana.
- Scalable neutral-atom qubit architectures. Develop scalable optical-tweezer arrays that trap hundreds to thousands of neutral atoms as well as investigate new cooling, loading, and rearrangement protocols to boost qubit uniformity and yield.
- Translational research in defect-based qubits in 2D materials or superconducting or topological phases in 2D materials.
- Conduct research and assist entrepreneurism in regional, emerging high-tech industry, i.e., how do companies cooperate in a fast-moving competitive environment, especially in a rural state.

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

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

Several academic and ecosystem centers are emerging to advance quantum science and innovation through research, education, and industry collaboration including: University of Wyoming's Center for Quantum Information Science and Engineering (C-QISE) drives interdisciplinary work in quantum materials, algorithms, simulation, and devices with a mission to foster innovation and prepare a skilled quantum workforce (uwyo.edu). In Colorado, the Colorado School of Mines integrates quantum engineering research and education and working with Elevate Quantum offers unique facilities and programs in quantum systems and sensors. The University of Colorado Boulder hosts world-renowned research centers such as JILA and Q-SEnSE that explore quantum sensing, fundamental physics, and engineering at scale. Elevate Quantum was formed through EDA funded regional Tech Hub program to connect academic, industry, and government partners across Colorado, Wyoming, and New Mexico to accelerate quantum innovation and economic impact. The University of Chicago works through the Chicago Quantum Exchange and embeds quantum research within broader innovation ecosystems that include industry and government partners. **A. Describe the relationship between the proposed Center/Institute and any similar Centers/Institutes, programs, or research capacities within the Montana University System.**

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

QCORE will collaborate with the newly emerging efforts in AI, MSU Interdisciplinary Institute on Artificial Intelligence (IIAI), and collaborate with and extend the work of other centers, institutes, and initiatives at MSU, such as the Center for Faculty Excellence, Science Math Resource Center, Technology Transfer Office, University Information Technology and the Research Cyber Infrastructure (RCI), High Performance Computing (HPC) facility, MonArk Quantum Foundry, OpTeC and Spectrum Lab, the Center for Research on Rural Education; the Institute for National Security Research and Education, and the Center for Science, Technology, Ethics and Society to advance research and educational excellence.

B. In cases of substantial duplication, explain the rationale for the proposed Center/Institute.

7. Assessment: How will the success of the center/institute be measured?

Five-year goals for the creation of QCORE are to be **nationally recognized leader**:

- Establishing best-in-class research and development for quantum networking and sensing.
- Demonstration of quantum information systems-enabled applications.
- Fostering quantum workforce development (K-12, 2 year, undergraduate and graduate programs and upskilling for professionals and technician training).
- Embodying a deeply integrated innovation ecosystem that supports the translation of quantum and adjacent technologies across the state of Montana.

The VPRED and QCORE leadership will evaluate the center's success with the intended metric of self-sufficiency in five years. QCORE must be able to sustain research programs, technical and administrative staff through sponsored research and grants. A project evaluator may be chosen to assess internal progress against established milestones and timelines quarterly. QCORE will share progress toward meeting the five-year goals through the publication of an annual report which will be shared with our internal and external advisory boards, as well as strategic partners, including the MSU provost, deans, and department heads.

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

- QCORE leadership and faculty affiliates
- MSU Executive Council
- Faculty Senate
- Student Symposium and Questionnaire
- Academic Council
- Academic leadership of MSU-Billings, MSU-Northern, Great Falls College - MSU

[i] National Security Memorandum on Promoting United States Leadership in Quantum Computing While Mitigating Risks to Vulnerable Cryptographic Systems, https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/04/national-security-memorandum-on-promoting-united-states-leadership-in-quantum-computing-while-mitigating-risks-to-vulnerable-cryptographic-systems/, 2022.

Montana Board of Regents
RESEARCH CENTER AND INSTITUTE PROPOSAL FORM

[ii] Quantum Technology Manufacturing Roadmap, prepared by SRI international for NIST, https://www.sri.com/press/story/quantum-technology-manufacturing-roadmap/ , Oct 2023.
[iii] An Assessment of U.S. – Allied Nations' Industrial Bases in Quantum Technology, Rand Corporation, ISBN: 978-1-9774-1243-0, https://doi.org/10.7249/RRA2055-1 , https://www.rand.org/pubs/research_reports/RRA2055-1.html, 2023.
[iv] Hyperion Research, "Challenges and Opportunities for Securing a Robust US Quantum Computing Supply Chain" Hyperion Research #HR4.0024.04.15. 2022. https://quantumconsortium.org/quantum-computing-supply-chain-issues/
[v] Boston Consulting Group study: https://www.bcg.com/publications/2024/long-term-forecast-for-quantum-computing-still-looks-bright
[vi] McKinsey & Company. "Quantum computing funding remains strong, but talent gap raises concern," June 2022
[vii]https://www.montana.edu/news/23386/montana-state-receives-26-7-million-grant-for-facility-to-test-and-promote-quantum-technology
[viii]https://www.defense.gov/News/Contracts/Contract/Article/4261297/#:~:text=Montana%20State%20University%2C%20Bozeman%2C%20Montana%2C%20was%20awarded%20a%20$31%2C518%2C010%20cost%2Dtype%20contract%20for%20Expand%20Q%2DCORE.
[viv] https://www.montana.edu/news/24156/board-of-regents-approves-new-institute-at-montana-state-to-address-national-security

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Montana University System

REQUEST TO PLAN FORM – ACADEMIC, ADMINISTRATIVE OR RESEARCH UNIT

ITEM XXX-2015-R-0326 **Meeting Date: March 2026**

Item Name: Request authorization to establish the Applied Quantum (QCORE) Center

Center/Institute/Unit Title: **Applied Quantum CORE (QCORE)**

Campus: **MSU** Expected Final Submission Date: **March 2026**

Contact Name/Info: **Alison Harmon, VP Research & Econ Development**

This form is meant to increase communication, collaboration, and problem-solving opportunities throughout the MUS in the center/institute development process. The completed form should exceed 2-3 pages. For more information regarding the center/institute approval process, please visit http://mus.edu/che/arsa/academicproposals.asp.

1) **Provide a brief description of the new center/institute (unit).**

Montana State University proposes to establish the Applied Quantum CORE (QCORE) with the primary aim of growing the quantum and enabling technology advancement ecosystem through applied research, technology development, and by training Montanans for leadership in the rapidly emerging industry. It will build on existing MSU research strengths in quantum information processing, quantum materials, and photonics. QCORE will pursue its primary aim in a way aligned with MSU's land-grant mission-- through research and development, student training and mentoring, industry partnerships, and community engagement.

QCORE will serve as a research and innovation center at MSU by providing access to appropriate technical infrastructure that will enable breakthrough technologies that shape the future of quantum innovation. QCORE will create a hub for communication, mentoring, and collaboration, connecting MSU research with the private sector and providing research opportunities for undergraduate and graduate students. Collaborations established within and through QCORE will make MSU more competitive for large, multiple-PI sponsored research projects.

Through current QCORE funding and activities, MSU is one of seven institutions in the world and probably the only university in the nation with both photonic and superconducting quantum computers. Access to these quantum computing systems will be a unique skill development experience for students as well as a technical advantage for researchers and partners. Additionally, QCORE is establishing cryogenic and quantum networking testbeds available to MSU and industry researchers working to develop and mature novel technologies that will support the hardware innovation to mitigate supply chain challenges faced by the quantum industry. QCORE will offer faculty, staff and students opportunities for networking and collaboration with industry and federal agencies, as well as research partners abroad to create and sustain opportunities for device development, test and evaluation, sponsored research (especially from industry), undergraduate and graduate research projects, academic programming, and faculty expansion and recognition.

2) **Describe the need for the center/institute. Specifically, how the center/institute meets current student, state, and industry research or community engagement needs. (Please cite sources in an addendum to this document).**

Quantum computers have the potential to break our current highest level of encryption used for communications and conversely, quantum information systems can provide unbreakable encryption. Therefore U.S. leadership in this field is considered critical to national security[i]. Leadership in this field will be dependent on developing friendly nation and

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domestic sources for the quantum supply chain and necessary quantum adjacent technologies including photonics, electronics, cryogenics, vacuum technologies, and materials[ii,iii]. A Quantum Economic Development Consortium (QED-C, formed by the US government under the National Quantum Initiative Act of 2018) report identified "Reliable access to key hardware subcomponents" as their top critical choke point for quantum computer development[iv]. While the Boston Consulting Group has estimated quantum computing could create $450 billion to $850 billion of economic value globally, sustaining a $90 billion to $170 billion market for hardware and software providers by the 2040s[v], a McKinsey study indicates risk of a large talent gap to meet that potential with a need for 350,000 graduates in quantum and quantum related fields[vi]. Creation of the proposed center would help MSU and Montana make a valuable contribution to this national need and help produce more technology-based jobs in the state, much as MSU's OpTeC (Optical Technology Center) has spurred the growth of photonics in the state.

MSU is a world leader in the engineering of rare-earth quantum materials and their extensive use in photonic signal processing for defense applications. Montana photonics companies developing quantum materials and hardware as well as other enabling technology industries such as cryogenics and electronics, will provide key components for this effort while also partnering through QCORE and Spectrum Lab to apply project results to innovate commercial quantum technology and products. MSU offers a unique interdisciplinary team with diverse expertise in quantum and quantum adjacent systems. The Air Force Research Laboratory (AFRL) has recognized MSU's research and technology innovation in the field through multiple grants and recently sponsored research[vii,viii]. The effort also leverages classified research opportunities offered by the recently established Applied Research Laboratory (ARL) at MSU, which is the first TOP SECRET/Q-level laboratory in Montana. This laboratory supports the growing portfolio of classified work at MSU and throughout the region. The nearest similar facility is the Space Dynamics Lab in Utah.

Additionally, QCORE will provide the research coordination and brand development needed to grow faculty and student recruitment, offer timely seminars and briefings, and build and strengthen relationships with external partners. External partners include governments (US and UK and other partner nations), national laboratories, and related industry partners including those that have signed MOUs with QCORE and MSU. Partners exist across a wide swath of MSU research projects and academic areas including quantum and quantum adjacent (photonics, optics and materials) technologies.

3) Describe how the center/institute fits with the institutional mission, strategic plan, and the existing MUS and institutional portfolios (refer to the most recent institutional Academic Priorities and Planning Statement).

QCORE will contribute to several *Choosing Promise* goals:

INTENTIONAL FOCUS 1: Drive Transformational Learning Experiences Creating Outstanding Educational Outcomes for All Students

INTENTIONAL FOCUS 2: Improve Lives and Society through Research, Creativity, and Scholarship

GOAL 2.1: Enhance the significance and impact of scholarship

And Grand Challenge 4: ·Securing the future of Montana: cybersecurity, photonics and optics, defense, governance and public policy

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Montana University System

REQUEST TO PLAN FORM – ACADEMIC, ADMINISTRATIVE OR RESEARCH UNIT

QCORE research may directly impact the national security challenge mentioned under item 2) above and multiple components of the Plan's fourth Grand Challenge.

QCORE will also help fulfill Montana State University's promise to expand engagement, by providing education, outreach, collaboration and workforce development opportunities to Montana's 12 tribal nations and 7 tribal colleges as well as K-12 education partners, particularly those in Montana's most rural areas.

4) **Describe any opportunities for collaboration you have identified or initiated either within the institution or between MUS institutions (i.e. articulation, course-sharing, research collaboration). Include potential contacts and their institutional affiliation.**

This center will build research and academic program collaborations between multiple colleges and departments (Physics, Chemistry and Biochemistry, Mathematical Sciences, Computer Science, Electrical and Computer Engineering, Mechanical Engineering, Gallatin College and the Department of Education) as well as existing research centers and projects (such as OpTeC, Spectrum Lab and the MonArk Quantum Foundry). Additional research and education collaboration on national security related activities will be addressed through INSRE, MilTech, TechLink, and the ARL.

5) **Describe any significant new financial resources (staff and/or facilities) needed to launch and sustain the center/institute. How do you anticipate supporting this new center/institute/unit**

An institute CEO/Executive Director, Director of Strategic Partnerships, Chief Technology Officer, Chief Innovation Officer and Director, QCORE Education & Workforce Development are all positions created and in place through federal grant support. The establishment of computing and networking testbeds and core (user) facilities focused on cryogenics, materials fabrication and characterization, component and device testing and development, are also grant supported. Anticipated MSU institutional support is consistent with its other centers will provide some operational assistance through the newly established Institute for National Security Research (INSRE)[viv] and Education and MilTech. QCORE activities are of interest to multiple federal agencies as well as the private sector so continuing grant, sponsored research and test and evaluation funding is expected.

Signature/Date		
Chief Academic Officer:	DocuSigned by: Robert Mokwa 212A28411AC04BD...	12/15/2025 | 9:50 AM MST
Chief Research Officer:	DocuSigned by: Alison Harmon 8596262C40F2420...	12/15/2025 | 12:54 PM MST
Chief Executive Officer:	Signed by: Brock Tessman 3B91DBE4C8B1461...	12/17/2025 | 12:23 PM MST
Flagship Provost*:	DocuSigned by: Robert Mokwa 212A28411AC04BD...	12/15/2025 | 9:50 AM MST

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Montana University System

REQUEST TO PLAN FORM – ACADEMIC, ADMINISTRATIVE OR RESEARCH UNIT

Flagship President*:	Signed by: Brock Tessman 3B91DBF4C8B1461...	12/17/2025 | 12:23 PM MST

*Not applicable to the Community Colleges.

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[i] National Security Memorandum on Promoting United States Leadership in Quantum Computing While Mitigating Risks to Vulnerable Cryptographic Systems, https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/04/national-security-memorandum-on-promoting-united-states-leadership-in-quantum-computing-while-mitigating-risks-to-vulnerable-cryptographic-systems/, 2022.

[ii] Quantum Technology Manufacturing Roadmap, prepared by SRI international for NIST, https://www.sri.com/press/story/quantum-technology-manufacturing-roadmap/ , Oct 2023.

[iii] An Assessment of U.S. – Allied Nations' Industrial Bases in Quantum Technology, Rand Corporation, ISBN: 978-1-9774-1243-0, https://doi.org/10.7249/RRA2055-1 , https://www.rand.org/pubs/research_reports/RRA2055-1.html, 2023.

[iv] Hyperion Research, "Challenges and Opportunities for Securing a Robust US Quantum Computing Supply Chain" Hyperion Research #HR4.0024.04.15. 2022. https://quantumconsortium.org/quantum-computing-supply-chain-issues/

[v] Boston Consulting Group study: https://www.bcg.com/publications/2024/long-term-forecast-for-quantum-computing-still-looks-bright

[vi] McKinsey & Company. "Quantum computing funding remains strong, but talent gap raises concern," June 2022

[vii]https://www.montana.edu/news/23386/montana-state-receives-26-7-million-grant-for-facility-to-test-and-promote-quantum-technology

[viii]https://www.defense.gov/News/Contracts/Contract/Article/4261297/#:~:text=Montana%20State%20University%2C%20Bozeman%2C%20Montana%2C%20was%20awarded%20a%20$31%2C518%2C010%20cost%2Dtype%20contract%20for%20Expand%20Q%2DCORE.

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