SUBJECT

Board Policy III.N., Statewide General Education – First Reading

REFERENCE

October 2020	The Board approved the first reading of proposed amendments to Board Policy III.N. designating the Executive Director or designee as chair of the GEM Committee.
December 2020	The Board approved the second reading of proposed amendments to Board Policy III.N.
August 2021	The Board approved the first reading of proposed amendments to Board Policy III.N. expanding membership of the GEM Committee to representatives from digital learning, dual credit, and open education. This included amendments to GEM competency areas.
October 2021	The Board approved the second reading of proposed amendments to Board Policy III.N.
December 2022	The Board approved the first reading of proposed amendments to Board Policy III.N that changed the GEM Oral Communication requirement from a minimum of 2 to a minimum of 3 credits and the institutionally-designated credits from a minimum of 6 to a minimum of 5.
February 2023	The Board approved the second reading of proposed amendments to Board Policy III.N.
August 2023	The Board approved the first reading of proposed amendments to Board Policy III.N. to allow institutions to propose specialized baccalaureate degree programs that require fewer than 36 general education credits in rare instances.
October 2023	The Board approved the second reading of proposed amendments to Board Policy III.N..

APPLICABLE STATUTE, RULE OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section III.N. and III.V.
Idaho Code § 33-3729

BACKGROUND/DISCUSSION

Board Policy III.N., General Education, outlines the statewide General Education Framework, which provides guidance to Idaho's public institutions in identifying courses that meet the General Education Matriculation (GEM) competencies for the facilitation of seamless credit transfer for students. It also provides initial guidance for the establishment of the General Education Committee. This Committee has an important role in shaping the continued consistency of these courses across our institutions as well as in providing leadership for innovation in

this curricular space.

The proposed amendments further clarify two areas related to General Education. First, they provide a unified purpose for the rubrics that have been developed for each Way of Knowing or disciplinary area in General Education. Board staff had, at the request of the General Education Committee, gathered input on the effective use of the rubrics from the faculty representative groups during Spring 2023. The General Education Committee proposed this change at the October 2023 General Education Summit and approved the change in January 2024. While the rubrics may continue to be used for a variety of purposes on campus, including for instruction and assessment, the policy now more clearly describes their utility as a guide for on-campus decisions about assigning general education courses to the various Ways of Knowing categories.

Secondly, the Committee worked collaboratively throughout last year to describe roles and term limits, as reflected in the policy amendments, and to develop Committee Bylaws to help shape the roles and responsibilities of the Committee.

The policy amendment and the Bylaws have also been reviewed by CAAP at their February 1, 2024 meeting.

IMPACT

Approval of the proposed amendments will facilitate Committee processes and allow the Committee to fulfill its intended purpose.

ATTACHMENTS

Attachment 1 - Board Policy III.N., Statewide General Education – First Reading
Attachment 2 – General Education Committee Bylaws

BOARD STAFF COMMENTS AND RECOMMENDATIONS

The policy amendments and bylaws were reviewed by CAAP on February 1, 2024 and by the Instruction, Research, and Student Affairs Committee of the Board on February 15, 2024. Board staff recommends approval.

BOARD ACTION

I move to approve the first reading of proposed amendments to Board Policy III.N., Statewide General Education, as submitted in Attachment 1.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

ATTACHMENT 1

Idaho State Board of Education
GOVERNING POLICIES AND PROCEDURES
SECTION: III. POSTSECONDARY AFFAIRS
SUBSECTION: N. Statewide General Education **~~February~~ April 2024**

In our rapidly-changing world, students need to understand how knowledge is generated and created. They need to adapt to new opportunities as they arise as well as effectively communicate and collaborate with increasingly diverse communities and ways of knowing. In combination with major coursework, general education curriculum prepares students to use multiple strategies in an integrative manner to explore, critically analyze, and creatively address real-world issues and challenges. General education coursework provides students with an understanding of self, the physical world, and human society—its cultural and artistic endeavors as well as an understanding of the methodologies, value systems, and thought processes employed in human inquiries. General education helps instill students with the personal and civic responsibilities of good citizenship, and prepares them to be adaptive, life-long learners.

This policy shall apply to the University of Idaho, Boise State University, Idaho State University, Lewis-Clark State College, College of Eastern Idaho, College of Southern Idaho, College of Western Idaho, and North Idaho College (hereinafter "institutions").

1. The state of Idaho's general education framework for Associate of Arts, Associate of Science, and Baccalaureate degrees, outlined below in Figure 1, shall be:

    a. Thirty-one (31) credits or more of the general education curricula must fit within the Gg~~g~~eneral E~~e~~ducation Matriculation (GEM) competency areas defined in subsection 4 of this policy, and
    b. Five (5) or more credits of the general education curricula, which are reserved for institutions to address the specific mission and goals of the institution. For this purpose, institutions may create new competency areas or they may choose to count additional credits from GEM competencies. Regardless, these institutionally designated credits must have learning outcomes linked to Association of American Colleges and Universities (AAC&U) Essential Learning Outcomes.

2. The intent of the general education framework is to:

    a. Establish statewide competencies that guide institutions' determination of courses that will be designated as GEM courses,
    b. Establish shared disciplinary/Ways of Knowing rubrics that guide ~~course/general education program assessment;~~institutional decision-making about designating courses to GEM competency areas, and
    c. Create a transparent and seamless transfer experience for undergraduate students.

3. There are six (6) GEM competency areas. The first two (2) emphasize integrative skills intended to inform the learning process throughout general education and major. The final four (4) represent ways of knowing and are intended to expose students to ideas and engage them in a broad range of active learning experiences.

   The GEM competency areas are as listed:

   a. Written Communication
   b. Oral Communication
   c. Mathematical Ways of Knowing
   d. Scientific Ways of Knowing
   e. Humanistic and Artistic Ways of Knowing
   f. Social and Behavioral Ways of Knowing

4. GEM courses in each area shall include the following competencies:

   a. Written Communication
      Upon completion of a course in this category, students are able to demonstrate the following competencies:

      i. Use flexible writing process strategies to generate, develop, revise, proofread, and edit texts.
      ii. Adopt strategies and genre appropriate to the rhetorical situation.
      iii. Use inquiry-based strategies to conduct research that explores multiple and diverse ideas and perspectives, appropriate to the rhetorical context.
      iv. Use rhetorically appropriate strategies to evaluate, represent, and respond to the ideas and research of others.
      v. Address readers' biases and assumptions with well-developed evidence-based reasoning.
      vi. Use appropriate conventions for integrating, citing, and documenting source material.
      vii. Read, interpret, and communicate key concepts in writing and rhetoric.

   b. Oral Communication
      Upon completion of a course in this category, students are able to demonstrate the following competencies:

      i. Research, discover, and develop information resources and structure spoken messages to increase knowledge and understanding.
      ii. Research, discover, and develop evidence-based reasoning and persuasive appeals for ethically influencing attitudes, values, beliefs, or behaviors.
      iii. Adapt spoken messages to the diverse personal, ideological, and emotional needs of individuals, groups, or contexts.
      iv. Employ effective spoken and nonverbal behaviors that support communication goals and illustrate self-efficacy.

v. Listen in order to effectively and critically evaluate the reasoning, evidence, and communication strategies of self and others.
vi. Demonstrate knowledge of key theories, perspectives, principles, and concepts in the Communication discipline, as applied to oral communication.

c. Mathematical Ways of Knowing
Upon completion of a course in this category, a student is able to demonstrate the following competencies:

i. Interpret mathematical concepts.
ii. Represent information/data.
iii. Use appropriate strategies/procedures when solving mathematical problems.
iv. Draw reasonable conclusions based on quantitative information.

d. Scientific Ways of Knowing
Upon completion of a non-lab course in this category, a student is able to demonstrate competencies i-iv. A student is able to demonstrate all five competencies, i-v, upon completion of a lab course.

i. Apply foundational knowledge and models of a discipline in the physical or natural sciences to analyze and/or predict phenomena.
ii. Apply scientific reasoning to critically evaluate assertions.
iii. Interpret and communicate scientific information via written, spoken and/or visual representations.
iv. Describe the relevance of specific scientific principles to the human experience.
v. Test a hypothesis in the laboratory or field using discipline-specific tools and techniques for observation, data collection and analysis to form a defensible conclusion.

e. Humanistic and Artistic Ways of Knowing
Upon completion of a course in this category, students are able to demonstrate at least five (5) of the following competencies:

i. Recognize and describe humanistic, historical, or artistic works within problems and patterns of the human experience.
ii. Distinguish and apply methodologies, approaches, or traditions specific to the discipline.
iii. Differentiate formal, conceptual, and technical elements specific to the discipline.
iv. Analyze, evaluate, and interpret texts, objects, events, or ideas in their cultural, intellectual or historical contexts.
v. Interpret artistic or humanistic works through the creation of art, language, or performance.
vi. Develop critical perspectives or arguments about the subject matter, grounded in evidence-based analysis.

vii. Demonstrate self-reflection, widened perspective, and respect for diverse viewpoints.

f. Social and Behavioral Ways of Knowing
Upon completion of a course in this category, students are able to demonstrate all five (5) of the following competencies.

i. Demonstrate knowledge of the theoretical and conceptual frameworks of a particular Social Science discipline.
ii. Describe self and the world by examining the dynamic interaction of individuals, groups, and societies as they shape and are shaped by history, culture, institutions, and ideas.
iii. Utilize Social Science approaches, such as research methods, inquiry, or problem-solving, to examine the variety of perspectives about human experiences.
iv. Evaluate how reasoning, history, or culture informs and guides individual, civic, or global decisions.
v. Identify the impact of the similarities and differences among and between individuals, cultures, or societies across space and time.

5. General Education Requirements

a. This subsection applies to Associate of Arts, Associate of Science, and Baccalaureate degrees. For the purpose of this policy, disciplines are indicated by course prefixes.

General education curricula must reflect the following credit distribution:

Competency Area	**Minimum Credits**
Written Communication	6
Oral Communication	3
Mathematical Ways of Knowing	3
Scientific Ways of Knowing	7 (from two different disciplines with at least one laboratory or field experience)
Humanistic and Artistic Ways of Knowing	6 (from two different disciplines)
Social and Behavioral Ways of Knowing	6 (from two different disciplines)
Institutionally-Designated Credits	5

i. GEM courses are designed to be broadly accessible to students regardless of major, thus college-level and non-GEM pre-requisites to GEM courses should be avoided unless deemed necessary by the institution.

ii. Additional GEM courses, beyond the general education curricula, may be required within the major for degree completion.

b. In rare instances, a specialized associate degree program might better serve students by distributing general education requirements differently than those listed above. Proposals for such programs shall be submitted to the Board office for review and approval on a case-by-case basis. Proposals must describe the demonstrable benefits that the alternative general education distribution will have for transfer students, the institutions' plans for additional advising, and any other information that will demonstrate how students will not be harmed by this alternative structure.

c. This subsection pertains to Associate of Applied Science (AAS) degrees.

The general education curricula for the AAS degree must contain a minimum of fifteen (15) credits, so distributed in the following areas:

Competency Area	Minimum Credits
Written Communication	3
Oral Communication	3
Mathematical Ways of Knowing	3
Social and Behavioral Ways of Knowing	3
Any general education course including institutionally-designated courses	3

d. GEM courses and institutionally-designated courses shall transfer as meeting an associated general education competency requirement at any institution pursuant to Board policy Section III.V.

6. Governance of the General Education Program and Review of Courses

a. GEM courses are developed by faculty and approved via the curriculum approval process of the institution delivering the courses. Faculty discipline groups representing all institutions shall meet at least annually or as directed by the Board, to ensure consistency and relevance of general education competencies and courses approved for their respective GEM competency areas.

b. Common Course Indexing is developed for courses offered within the GEM framework to provide greater transparency and seamlessness within transfer processes at Idaho's postsecondary institutions. Common-indexed courses are accepted as direct equivalents across institutions for transfer purposes. Common course indexing shall include common course prefix, common course number, common course title, and common GEM discipline area designation. The common

course number shall be three digits in sequence, but can be preceded by a single digit if four numbers are utilized by the institution (x###).

The common course list shall be approved by the Board on an annual basis and shall be maintained by the Board office. Changes to the list may be proposed by faculty discipline groups to the General Education ~~Matriculation~~ Committee. Proposed additions or removal of courses on the common course list must be reviewed by the General Education ~~Matriculation~~ Committee prior to Board approval. The request to remove a common-indexed course from an institution's academic catalog must be approved by the Board. The request to discontinue a course must be submitted in writing by the institution to the Board office. The request shall be submitted no less than a year in advance and provide rationale for the inability to offer the course.

c. The General Education ~~Matriculation (GEM)~~ Committee shall consist of a Board-appointed representative from each of the institutions (Institutional Representatives), as well as one Subject Representative from each of the following communities: ~~from~~ the Division of Career Technical Education, ~~from~~ the Idaho Registrars Council, ~~from~~ the digital learning community, ~~from~~ the dual credit community, ~~from~~ the open education community; and the Executive Director of the Board, or designee, who shall serve as the chair of the committee. Institutional Representatives are generally the directors or deans of general education (or equivalent). Upon Board approval, appointments for Institutional Representatives will be for the duration of the representative's term as general education director. Subject Representative terms are for three years, commencing on July 1st. If Subject Representatives are amenable to continuing, they are affirmed by their respective groups prior to their term's end. To ensure alignment with AAC&U Essential Learning Outcomes and subsection 1, the Committee shall meet at least annually to review the competencies and rubrics of the general education framework. The Committee shall make recommendations to the Board regarding the general education framework and the common course list. The Committee shall review and make recommendations on the general education competencies as necessary. GEM Committee duties are prescribed by the Board, including those that may involve addressing issues related to competency areas and course offerings. The GEM Committee reports to the Council on Academic Affairs and Programs.

d. The institutions shall identify all general education courses in their curricula and identify them in a manner that is easily accessible by the public via their respective websites, as well as relevant web resources maintained by the Board office.

General Education Committee Bylaws

Mission and Purpose

General education courses are a particularly powerful part of a college education. This set of courses provide students with the opportunity to cultivate the habits of mind associated with academic inquiry, to gain experience with disciplinary inquiry and communication, and to navigate a variety of perspectives. Further, general education courses have a direct and positive impact on student retention, persistence, and eventual graduation. Since general education courses are offered at all public postsecondary institutions in Idaho, providing coordinated guidance is especially important.

The General Education Committee is guided by a spirit of open inquiry and a shared interest in collaboration. The General Education Committee advocates for, supports, and coordinates general education among all Idaho public postsecondary institutions. As leaders of general education from each institution, the committee members individually contribute extensive institutional knowledge and disciplinary expertise to the shared commitment to continually improving general education across the state of Idaho.

A. Powers and Duties

The General Education Committee is responsible for collaborating on a statewide vision of general education, making recommendations about general education, reviewing the competencies and other supporting materials for the general education framework, making recommendations to the Board regarding the general education framework and common course list, revising and making recommendations on the general education competencies, and other duties as prescribed by the Board. The General Education Committee reports to the Council on Academic Affairs and Programs.

B. Meetings

1. The Committee holds two full Committee standing meetings annually. The two meetings are in person whenever possible; at least one of the meetings coincides with the annual GEM Summit. Follow-up remote meetings occur as needed. A quorum of the Committee consists of a simple majority of current voting members. A quorum shall be present to conduct any official business.

2. Meeting locations shall be determined by the Committee.

C. Membership

1. Committee membership is established by Idaho Board of Education policy III.N.

2. Committee members must uphold the goals and objectives of the Committee. Decision-making is a collective action and all members have a joint responsibility for decisions and actions.

D. Nominating Process

1. Institutional Representatives are generally the directors or deans of general education on campus (or equivalent). Upon Board approval, appointments for Institutional Representatives will be for the duration of the representative's term as general education director.

2. Subject Representatives (registrar, technical college leadership, dual credit, open education, and digital learning) terms are for three years, commencing on July 1st. If Subject Representatives would like to serve additional terms, they are affirmed by their respective groups prior to their term's end.

3. All official Committee members shall have equal voting privileges.

E. Committee Officers and Duties

1. There are two officers of the Committee: Chair and Vice Chair.

2. The Chair is a designee of the Executive Director of the Board. This role has historically been filled by the Associate Academic Officer. The Chair, in consultation with the committee, advocates for general education at the state level, coordinates proposed policy changes, plans the GEM Summit, coordinates the GEM Innovative Teaching Awards, and coordinates general education-related activities that arise.

3. The Vice Chair is elected by the voting members of the General Education Committee from among the Institutional Representatives. The Vice Chair is elected at a regular meeting for a three-year term. Whenever possible, the Vice Chair terms alternate between the four-year and two-year institutions. Vacancies are filled by election for the remainder of the unexpired term. The Vice Chair advises the Chair on meeting agendas and provides recommendations on matters related to the General Education Committee's mission and the Chair's general education responsibilities.

4. Committee representatives who serve on working groups and similar bodies are appointed by the Committee Chair.

F. Adoption, Amendment, and Repeal of By-laws

1. Recommendations for amendments or repeals of bylaws may occur at any regular or special meeting of the Committee and approved by a majority vote of the Committee, provided notice has been presented at the preceding meeting of the Committee.

SUBJECT

Board Policy III.Q., Admissions Standards – First Reading

REFERENCE

June 2007	Board approved the first reading of amendments to Board Policy III.Q.
August 2007	Board approved the second reading of amendments to Board Policy III.Q.
December 2013	Board approved the first reading of amendments to Board Policy III.Q.
February 2014	Board approved the second reading of amendments to Board Policy III.Q.
April 2017	Board approved the first reading of amendments to Board Policy III.Q.
June 2017	Board approved the second reading of amendments to Board Policy III.Q.
June 2020	Board approved a temporary waiver of the College Entrance Exam minimum admission requirement in response to the COVID-19 pandemic.
June 2021	Board approved removing College Entrance Exam minimum admission requirements.

APPLICABLE STATUTES, RULE OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section III.Q, Admissions Standards

BACKGROUND / DISCUSSION

The proposed changes update and streamline this policy in several ways. First, the high school course requirements are clarified through removing specific course limitations that are no longer appropriate. Secondly, changes to Career Technical Education (CTE) program admissions clarify CTE admission procedures and remove descriptions of advising processes that are better described elsewhere. Third, revisions to the provisional (proposed "alternative") admissions process better reflect options for admitting and serving students, and in particular, high-achieving students from high schools without high school accreditation from a Board-recognized accreditor.

IMPACT

Approval of the policy amendments will improve readability and interpretability of the policy. Additionally, amendments provide clearer guidance to admissions offices on acceptable approaches for high school admissions.

ATTACHMENTS

Attachment 1 – Board Policy III.Q, Admissions Standards – First Reading

STAFF COMMENTS AND RECOMMENDATIONS

The proposed policy amendments were reviewed by Board staff, enrollment/admissions staff at all eight institutions, career technical college deans, the Council on Academic Affairs and Programs at their February 1, 2024 meeting, and the Instruction, Research, and Student Affairs Committee of the Board at their February 15, 2024 meeting. Staff recommends approval.

BOARD ACTION

I move to approve the first reading of proposed amendments to Board Policy III.Q, Admission Standards as presented in Attachment 1.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

ATTACHMENT 1

Idaho State Board of Education
GOVERNING POLICIES AND PROCEDURES
SECTION: III. POSTSECONDARY AFFAIRS
SUBSECTION: Q. Admission Standards ~~June 2021~~April 2024

1. Institution Policies

   Each postsecondary institution must establish institutional policies which meet or exceed the following minimum academic and career technical admission standards. Additional and more rigorous requirements also may be established by the institutions for admission to specific programs, departments, schools, or colleges. Consistent with institutional policies, admission decisions may be appealed by applicants to the institutional admissions committee. Career Technical Education program admission requirements apply to all technical colleges, including the College of Eastern Idaho, the College of Southern Idaho, the College of Western Idaho, Lewis-Clark State College, Idaho State University College of Technology, and North Idaho College.

2. Institutional Academic ~~Program~~ Admission

   a. Academic ~~Program~~ Regular Admission

   Students attending an Idaho public school, or Idaho private school that has entered a Direct Admission participation agreement with the Board, may be notified of their admission to an Idaho public college or university through the State Board's Direct Admission Program. Admission awarded through the program is contingent on the verified level of achievement in high school curriculum and successful completion of Idaho high school graduation requirements.

   An applicant who is not admitted under the Board's Direct Admission Program must graduate from a high school accredited by a body recognized by the Board and complete the Admission Standards Core Courses with a minimum 2.00 cumulative grade point average. Cognia is the Board's recognized high school accrediting body. Applicants who graduated from high school prior to ~~1989~~ 1995 will be subject to the admission standards at the time of their high school graduation. Each institution may develop a separate policy for the admissions and placement of international students.

   Admission Standards Core Courses

Subject Area	Minimum Requirement	Select from These Subject Areas
Secondary Language Arts and Communication	8 credits	Composition, Literature, and Oral Communication

Mathematics	6 credits	A minimum of six (6) credits. Secondary Mathematics includes Integrated Mathematics, Applied Mathematics, Business Mathematics, Algebra, Geometry, Trigonometry, Fundamentals of Calculus, Probability and Statistics, Discrete Mathematics, and courses in Mathematical Problem Solving and Quantitative Reasoning. A total of 8 credits are strongly recommended. Four (4) of the required mathematics credits must be taken after 9th grade. Courses not identified by traditional titles, (i.e., Algebra I or Geometry), may be used as long as they contain all of the critical components of higher math functions prescribed by the State Mathematics Content Standards. Institutions may recognize other Mathematics courses as meeting this requirement if those courses are taken in compliance with the Idaho state minimum graduation requirements.
Social Studies	5 credits	American Government (state and local), Geography, U.S. History, and World History. Other courses may be selected from Economics, including Consumer Economics, if it aligns to the state content standards, Psychology, and Sociology.
Science	6 credits	Secondary sciences include instruction in Applied Sciences, Earth and Space Sciences, Physical Sciences, and Life Sciences. ~~A maximum of two (2) credits may be derived from career technical science courses when courses are aligned to state career technical content standards, and/or Applied Biology, and/or Applied Chemistry. (Maximum of two (2) credits).~~ Institutions may recognize other Science courses as meeting this requirement if those courses are taken in compliance with the Idaho state minimum graduation requirements. Must have laboratory science experience in at least two (2) credits. A laboratory science course is defined as one in which at least one (1) class period per week is devoted to providing students with the opportunity to manipulate equipment, materials, or specimens; to develop skills in observation and analysis; and to discover, demonstrate, illustrate, or test scientific principles or concepts.
Arts and Humanities (including world languages)	2 credits	Humanities courses include instruction in Visual Arts, Music, Theatre, Dance, or World Language aligned to the Idaho content standards for those subjects. Other courses such as Literature, History, Philosophy, Architecture, or Comparative World Religions may satisfy the humanities standards if the course is aligned to the Interdisciplinary Humanities Content Standards. History courses beyond those required for state high school graduation may be counted toward this category. World Language is strongly recommended. The Native American Languages may meet the world language credit requirement
Other College Preparation	3 credits	Speech or Debate [no more than one (1) credit]. Debate must be taught by a certified teacher.

		Studio/Performing Arts (art, dance, drama, and music). Foreign Language (beyond any foreign language credit applied in the Humanities/Foreign Language category). Secondary Career Technical courses. ~~(no more than two (2) credits) in Agricultural Science and Technology; Business Technology Education; Computer Science Technology; Engineering; Family and Consumer Sciences; Marketing Technology Education; Technology Education, and individualized occupational training.~~

If the student graduated from a high school that does not offer a required course, applicants may contact the institutional admission officer for clarification of provisional admission procedures.

High school credit counted in one (1) category (e.g., Humanities/World Languages) may not also count in another category.

b. Academic ~~Provisional~~ Alternative Admission

i. ~~A d~~Degree-seeking applicants who do~~es~~ not qualify for admission based on subsection ~~4~~2.a. above~~, but who~~ may be granted alternative admission if they ~~satisfies~~ satisfy one (1) or more of the criteria below~~, may seek provisional admission by petitioning the institutional admissions officer~~:

1) Graduated from a secondary school accredited by a body recognized by the Board but has not completed the Admission Standards Core courses set forth above;

2) Did not graduate from a secondary school accredited by a body recognized by the Board, [e.g. ~~including~~ home~~-~~schooled students, ~~and has acceptable performance on either the~~ General Educational Development (GED) diploma holders], and have acceptable predictive indicators of academic success approved~~test or another standardized diagnostic test accepted~~ by the institution;

3) Deserves consideration by the institution because of special status (e.g., ~~disadvantaged or minority students, delayed entry students,~~ returning veterans, ~~or~~ gifted and talented students wishing to enter college early, or other students in unique circumstances as determined by the institution). Each institution may develop a separate policy for the admission of special status students.

~~A student seeking provisional admission to any public postsecondary institution must take at least one (1) assessment indicator that will allow the institution to~~

~~assess competency and placement.~~

ii. ~~If provisionally admitted, a student will enroll with provisional standing and is subject to the institutional grade retention~~. Students granted alternative admission may have conditions placed on their admission, subject to institutional policies. ~~A provisionally admitted student may change to regular admission status upon satisfactory completion of~~ Students may be granted admission and be required to satisfactorily complete up to fourteen (14) baccalaureate level credits, twelve (12) of which must be general education ~~courses~~ credits. Regular admission status must be attained within three (3) registration periods or the student will be dismissed, subject to institutional committee appeal procedures.

c. Academic Transfer Admission

i. A degree-seeking student who, after graduating from high school or earning a GED, has earned at least fourteen (14) or more semester hours of transferable academic college level credit from a regionally accredited college or university with a minimum cumulative GPA of 2.00 may be admitted.

ii. A student not meeting the requirement in subsection ~~6~~2.a. may petition the institutional admissions officer to be admitted. If admitted, the student ~~must enroll on probation status, meet all conditions imposed by the institutional admissions committee, and complete the first semester with a minimum 2.00 GPA, or may be dismissed.~~may have conditions placed on their admission, subject to institutional policies as described in subsection 2.b.ii.

d. Academic Program Placement

Placement assessment indicating potential for success may be required for some academic programs. Placement requirements vary according to the program. Each institution shall establish academic program placement policies and publish these policies in an accessible manner on the institution's website.

3. Career Technical Program Admission~~s~~

~~a. Admission Standards~~

~~Regular or Provisional~~ Institutional academic admission standards apply to individuals who seek a technical certificate or Associate of Applied Science (A.A.S.) degree through a career technical program. The admission standards and placement criteria do not apply to workforce development or short-term training programs. Career technical programs employ program admission and student advising/navigation processes in addition to institutional ~~program~~ academic admission.

~~b. Student Advising~~

~~i. Clarify the importance of career planning and preparation: high school students should be actively engaged in career planning prior to entering the 9th grade. Career planning assures that students have sufficient information about self and work requirements to adequately design an education program to reach their career goals.~~

~~ii. Emphasize that career technical courses in high school, including career technical advanced opportunities and work-based learning connected to school-based learning, are beneficial to students seeking continued education in career technical programs at the postsecondary level.~~

~~iii. Clarify the kind of educational preparation necessary to successfully enter and complete postsecondary studies. Mathematics and science are essential for successful performance in many career technical programs. Programs of a technical nature generally require greater preparation in applied mathematics and laboratory sciences.~~

~~iv. Clarify that career technical programs of one or two years in length may require additional time if applicants lack sufficient educational preparation.~~

~~c. Career Technical Program Regular Admission~~

~~Students desiring Regular Admission to any of Idaho's technical colleges must meet the following standards. Students planning to enroll in programs of a technical nature are also strongly encouraged to complete the recommended courses.~~ Admission to a specific career technical program is based on the capacity of the program and specific academic and/or physical requirements established by the technical college/program.

~~i. Standards for students who graduated from high school in 1997 or earlier~~

~~1) High School diploma with a minimum 2.0 GPA[1] from a high school accredited by a body recognized by the Board; and~~

~~2) Placement examination as determined by the institution. Scores may also be used to determine placement eligibility for specific career technical programs; and~~

~~3) Satisfactory completion of high school coursework that includes at least the following:~~

~~[1]An institution may substitute a composite index placement exam score and high school GPA for the GPA admission requirement.~~

a) Mathematics — 4 credits (6 credits recommended) from challenging math sequences of increasing rigor selected from courses such as Algebra I, Geometry, Applied Math I, II, and III, Algebra II, Trigonometry, Discrete Math, Statistics, and other higher-level math courses. Two (2) mathematics credits must be taken in the 11th or 12th grade. Less rigorous mathematics courses taken in grades 10-12 after 1998, such as pre-algebra, review mathematics, and remedial mathematics, shall not be counted.

b) Science — 4 credits (6 credits recommended, with 4 credits in laboratory science) including at least 2 credits of laboratory science from challenging science courses including applied biology/chemistry, principles of technology (applied physics), anatomy, biology, earth science, geology, physiology, physical science, zoology, physics, chemistry, and agricultural science and technology courses (500 level and above).

c) Secondary Language Arts and Communication — 8 credits. Applied English in the Workplace may be counted for English credit.

d) Other — Career technical courses, including postsecondary credits earned pursuant to Board Policy III.Y. Advanced Opportunities and organized work-based learning experiences connected to the school-based curriculum, are strongly recommended. High School Work Release time not connected to the school-based curriculum will not be considered.

ii. Standards for Others Seeking Regular Career Technical Program Admission

Individuals who graduated from high school, received their GED prior to 1997, or who are at least 21 years old and who desire Regular Admission to the technical colleges must have a:

1) High School diploma with a minimum 2.0 GPA from a high school accredited by a body recognized by the Board; or

2) General Educational Development (GED) certificate; and

3) Diagnostic/placement tests as determined by the institution. Scores may also be used to determine admission eligibility for specific career technical programs.

d. Career Technical Program Provisional Admission

Students who do not meet all requirements for Regular Admission may apply to a

~~technical program under provisional admission. Provisionally admitted students who are conditionally admitted must complete appropriate remedial, general and/or technical education coursework related to the career technical program for which Regular Admission status is desired, and to demonstrate competence with respect to that program through methods and procedures established by the technical college. Students desiring Provisional Admission must meet the following standards:~~

~~i. High School diploma or GED certificate; and~~

~~ii. diagnostic/placement tests as determined by the institution. Scores may also be used to determine placement eligibility for specific career technical programs.~~

~~iii. Institutions may allow individuals who do not have a high school diploma or GED to be admitted if the applicant can demonstrate the necessary ability to succeed in a career technical program through appropriate tests or experiences as determined by the institution.~~

~~e~~a. Career Technical Program Placement Criteria

Placement test scores indicating potential for success ~~are generally~~ may be required for enrollment in a career technical program of choice. Placement score requirements vary according to the program.

Each institution shall establish career technical program placement policies and publish these policies in an accessible manner on the institution's website.

Specific career technical programs may require different levels of academic competency and admission requirements. Students must also be familiar with the demands of a particular occupation and how that occupation matches individual career interests and goals. Therefore, before students can enroll in a specific program, the following placement requirements must be satisfied:

i. Specific program requirements (including placement exam scores) established by the technical program. A student who does not meet the established requirements for the program of choice will have the opportunity to participate in remedial education to improve their skills; and

ii. Formal procedures and definitions for program admission employed by the technical college. Program admission requirements and procedures shall be clearly defined and published for each program.

IDAHO DIVISION OF CAREER TECHNICAL EDUCATION (Division)

SUBJECT

Board Policy III.L. Prior Learning and III.Y. Advanced Opportunities – Second Reading

REFERENCE

October 2014	The Board approved the first reading of amendments to Board Policy III.Y. replacing Tech Prep with Technical competency credit.
February 2015	The Board approved the second reading of amendments to Board Policy III.Y.
June 2018	The Board approved the first reading of amendments to Board Policy III.Y. establishing system-wide policy for awarding credit for AP exams.
August 2019	The Board approved the first reading of Board Policy III.L, which includes how PLA is administered and how different forms of credit are awarded to meet degree requirements.
October 2019	The Board approved the second reading of Board Policy III.L.
February 2020	The Board approved the first reading of Board Policy III.L. rewriting the majority of the existing policy, including the removal of continuing education from the policy, adding references to institution developed crosswalks identifying how credit will be award for identified exams.
April 2020	The Board approved the second reading of Board Policy III.L.
December 2023	Board approved first reading of Board Policy III.L calling out the use of the Divisions microcredentialing platform as a prior learning assessment and awarding credits and III.Y replacing technical competency credit with the micro-credentialing platform.

APPLICABLE STATUTE, RULE, OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Sections III.E., III.L, and III.Y.

BACKGROUND/DISCUSSION

The Division is requesting amendments to Board Policy III.Y. Advanced Opportunities and III.L. Prior Learning. The amendments to Policy III.Y would replace what is now referred to as technical competency credit with microcredentials as established in Board policy III.E. Amendments to Board Policy III.L. would call our microcredentials as an allowable methodology for prior learning

assessment. The Divisions microcredentialing platform referenced in Board Policy III.E. is SkillStack®.

The Division received no comments or concerns regarding the requested amendments between the first and second readings. There have been no changes to the proposed policies between the first and second readings.

IMPACT

Proposed amendments to Board policy will provide clarification on how microcredentials can be used to show how students are meeting the same outcomes that were previously referred to in technical competency credit eligible programs and highlight their use for evaluating credit for prior learning.

ATTACHMENTS

Attachment 1 – Board Policy III.L. – Second Reading
Attachment 2 – Board Policy III.Y. – Second Reading

BOARD STAFF COMMENTS AND RECOMMENDATIONS

Board staff recommends approval.

BOARD ACTION

I move to approve the second reading of amendments to Board policies III.L and III.Y. as provided in attachments 1 and 2.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

ATTACHMENT 1

Idaho State Board of Education
GOVERNING POLICIES AND PROCEDURES
SECTION: III. POSTSECONDARY AFFAIRS
SUBSECTION: L. Prior Learning ~~April 2020~~February 2024

This policy establishes the foundation by which institutions shall provide students with opportunities to demonstrate competencies through established assessment processes to earn credit for prior learning. This policy applies to the University of Idaho, Boise State University, Idaho State University, Lewis-Clark State College, College of Eastern Idaho, College of Southern Idaho, College of Western Idaho, and North Idaho College (hereinafter "institutions").

1. Definitions

   a. Crosswalk: An equivalency table that identifies how credit for prior learning articulates to direct course equivalencies and general education requirements as provided in Board Policy III.N General Education, or to microcredentials as defined in Board Policy III.E Certificates and Degrees.

   b. Prior Learning Assessment (PLA): The process by which an individual's prior learning is assessed and evaluated for purposes of granting college credit, certification, or advanced standing toward further education or training. There are four generally accepted approaches to PLA and, when properly conducted, all ensure academic quality:

      i. National standardized exams in specific disciplines, including but not limited to:
         a) College Level Examination Program (CLEP)
         b) DANTES Subject Standardized Test
         c) Excelsior College Exams (UExcel)
         d) Advanced Placement (AP)
         e) International Baccalaureate (IB)

      ii. Challenge exams for local courses at the student's college or university

      iii. Individualized assessments or experiential learning, particularly portfolio-based assessments whereby students demonstrate learning acquired through experiences including but not limited to:
         a) Work or employment
         b) Employer training programs
         c) Independent study
         d) Non-credit courses
         e) Volunteer or community service
         f) Travel
         g) Non-college courses or seminars

h) Apprenticeships

iv. Evaluated non-college or non-credit courses and programs, such as:
a) The National College Credit Recommendation Service (NCCRS)
b) The American Council on Education's ACECREDIT service and evaluations of corporate and military training
c) microcredentials pursuant to Board Policy III.E.

2. Standards

a. Institutional Policies

i. Each institution is responsible for determining how best to implement PLA and should do so within the context of its mission, culture, student needs, academic programs, and career technical education programs.

ii. Each institution will ensure students have access PLA methods as deemed appropriate by its faculty.

iii. Each institution will provide professional development for faculty members, administrators, and staff working with students to ensure transparency and consistency in evaluating and awarding credit through PLA.

iv. Institutional policies and procedures must include the awarding of credit for education, training or service completed by an individual as a member of the armed forces or reserves pursuant to Section 33-3727, Idaho Code

v. Each institution will track PLA data, including student demographics, credits earned, type of PLA awarded, and associated costs to students.

b. Student Eligibility

i. To be eligible to earn PLA credits, undergraduate students must be admitted and enrolled in a public Idaho college or university.

a. Awarding Credit

i. Credit is awarded when a student successfully demonstrates evidence of college-level learning. Credit will be identified on the student's transcript as credit for prior learning.

ii. PLA credit will count as course credit and may be applied toward a degree, certificate, or other credential.

iii. Each institution shall include in its written policy on PLA the maximum number of credits earned through PLA that can be counted toward a degree or certificate.

b. Transferability

i. Once recorded on a student's transcript, PLA credit is transferable among Idaho institutions on the same basis as if the credit had been earned as a regular student at the awarding institution.

c. Fees

i. Fees for credit for prior learning shall be assessed consistently with Board Policy Section V.R. and must be based on and reflect the operational costs of administering a PLA. Fees may not be based on the number of credits awarded and shall be made publicly available in a single online location. Fees for transcribing credit shall not be applied for the transcription of credit awarded through the assessment of prior learning. Transcription fees are allowed for Workforce Training courses pursuant to Board Policy Section V.R.

ii. To ensure transparency for prospective students and students seeking transfer between institutions each institution shall develop and publish in a central location on its website and in other materials clearly stated and understandable policies on credit for prior learning. This information must include the cost and the process for students to pursue credit for prior learning and how credit that is awarded may satisfy course and degree requirements.

3. Crosswalks

a. Each institution will make available to students crosswalks identifying how credit for AP exams, CLEP exams, or military training will be awarded for common indexed general education courses. Where applicable, institutions will work together to identify areas within the crosswalks where credit for AP exams, CLEP exams, and military training can be applied consistently across institutions for meeting general education requirements. Crosswalks for AP exams, CLEP exams, and military training will include how exams and training are articulated to general education requirements and common indexed courses as provided in Board Policy III.N. For AP and CLEP exams, crosswalks will include minimum scores necessary for awarding credit across all institutions and will adhere to the AP exam credit requirement established in Board policy III.Y. For military training, crosswalks will include how equivalent college credit will be awarded.

~~a.~~b. Each institution will make available to students crosswalks identifying how credits for microcredentials will be awarded. Crosswalks specific to

microcredentials shall be developed in collaboration with the Division of Career Technical Education to assure alignment with the microcredentials platform.

ATTACHMENT 2

Idaho State Board of Education
GOVERNING POLICIES AND PROCEDURES
SECTION: III. POSTSECONDARY AFFAIRS
SUBSECTION: Y. Advanced Opportunities ~~August 2018~~February 2024

Boise State University, Idaho State University, University of Idaho, Lewis-Clark State College, College of Eastern Idaho, North Idaho College, College of Southern Idaho, and College of Western Idaho are covered by these policies. Postsecondary programs intended for transfer come under the purview of the Board.

1. Purpose

The State Board of Education is committed to improving the educational opportunities available to Idaho citizens by creating a seamless system of public education. The purpose of this policy is to provide program standards for advanced opportunities for secondary students. To this end, the intent of Advanced Opportunities is:

a. For postsecondary institutions to provide educational programs and training to their respective service regions;
b. Support and enhance regional and statewide economic development;
c. Facilitate collaboration between all school levels, including public elementary and secondary schools;
d. Prepare secondary graduates for postsecondary programs;
e. Enhance postsecondary goals;
f. Reduce duplication and provide for an easy transition between secondary and postsecondary education; and
g. Reduce the overall cost of educational services and training to the student.

2. Definitions

The State Board of Education recognizes four advanced opportunities programs. They are: Advanced Placement®, dual credit, technical competency credit (formerly known as Tech Prep), and the International Baccalaureate program.

a. Advanced Placement® (AP)

The Advanced Placement® Program, administered by the College Board, is a series of courses in a variety of subjects. AP courses are not tied to a specific college curriculum, but rather follow national College Board curricula. While taking the AP exam is optional, students may earn college credit by scoring well on the national AP exams. Individual postsecondary institutions have the discretion to accept the scores from the AP exams to award college credit or advanced standing.

b. Dual Credit Courses

i. Dual credit courses are courses allowing high school students to simultaneously earn credit toward a high school diploma and a postsecondary degree or certificate. Dual credit is awarded to a student on his or her postsecondary and high school transcript for the successful completion of a single course. Postsecondary institutions work closely with high schools to deliver college courses that are identical to those offered on the college campus. Credits earned in a dual credit class become part of the student's permanent college record. Students may enroll in dual credit courses taught at the high school or on the college campus.

ii. Two types of postsecondary credit may be earned: *Academic* and *Technical*. Academic credits apply to postsecondary academic programs and some postsecondary technical programs. Technical credits generally only apply to postsecondary technical programs and are not applicable toward academic postsecondary programs. Students must work closely with their advisor(s) to ensure the credit earned in their dual credit course will apply to their intended postsecondary degree program.

c. ~~Technical Competency Credit (TCC)~~ Microcredentials

~~i. Technical Competency Credit (TCC) allows secondary students to document proficiency in the skills and abilities they develop in approved high school career technical programs to be evaluated for postsecondary transcription at a later date. In addition to the standards outlined in section 4.d below, additional policies of the transcribing postsecondary institution may also apply.~~

~~Technical Competency Credits are awarded for skills and competencies identified as eligible TCC through a TCC Agreement with at least one Idaho postsecondary institution. Eligible skills and competencies are included in approved high school career technical programs and approved by the postsecondary institution in advance. Students participating in a high school program approved for TCC are not considered postsecondary students until they matriculate to a postsecondary institution.~~ Microcredentials as defined in Board Policy III.E. Microcredentials replace technical competency credits (TCC). Students who have completed a secondary program previously approved for technical competency credits shall be awarded credit when they matriculate to the participating postsecondary institution in accordance with the TCC articulation agreement that was in place at the time they entered the TCC program.
~~ii.~~

d. International Baccalaureate (IB)

Administered by the International Baccalaureate Organization, the IB program provides a comprehensive liberal arts course of study for students in their junior and senior years of high school. IB students take end-of-course exams that may qualify for college-credit. Successful completion of the full course of study leads to an IB diploma.

3. Idaho Programs Standards for Advanced Opportunities Programs

All advanced opportunities programs in the state of Idaho shall be developed and managed in accordance with these standards which were designed to help school districts, colleges and universities plan, implement, and evaluate high quality advanced opportunities programs offered to high school students before they graduate. Students must work closely with their advisor(s) to ensure the credit earned in their Advanced Opportunities course will apply to their intended postsecondary degree program.

a. Dual credit Standards for Students Enrolled in Courses Taught at the High School

Curriculum

Curriculum 1 (C1**)**	Courses administered through a dual credit program are catalogued courses and approved through the regular course approval process of the postsecondary institution. These courses have the same departmental designation, number, title, and credits; additionally these courses adhere to the same course description and course content as the postsecondary course.
Curriculum 2 (C2)	Postsecondary courses administered through a dual credit program are recorded on students' official academic record of the postsecondary institution.
Curriculum 3 (C3)	Postsecondary courses administered through a dual credit program reflect the pedagogical, theoretical and philosophical orientation of the sponsoring faculty and/or academic department at the postsecondary institution.

Faculty

Faculty 1 (F1)	Instructors teaching college or university courses through a dual credit program must meet the academic requirements for faculty and instructors teaching at a postsecondary institution or provisions are made to ensure instructors are capable of providing quality college-level instruction through ongoing support and professional development.
Faculty 2 (F2)	The postsecondary institution provides high school instructors with training and orientation in course curriculum, student assessment criteria, course philosophy, and administrative requirements before certifying the instructors to teach the college/university's courses.
Faculty 3 (F3)	Instructors teaching dual credit courses are part of a continuing collegial interaction through professional development, such as seminars, site visits, and ongoing communication with the postsecondary institutions' faculty and dual credit program administration. This interaction addresses issues such as course content, course delivery, assessment, evaluation, and professional development in the field of study.
Faculty 4 (F4)	High school faculty is evaluated by using the same classroom performance standards and processes used to evaluate college faculty.

Students

Students 1 (S1)	High school students enrolled in dual credit courses are officially admitted as degree-seeking, non-degree or non-matriculated students of the sponsoring postsecondary institution.
Students 2 (S2)	High school students are provided with a student guide that outlines their responsibilities as well as guidelines for the transfer of credit.
Students 3 (S3)	Students and their parents receive information about dual credit programs. Information is posted on the high school's website regarding enrollment, costs, contact information at the high school and the postsecondary institution, grading, expectations of student conduct, and other pertinent information to help the parents and students understand the nature of a dual credit course.
Students 4 (S4)	Admission requirements have been established for dual credit courses and criteria have been established to define "student ability to benefit" from a dual credit program such as having junior standing or other criteria that are established by the school district, the institution, and State Board of Education Governing Policies and Procedures.
Students 5 (S5)	Prior to enrolling in a dual credit course, provisions are set up for awarding high school credit, college credit or dual credit. During enrollment, the student declares what type of credit they are seeking (high school only, college only or both high school and college credit). To earn college credit, the student must be enrolled at the postsecondary institution.

Assessment

Assessment 1 (A1)	Students enrolled in dual credit courses are held to the same course content standards and standards of achievement as those expected of students in postsecondary credit only courses.
Assessment 2 (A2)	Every course offered through a dual credit program is annually reviewed by postsecondary faculty from that discipline and dual credit teachers/staff to assure that grading standards meet those in on-campus sections.
Assessment 3 (A3)	Students enrolled in dual credit courses are assessed and awarded credit using the same methods (e.g. papers, portfolios, quizzes, labs, etc.) as their on-campus counterparts.

Program Administration and Evaluation

Admin & Evaluation 1 (AE1)	The dual credit program practices are assessed and evaluated based on criteria established by the school, institution and the State Board of Education to include at least the following: course evaluations by students, follow-up of the graduates who are college or university freshmen, and a review of instructional practices at the high school to ensure program quality.
Admin & Evaluation 2 (AE2)	Every course offered through a dual credit program is annually reviewed by faculty from that discipline and dual credit staff to assure that grading standards meet those in postsecondary sections.

Admin & Evaluation 3 (AE3)	Students enrolled in dual credit courses are assessed using the same methods (e.g. papers, portfolios, quizzes, labs, etc.) as their on-campus counterparts.
Admin & Evaluation 4 (AE4)	A data collection system has been established based on criteria established by the high school, institution and State Board of Education to track students enrolled in dual credit courses to provide data regarding the impact of dual credit programs in relation to college entrance, retention, matriculation from high school to college, impact on college entrance tests, etc. A study is conducted every 5 years on dual credit graduates who are freshmen and sophomores in a college or university.
Admin & Evaluation 5 (AE 5)	Costs for high school students have been established and this information is provided to students before they enroll in a dual credit course. Students pay a reduced cost per credit that is approved annually at the Board's fee setting meeting and defined in Board Policy V.R. Fees. .
Admin & Evaluation 6 (AE 6)	Agreements have been established between the high school and the postsecondary institution to ensure instructional quality. Teacher qualifications are reviewed, professional development is provided as needed, course content and assessment expectations are reviewed, faculty assessment is discussed, student's costs are established, compensation for the teacher is identified, etc.
Admin & Evaluation 7 (AE 7)	Postsecondary institutions have carefully evaluated how to provide services to all students regardless of where a student is located.

b. Dual Credit Standards for Students Enrolled in Courses at the College/University Campus

A.	The student is admitted by the postsecondary institution as a non-degree seeking student.
B.	The student is charged the part-time credit hour fee or tuition and additional fees as established by the institution.
C.	Instructional costs are borne by the postsecondary institution.
D.	Four (4) semester college credits are typically equivalent to at least one (1) full year of high school credit in that subject.
E.	As part of the enrollment process, institutions must ensure the student and the student's parent/guardian receive counseling that outlines the risks and possible consequences of enrolling in postsecondary courses, including but not limited to the impacts on future financial aid, and the consequences of failing or not completing a course in which the student enrolls. It is the responsibility of the postsecondary institution to provide advising for all students taking courses on the postsecondary campus.
F.	Students under the age of 16 who are enrolled in a secondary school may seek admission to enroll in courses provided on the postsecondary campus by submitting a petition to the high school principal's office and to the admissions office of the postsecondary institution.

c. Advanced Placement Standards

Advanced Placement (AP) courses are taught by high school teachers following the curricular goals administered by The College Board. These courses are academically rigorous and conclude with the optional comprehensive Advanced Placement exam in May. Students taking Advanced Placement courses accept the challenge of a rigorous academic curriculum, with the expectation of completing the complex assignments associated with the course and challenging the comprehensive Advanced Placement exam. The Advanced Placement examination is a national assessment based on the Advanced Placement curriculum, given in each subject area on a specified day at a specified time, as outlined by the College Board. Students and parents are responsible for researching the Advanced Placement policy of the postsecondary institution the student may wish to attend. Each institution shall publish their credit award policy, including course credit awarded, on their institutional webpage and report the policy annually to the Board office.

College/university credit is based on the successful completion of the Advanced Placement exam, and dependent upon institutional Advanced Placement credit acceptance policy. Each institution shall award academic credit for scores of 3, 4, and 5 on the AP exam. Institutions may choose to award more credit for scores of 4 or 5. Institutions shall strive to align Advanced Placement credit awards to courses that fulfill general education or program credit. Elective credit shall only be awarded when a general education or program credit is not available. The Board office shall review, no less than every three years, the validity of such credits awarded to assess student performance based on this policy.

Institutions may seek an exception to the score requirement in the policy if the institution has evidence that students are not performing adequately in the subsequent course or are in some way disadvantaged academically based on their placement within the Advanced Placement policy. Each institution's chief academic officer or designee shall present the evidence to the Board office. The Board office will convene a committee comprised of faculty, staff, and others to review the findings and render determination as to whether the minimum Advanced Placement score threshold should be increased.

Curriculum

Curriculum 1 (C1**)**	Postsecondary institutions evaluate AP scores and award credit reflecting the pedagogical, theoretical, and philosophical orientation of the sponsoring faculty and/or academic department at the institution.
Curriculum 2 (C2)	High school credit is given for enrollment and successful completion of an AP class.

Faculty

Faculty 1 (F1)	AP teachers shall follow the curricular materials and goals outlined by The College Board.

Faculty 2 (F2)	The AP teacher may attend an AP Institute before teaching the course.

Students/Parents

Students 1 (S1)	A fee schedule has been established for the AP exam. Students and their parents pay the fee unless other arrangements have been made by the high school.
Students 2 (S2)	Information must be available from the high school counselor, AP coordinator or other faculty members regarding admission, course content, costs, high school credit offered and student responsibility.

Assessment

Assessment 1 (A1)	Students are assessed for high school credit according to the requirements determined by the high school.

Program Administration and Evaluation

Admin & Evaluation 1 (AE1)	To evaluate the success of the programs and to improve services, the school district must annually review the data provided by The College Board.
Admin & Evaluation 2 (AE2)	The school district must carefully evaluate how to provide services to all students, regardless of family income, ethnicity, disability, or location of educational setting.

d. ~~Technical Competency Credit (TCC)~~Microcredential Standards

Career technical education programs in Idaho are delivered through comprehensive high schools, career technical ~~schools~~centers, and the technical college system. ~~Technical Competency Credit allows secondary career technical students the opportunity to earn secondary and postsecondary technical credits. Technical Competency Credit is offered through approved secondary career technical programs with an articulation agreement between the high school and a postsecondary institution. Technical Competency Credit is an advanced learning opportunity that provides a head start on a technical certificate or an applied science degree.~~Pursuant to Board Policy III.E. all microcredentials are tracked as digital badges through a platform approved and maintained by the Division of Career Technical Education. Idaho's educators may validate skills their students demonstrate proficiency in through the awarding of badges in the platform. Industry-relevant badges are awarded based on the validated skills. Program standards are developed for each badge through a collaborative process that engages industry, college/university faculty, secondary faculty, applicable agency staff and other stakeholders. As students provide evidence of the competencies for each skill, educators evaluate the competencies based on common assessments. Once all skills are validated for a particular badge, the information is entered into the platform and badges are issued. Microcredentials may be stacked and used toward credit for prior learning or the awarding of a certificate or degree.

~~**Curriculum**~~

Curriculum 1 (C1)	The high school career technical program must have competencies comparable with a postsecondary institution technical program and be identified as eligible for TCC consideration through a TCC Agreement (e.g., articulation agreement) with at least one Idaho postsecondary institution.
Curriculum 2 (C2)	Secondary and postsecondary educators must agree on the technical competencies, the student learning outcomes, and the level of proficiency to be demonstrated by the student.

Faculty

Faculty 1 (F1)	Secondary educators must hold appropriate career technical certification in the program area for which credit is to be awarded.

Students

Students 1 (S1)	Technical Competency Credit (TCC) students are high school students; they are neither enrolled in the postsecondary institution nor counted as dual credit students. Students may request transcription of TCCs onto a postsecondary transcript after demonstrating the required level of proficiency; they must follow the transcribing institution's TCC transcription policy and pay the transcription fee discussed in standard AE1. After completing a TCC course or sequence according to the articulation agreement, the credits must be transcribed within the time period required by the transcribing institution and in no instance longer than two years.
Students 2 (S2)	High school students are provided with a student guide that outlines their responsibilities, guidelines for credit transfer and information regarding how the technical credit will apply to postsecondary certificates and degree requirements. The student guide must include an explanation of the difference between technical and academic credit, how a career technical course is a part of a career technical program sequence, and how the courses may impact their academic standing when they fully matriculate after high school.
Students 3 (S3)	At the completion of the Technical Competency Credit program, the instructor shall identify students who have met program competencies.

Assessment

Assessment 1 (A1)	The students are assessed for postsecondary technical credit according to the requirements of the Technical Competency Credit agreement.

Program Administration and Evaluation

Admin & Evaluation 1 (AE1)	When the student requests the transcription of a TCC credit, they are assessed a transcription fee consistent with Board Policy Section V.R for qualifying TCC earned in high school.
Admin & Evaluation 2 (AE2)	TCC agreements between a secondary career technical program and a postsecondary institution must be reviewed annually by the institution.

BOISE STATE UNIVERSITY

SUBJECT

Ph.D. in Engineering

APPLICABLE STATUTE, RULE, OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section III.G and III.Z

BACKGROUND/DISCUSSION

Boise State University proposes to offer a Ph.D. program in Engineering. Initially, there will be four tracks: Infrastructure Systems, Water and Environment Systems, Energy Systems, and Mechatronics and Control Systems.

The vision for the Ph.D. in Engineering program is to create an interdisciplinary doctoral program that integrates engineering research with non-engineering disciplines to improve the research products, economic return, and community impact. The College of Engineering currently hosts two disciplinary Ph.D. programs in Electrical Engineering and Material Science Engineering and participates in the Ph.D. programs in Computing and Biomedical Engineering. While these programs incorporate faculty members from engineering, science, mathematics, and computer science disciplines, they are focused on specific fields of study of science and engineering, and do not fully serve the College of Engineering faculty, nor do they offer inclusive engineering opportunities to Idaho students to compete in a growing and changing job market. The Ph.D. in Engineering program is proposed with a broad agenda that can include all engineering fields of research and bring non-engineering perspectives into engineering research. The program offers great flexibility in designing an education that fits student needs and is conducive to cutting-edge, interdisciplinary scientific discovery and societal impact.

IMPACT

A doctorate in engineering allows students to conduct groundbreaking research in various fields with significant social and economic outcomes in the region and nationally, including infrastructure, environment, energy, and mechatronic systems. Engineering research impacts all walks of life, but the traditional engineering programs generally miss a broader opportunity to serve society and the environment by taking a siloed technical approach. To broaden engineering education and impact, research must be informed by expertise from non-engineering fields, including ecology, environmental studies, and public policy. The proposed program will include the latter aspects that are missing in the traditional engineering curriculum to prepare Idaho students for tackling complex problems of the present and future.

The program has three broad objectives that will support the career advancement of Idaho residents and stimulate economic growth in the State of Idaho.

1. Expand the postdoctoral workforce in the State of Idaho.
2. Create engineering researchers with transdisciplinary technical skills who can work seamlessly across interdisciplinary boundaries.
3. Increase research and creativity in and for Idaho.

Since 2005, the College of Engineering (COEN) at Boise State has seen enrollment of engineering majors increase nearly 60 percent, making Boise State's COEN the largest engineering college in the State of Idaho. With more than 450,000 square feet dedicated to classrooms, research labs, innovation studios, and collaboration space, Boise State's COEN is primed to offer students state-of-the-art facilities for an inclusive, innovative, and integral education. Over 80% of the undergraduate students in the college hold internships or work in research in one of COEN's 57 laboratories before graduating, preparing them for success on day one in any graduate program or industry job.

A Ph.D. in Engineering program at Boise State can help fill an opportunity gap for Idahoans. Ph.D. holders earn 21% and 43% more than master's and bachelor's degree holders, respectively. Currently, most Ph.D.-level jobs in Idaho are filled by out-of-state job seekers. Lack of local opportunities for Idahoans to obtain skills for Ph.D.-level jobs is a workforce concern and this degree program helps fill this gap with opportunities to compete for high-paying jobs. Boise State projects that the program will reach a size of 11-12 students by the fifth year, graduating approximately 4 students per year once the program is up and running.

The program will utilize existing faculty lines to support graduate advising as faculty seek Ph.D. students to support research plans. Additional funding will be needed for administrative support to maintain the program. The college is planning to hire a joint part-time Ph.D. program coordinator to support existing Ph.D. programs in Electrical Engineering and Biomedical Engineering to include the proposed program. The program will use existing college Graduate Assistant (GA) resources and anticipates generating additional new resources through federally supported GA lines. Total expenditures are $26,507 - $28,965 of ongoing funds and $275,712 - $510,822 of one-time funds. This represents a combination of state and federal funding.

ATTACHMENTS

Attachment 1 – Ph.D. in Engineering Proposal and External Peer Review Report

STAFF COMMENTS AND RECOMMENDATIONS

Boise State University projects six enrollments in its first year, reaching 11 by year five and graduating two by year four. Estimations are informed by current enrollments and graduation rates in existing Ph.D. programs in Boise State's College of Engineering to include feeder pools from BS/MS Civil and Mechanical

Engineering programs. Projections are also based on existing undergraduate students from Boise State that go on to seek Ph.D. programs out of state. The program identified that six enrollments will be needed to maintain sustainability. This is based on the resources needed to support the program. If minimums are not met within the first four years, the program will re-evaluate recruiting efforts as well as focus on expanding program faculty. If after three consecutive years enrollments are below the minimum numbers, the graduate college will evaluate for potential discontinuation of the program.

Consistent with Board Policy III.G., the proposed Ph.D. in Engineering program was reviewed by an external review panel consisting of Dr. Chandra Kothapalli, Cleveland State University and Dr. Jeffery Heys, Montana State University. Based on their review, reviewers believed that "*the lack of a broad, interdisciplinary PhD in Engineering is limiting opportunities for Idaho students and faculty*. *The establishment of the degree program will support Boise State's strategic goals to increase PhD awards, research expenditures, and support recruitment and retention of faculty*." Reviewers were overall very supportive of the proposed program. Recommendations related to the proposal were largely connected with challenges associated with interdisciplinary graduate programs. These included tailored policies for graduate student admissions, remedial coursework requirements, graduate committee composition, examination requirements, etc. that recognize the interdisciplinary nature of the proposed program. As provided in the report, program assessment may also require unique measures because the program crosses departmental boundaries. The reviewers shared these key observations and potential challenges and provided recommendations. Boise State provided a response (also included with attached materials) and amended their proposal to include some of the information the panel recommended, with some items in progress.

Boise State University's request to offer a Ph.D. in Engineering is consistent with their Service Region Program Responsibilities and their current institution plan for Delivery of Academic Programs in Region III. In accordance with Board Policy III.Z., no institution has the statewide program responsibility specifically for engineering programs.

Currently, the University of Idaho offers a Ph.D. in Mechanical Engineering and in Civil Engineering. Idaho State University offers a Ph.D. in Engineering and Applied Science. As provided in the program proposal, ISU's program focuses on traditional disciplines like Chemistry, Geosciences, Mathematics, and Mechanical Engineering and does not have the same focus areas/tracks as the proposed Ph.D. in Engineering (Infrastructure Systems, Water and Environment Systems, Energy Systems, and Mechatronics and Control Systems). Based on enrollment and graduation data provided on page 8 of the proposal:

- U of I has 1-2 graduates per year for the Mechanical Engineering program with enrollment between 13-20 over a four-year period.

- U of I has 1-4 graduates per year for their Civil Engineering program with enrollment of 9-13 over a four-year period.
- ISU has about 1-3 graduates for the Engineering and Applied Science program with 18-24 enrollments over a four-year period.

The proposal completed the program review process and was presented to the Council on Academic Affairs and Programs on December 7, 2023; and to the Instruction, Research, and Student Affairs on February 15, 2024.

Board staff recommends approval.

BOARD ACTION

I move to approve the request by Boise State University to create a Ph.D. in Engineering, as presented in Attachment 1.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

Institutional Tracking No. _____

Idaho State Board of Education

FULL PROPOSAL FORM

Academic Degree and Certificate Program

Date of Proposal Submission:	October 6, 2023			
Institution Submitting Proposal:	Boise State University			
Name of College, School, or Division:	College of Engineering			
Name of Department(s) or Area(s):	Civil Engineering, and Mechanical Engineering			
Official Name of the Program:	Ph.D. in Engineering			
Implementation Date:	Fall 2024			
Degree Information:	Degree Level: Graduate	Degree Type: Ph.D.		
CIP code (consult IR /Registrar):	14.0101			
Method of Delivery: Indicate percentage of face-to-face, hybrid, distance delivery, etc.	100% Face-to-Face			
Geographical Delivery:	Location(s)	Boise	Region(s)	III
Indicate (X) if the program is/has: (Consistent with Board Policy V.R.)	☐ Self-Support fee	☐ Professional Fee	☐ Online Program Fee	
Indicate (X) if the program is: (Consistent with Board Policy III.Z.)	X Regional Program Responsibility	☐ Statewide Program Responsibility		

Proposed Action

X **New program offering**
- ☐ Undergraduate program
- X Graduate program
- ☐ Undergraduate certificate (30 credits or more)
- ☐ Graduate certificate (30 credits or more)

☐ **New branch campus or change in location**

☐ **Modification of Existing Academic Programs**
- ☐ Converting one program option to a stand-alone program
- ☐ Consolidating two or more undergraduate programs into one
- ☐ Consolidating two or more graduate programs into one
- ☐ Splitting an existing program into two or more programs
- ☐ Program expansion outside an institution's Designated Service Region as defined in Board Policy III.Z.
- ☐ Adding certificate or degrees to existing programs

09/27/2023			
College Dean	Date	Vice President for Research (as applicable)	Date
	09/27/2023		11/1/2023
Graduate Dean/other (as applicable)	Date	Academic Affairs Program Manager, OSBE	Date
Jo Ellen DiNucci (Sep 28, 2023 13:25 MDT)	09/28/202		11/02/2023
SAVP/Deputy CFO	Date	Chief Financial Officer, OSBE	Date
John Buckwalter (Sep 27, 2023 16:17 MDT)	09/27/2023		11/13/23
Provost/VP for Instruction	Date	Chief Academic Officer, OSBE	Date
	10/06/2023		
President	Date	SBOE/Executive Director or Designee Approval	Date

Before completing this form, refer to Board Policy Section III.G., Postsecondary Program Approval and Discontinuance. This proposal form must be completed for the creation of each new program. All questions must be answered.

Rationale for Creation of the Program

1. **Describe the request and give an overview of the changes that will result.** What type of substantive change are you requesting? Will this program be related or tied to other programs on campus? Identify any existing program that this program will replace. If this is an Associate degree, please describe transferability.

Overview

Boise State proposes the creation of a new interdisciplinary program leading to the degree of ***Doctor of Philosophy in Engineering***. Faculty members participating in the program will be primarily drawn from the College of Engineering, while the program is open to all Boise State faculty and has interest in multiple colleges across campus. This program will not replace, or be tied to other PhD programs on campus.

A doctorate in engineering allows students to conduct groundbreaking research in various fields with significant social and economic outcomes for the region and nationally, including infrastructure, environment, energy, and mechatronic systems. Engineering research impacts all walks of life, but the traditional engineering programs generally miss a broader opportunity to serve the society and the environment by taking a silo technical approach. To broaden engineering education and impact, research must be informed by expertise from non-engineering fields, including ecology, environmental studies, and public policy. The proposed program will include the latter aspects that are missing in the traditional engineering curriculum to prepare Idaho students for tackling complex problems of the present and future.

Initially, there will be four tracks in the proposed program:

- The ***Infrastructure Systems track*** focuses on innovative solutions that support the fundamental needs and functions of a society including food, water, transportation, communications, and energy. Students can conduct inter/trans-disciplinary research that include opportunities in both built and natural infrastructure systems and their interconnections.
- The ***Water and Environment Systems Track*** adopts quantitative and qualitative methods from various fields of study to solve the most pressing natural resources issues of our time. The program offers great flexibility in designing an education course that fits student needs and is conducive to cutting edge, interdisciplinary scientific discovery and societal impact.
- The ***Energy Systems Track*** focuses on modern energy systems, particularly on energy generation, transmission, storage, and conversion technologies. This emphasis considers a wide range of scales from the material level up to grid scale applications.
- The ***Mechatronics and Control Systems Track*** deals with combinations of electronic, mechanical, and material systems to achieve a desired function or outcome. This multidisciplinary approach includes product design, electrical engineering, mechanical engineering, computing and materials science. This track pursues "smart" applications by the inclusion of sensors, actuators, and control systems directly.

Why Ph.D. in Engineering?

The vision for the Ph.D. in Engineering program is to create an interdisciplinary doctoral program that integrates engineering research with non-engineering disciplines to improve the research products, economic return, and community impact. The College of Engineering currently hosts

two disciplinary Ph.D. programs in Electrical Engineering and Material Science Engineering, and participates in Ph.D. programs in Computing and Biomedical Engineering. While these programs incorporate faculty members from engineering, science, mathematics, and computer science disciplines, they are focused on specific fields of science and engineering, and do not fully serve the College of Engineering faculty, nor do they offer inclusive engineering opportunities to Idaho students to compete in the growing and changing job market. The Ph.D. in engineering program is proposed with a broad agenda that can include all engineering fields of research and bring non-engineering perspectives into engineering research. The program offers great flexibility in designing an education that fits student needs and is conducive to cutting-edge, interdisciplinary scientific discovery and societal impact.

Objectives

This program has three broad objectives that will support the career advancement of Idaho residents and stimulate economic growth in the state of Idaho.

1. Expanding the postdoctoral workforce in the state of Idaho

With the changing weather patterns and socio-environmental conditions, and the need to be more resilient and sustainable, there is a need for a workforce that is capable of understanding these changes and designing infrastructure that lasts. It is paramount to develop this workforce within the state of Idaho so that they can better cater to the local needs. Recent investment by the National Science Foundation in the Innovation Corps Hubs program, of which Boise State is a part, requires that future workforce has the necessary entrepreneurial and leadership skills to engage in this and similar programs and help Idaho take advantage of the increasingly abundant opportunities in this arena. This PhD program intends to fill this gap.

2. Create engineering researchers with transdisciplinary technical skills who can work seamlessly across interdisciplinary boundaries

The primary goal of any engineering project is human welfare and thriving communities. So, it is paramount that engineers develop the necessary skills to appreciate the community impacts of their research projects. Producing engineers that not only have the technical skills to lead technological advancements and revolution, but also have the fundamental understanding of the impacts of the technology on the society and the environment is a fundamental responsibility of the engineering schools. This kind of engineer will be able to cross the disciplinary boundaries with ease and conduct research in a responsible and effective manner. The proposed PhD program aims to achieve this through mandatory convergence courses that will broaden students' perspectives and their understanding of the implications of their research. For example, a student conducting research to mitigate congestion in cities should have the fundamental knowledge of transportation engineering but also be able to account for the community preferences and the local culture to ensure the end product meets the functional and emotional needs of the community. By exposing students to courses, such as those offered by the School of Public Service, along with course work in transportation engineering, students will have the skills and knowledge to account for community impact.

3. Increased research and creative activity in and for Idaho

This program will undoubtedly strengthen external funding applications from researchers involved in the program. Federal research funding agencies, such as the National Institutes of Health (NIH), National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and Department of Defense (DoD) are actively interested in funding collaborative, transdisciplinary projects that tie together expertise across departments, colleges, and communities. Some of the civil and mechanical engineering faculty at Boise State currently involved in establishing this PhD program have had success with federal funding, but can be more successful if the PhD in Engineering program is established. Furthermore, this PhD program opens up frontiers of federally-funded research opportunities for a wide group of faculty. Successfully funded awards from researchers involved in steering this program include an NSF Improving Undergraduate STEM Education (IUSE), Idaho Global Entrepreneurial Mission (IGEM) Council, Idaho NASA EPSCoR, Bureaus of Land Management and Reclamation, Department of Energy, and Department of Defense awards, totaling $1.95 million in extramural funding. These same researchers applied for $7.9 million in funding in 2021, and they're targeting $7.3 million in grant submissions for the upcoming year. However, the ability to compete for research funding has been severely hindered by the absence of PhD programs accessible to Civil and Mechanical Engineering faculty. This PhD program will address this limitation and stand as a tangible demonstration of collaboration and transdisciplinary engagement across the Boise State campus. This type of transdisciplinary initiative will be critical to success in driving Boise State towards a very high research activity status. Additionally, the proposed program will serve recent and new hires in Mechanical Engineering and Civil Engineering. This PhD program will strengthen the competitiveness of the research environment at Boise State, and we anticipate it will contribute to the success of future submissions.

2. **Need for the Program**. Describe evidence of the student, regional, and statewide needs that will be addressed by this proposal to include student clientele to be served and address the ways in which the proposed program will meet those needs.

   a. **Workforce and economic need:** Provide verification of state workforce needs that will be met by this program. Include job titles and cite the data source. Describe how the proposed program will stimulate the state economy by advancing the field, providing research results, etc.

Total employment opportunities across the nation are projected to grow by 8.3 million jobs between 2021 and 2031, and "*Occupations that Need More Education for Entry are Projected to Grow Faster Than Average*" according to the US Bureau of Labor Statistics (BLS). A sizable fraction of employment opportunities requires a PhD degree. For example, 5.8% of "architectural and engineering managers", 4.4% of "civil engineers", 5.7% of "environmental engineers", 3.6% of "mechanical engineers" and 7.4% of "engineers, all other" hold a PhD degree (source: BLS). Although seemingly low in percentage, these statistics translate to large absolute numbers, when considering that 158.1 million jobs were available in 2021 (projected to increase to 166.5 million by 2031, source: BLS). Importantly, PhD degree holders earn a considerably larger salary (43% more than a BS degree holder and 21% more than an MS degree holder; (Figure 1), and they have a notably smaller unemployment rate (57% and 42% less than a BS and an MS degree holder, respectively; Figure 1). Hence, not only PhD degree holders contribute more to the economy, but also rarely do they rely on unemployment benefits. Moreover, future economic growth is critically dependent on increased productivity of American workers. According to the BLS, total factor

productivity increases "*can be from technological improvements, increases in the education or quality of the workforce, improvements in management practices, and economies of scale*". An Engineering PhD program at Boise State is decisive in keeping Idaho's economy in par with the national demand growth.

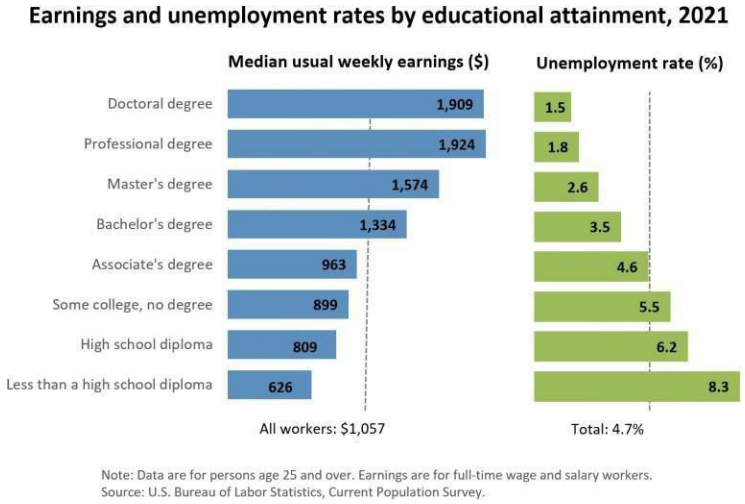


Figure 1: Median weekly earnings and unemployment rate nationally based on education attainment. Source: Bureau of Labor Statistics, available at:
https://www.bls.gov/emp/images/ep_chart_001.png

Idaho's economy urgently needs a PhD in Engineering program at Boise State to ensure projected jobs in Idaho with a PhD requirement are filled with a trained workforce. Specifically, job opportunities that require a doctoral degree are projected to increase from 16,756 in 2020 to 19,290 in 2030, adding 2,534 jobs with a PhD requirement (Table 1). Among all available employment opportunities in Idaho in 2020 (811,381), 15.2% were engineering-related. In a conservative calculation, if we assume 15.2% of new PhD requiring jobs by 2030 are engineering-related, it sums to 385 new PhD graduates required to fill the available engineering jobs in Idaho. Idaho universities are currently far behind in generating the state needs of PhD graduates.

Table 1: Employment projections in Idaho. Source: Idaho Department of Labor.

	Employment		Change, 2020-2030	
	2020	2030	Number	Percentage
Engineering related jobs				
Engineering + Construction + Production	123,622	153,041	29,419	23.8%
Educational requirement				
Doctoral or professional degree	16,756	19,290	2,534	15.1%

Additionally, current investments in Idaho, including the $15 billion manufacturing lab by Micron, $800 million data center by Meta/Facebook, and Idaho Power's 100% clean energy plan by

2035, will require a highly skilled workforce. Many of these companies are currently hiring PhD graduates from out-of-state universities, while Boise State University has the capacity to train local students to fill these high-paying jobs.

b. Student demand. What is the most likely source of students who will be expected to enroll (full-time, part-time, outreach, etc.). Provide evidence of student demand/ interest from inside and outside of the institution.

Since 2005, the College of Engineering (COEN) at Boise State has seen enrollment of engineering majors increase nearly 60 percent, making Boise State's COEN the largest engineering college in the state of Idaho. With more than 450,000 square feet dedicated to classrooms, research labs, innovation studios, and collaboration space, Boise State's COEN is primed to offer students state-of-the-art facilities for an inclusive, innovative, and integral education. Over 80% of the undergraduate students in the college hold internships or work in research in one of COEN's 57 laboratories before graduating, preparing them for success day one in any graduate program or industry job. These graduates continue to help drive economic growth in Idaho as over 70% stay in Idaho after graduation. In the last five years, research expenditures in the College of Engineering have more than doubled to over $14 million. These statistics point to the interest of Boise State's undergrad and graduate students to get involved in research, and the capacity of the faculty to secure external funding opportunities for these students to conduct state-of-the-art and applied investigations with significant societal benefits.

Several federally funded graduate training programs at Boise State also attest to the need for an Engineering PhD. For example, the Bridge to the Doctorate Fellowship program prepared student candidates from domestic underrepresented minority backgrounds who are pursuing graduate studies in science, technology, engineering, and mathematics (STEM) programs. However, due to lack of an engineering PhD program at Boise State many of these talented students move to other states to pursue their doctoral degree. Another example of such programs is the Stellar Engineering Students Graduate Program Scholarship which is dedicated to providing financial, cultural (academic culture), and academic support to MS level engineering students. In response to the external review comments, the National Science Foundation's (NSF) scholarships in STEM suggested that Boise State should request additional funding for supporting PhD level students; an opportunity that was missed due to lack of an Engineering PhD program at Boise State. Furthermore, highly talented Boise State students are pursuing PhDs at out-of-state universities, which amounts to a large loss for Idaho. One such student is Ulises Trujillo-Garcia, a recent Civil Engineering graduate from Boise State who was frequently highlighted nationally for his accomplishments, but is now pursuing his NSF-funded PhD studies at Arizona State University. Student support letters (attached) also attest to an urgent need for a PhD in Engineering program that can serve Idahoans.

c. Societal Need: Describe additional societal benefits and cultural benefits of the program.

A PhD in Engineering program at Boise State can contribute to equity and equality in Idaho. As shown in the previous section, PhD holders earn 21% and 43% more than master and bachelor degree holders. Currently, a majority of PhD-level jobs in Idaho are filled by out-of-state job seekers. While attracting talent and skill to Idaho is of greatest economic benefit to the state, lack of local opportunities for Idahoans to obtain skills for the PhD-level jobs create an equity concern. It is of utmost importance that Boise State fulfills its duty to provide Idahoans with opportunities to compete for the high-paying jobs.

Idaho is experiencing one of the largest population increase rates in the country, creating new opportunities for the growth of its infrastructure and industry. Furthermore, federal, state and

private investments in the growth of various industries in the Gem state create new demand for highly skilled workforce. Providing opportunities to local students not only will ensure culturally sensitive outcomes, but also enhances the societal acceptance of these projects. These are among many examples of the societal and cultural benefits of the PhD in Engineering program.

3. Program Prioritization

Is the proposed new program a result of program prioritization?

Yes_____No_X____

If yes, how does the proposed program fit within the recommended actions of the most recent program prioritization findings.

4. Credit for Prior Learning

Indicate from the various cross walks where credit for prior learning will be available. If no PLA has been identified for this program, enter 'Not Applicable'.

Not Applicable.

5. Affordability Opportunities

Describe any program-specific steps taken to maximize affordability, such as: textbook options (e.g., Open Educational Resources), online delivery methods, reduced fees, compressed course scheduling, etc. This question applies to certificates, undergraduate, graduate programs alike.

Like most PhD programs in engineering, our program will utilize a variety of funding opportunities (NSF, NASA, etc.) to provide enrolled students with graduate tuition support and stipends. This reduces the cost of attendance burden and provides students with funding to support living in Boise.

Enrollments and Graduates

6. Existing similar programs at Idaho Public Institutions. Using the chart below, provide enrollments and numbers of graduates for similar existing programs at your institution and other Idaho public institutions for the most past four years.

Table 2 represents the enrollment and graduation data for programs similar to the proposed PhD in Engineering program. It can be noted from this table that yearly the state is producing 2 to 3 PhDs in civil and mechanical engineering on an average. If we assume 10% of the 385 jobs projected (see response to item 2 above) that is an estimated need of over 35 PhDs by 2030. These numbers clearly show that existing programs will not be able to meet the need which clearly establishes a need for the proposed program.

Table 2: Enrollment and graduation data for similar existing programs

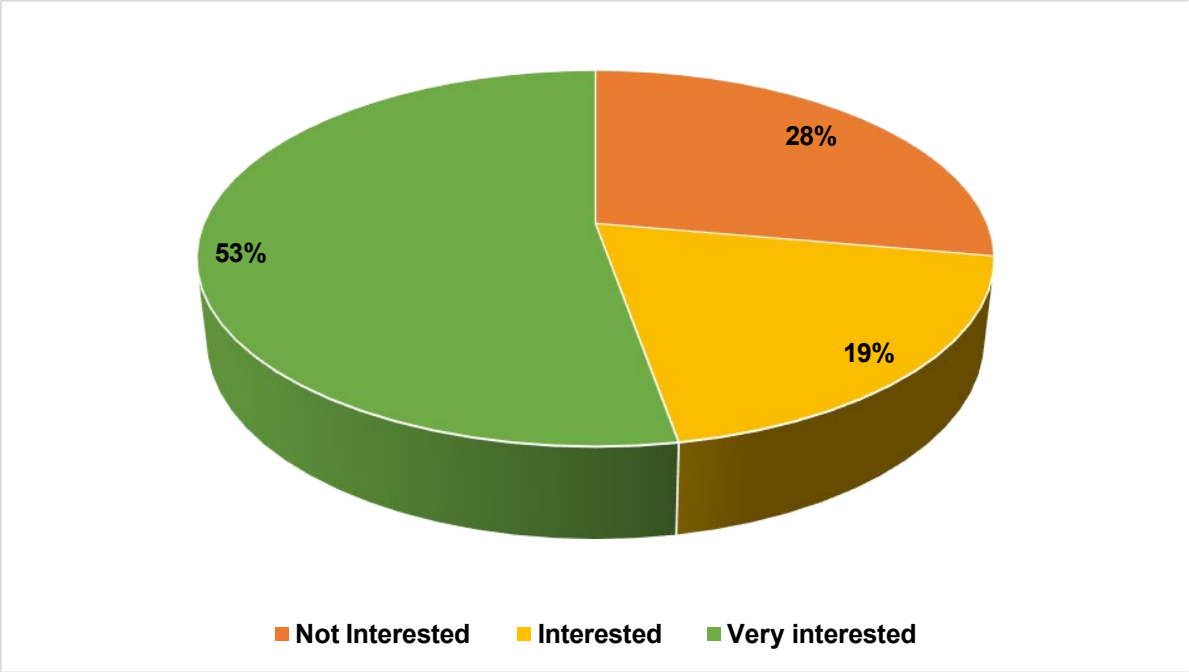
Instit.	Program Name	Fall Headcount Enrollment in Program				Number of Graduates from Program (Summer, Fall, Spring)			
		FY19	FY20	FY21	FY22 (most recent)	FY19	FY20	FY21	FY22 (most recent)
UI	PhD in Mechanical Engineering	13	14	20	18	2	2	1	1
UI	PhD in Civil Engineering	13	12	8	9	1	4	1	4
ISU	PhD in Engineering and Applied Science	18	19	23	24	1	2	1	3

7. **Justification for Duplication** (if applicable). If the proposed program is similar to another program offered by an Idaho public higher education institution, provide a rationale as to why any resulting duplication is a net benefit to the state and its citizens. Describe why it is not feasible for existing programs at other institutions to fulfill the need for the proposed program.

Idaho State University offers a PhD in Engineering and Applied Science. However, ISU's program does not offer the focus areas/tracks we propose in this program. Additionally, the ISU program is arranged around traditional disciplines such as Chemistry, Geosciences, Mathematics, and Mechanical Engineering. While these programs do have similarities, students enrolling in PhD engineering programs are typically selecting a school for the advisor and the particular research, which limits the competition and actually adds to the base of PhD students created in Idaho.

A survey conducted among current undergraduate and graduate (MS) students in the Civil and Mechanical engineering programs showed huge interest in this program. 72% of the survey respondents indicated they are "interested to very interested" in the program, while 28% showed no interest. This demonstrates both the need and interest in the program. This data can be seen in Figure 2.

Figure 2: Pie chart showing the interest of current BS and MS students in CE and ME programs in PhD in Engineering



8. **Projections for proposed program:** Using the chart below, provide projected enrollments and number of graduates for the proposed program:

Table 3 presents the projected enrollment and graduations for the first five years for the proposed program. These estimations are informed by the current enrollments and graduation rates in existing PhD programs in College of Engineering as well as the feeder pools from the BS and MS programs in Civil and Mechanical engineering. This data is presented in Table 4.

Table 3: Enrollment and graduation projections for the proposed program

Proposed Program: Projected Enrollments and Graduates First Five Years									
Program Name: PhD in Engineering									
Projected Fall Term Headcount Enrollment in Program					**Projected Annual Number of Graduates from Program**				
FY25 (first year)	FY26	FY27	FY28	FY29	FY25 (first year)	FY26	FY27	FY28	FY29
6	7	9	11	11	-	-	-	2	4

Table 4: Enrollment and graduation data for PhD programs in COEN, and BS and MS programs in Civil Engineering (CE) and Mechanical Engineering (ME) departments

Program Name	Fall Headcount Enrollment in Program				Number of Graduates from Program (Summer, Fall, Spring)				
	Fall 2019	Fall 2020	Fall 2021	Fall 2022 (most recent)	FY19	FY20	FY21	FY22	FY23 (most recent)
PhD in Material Science and Engineering	47	53	55	55	6	5	9	9	5
PhD in Biomedical Engineering	5	7	13	19	-	-	-	-	-
PhD in Electrical and Computer Engineering	37	31	26	19	2	5	7	7	3
PhD in Computing	42	52	66	62	-	3	3	5	7
BS in Civil Engineering	254	259	246	236	45	40	44	39	50
MS in Civil Engineering	6	12	18	21	9	4 3	4	4	6
BS in Mechanical Engineering**	481	447	444	467	98	91	80	93	78
MS in Mechanical Engineering	16	16	13	15	6	10	8	5	3

**Note: Enrollment numbers include students declared as a BS in Mechanical Engineering and Pre-Mechanical Engineering

9. **Describe the methodology for determining enrollment and graduation projections.** Refer to information provided in Question #2 “Need for the Program” above. What is the capacity for the program? Describe your recruitment efforts? How did you determine the projected numbers above?

Our projected enrollment in the program is based upon existing undergraduate students from Boise State University in mechanical and civil engineering that go on to seek PhD programs. Typically, this number is on the order of 5% for each major resulting in a pool of Boise State University graduates of 10 per year. Additionally, considering that each program faculty is likely to advise 1-2 PhD students at a given time and enrollment of 10-12 within the first four years is

expected. This is also similar to the recently created PhD in Biomedical Engineering which has roughly 10 PhD students enrolled after a few years of being offered and a similar number of faculty. Additionally, based on the programs evaluated in question 6 achieving an enrollment of 10-12 students within the first four years is within range. We expect the program to see further growth as additional hires occur and as the program gains popularity due to its flexibility, and project the potential to grow towards an enrollment in the 20s similar to the Computing and the Materials Science PhD programs at Boise State University. Student support will be driven primarily through external funding with the long-term goal of external funding/internal funding reaching a 2:1 ratio in maturity.

Recruitment to the program will be coordinated with the recruiting staff of the graduate college. Recruitment at a local level will occur primarily by informal contact between faculty members and local professionals and their organizations. We anticipate some recruitment of highly qualified Boise State undergraduate and master's-level students. Because of the interdisciplinary and flexible nature of the Engineering PhD program, we believe that the program will have broad appeal, enabling us to recruit students nationally and internationally as well. In all engineering fields, students are primarily motivated to apply to graduate programs because of the faculty research reputation. To enable recruitment, we propose the following formal and informal recruiting efforts:

1. Graduate recruiting visits (formal): Support of top tier student candidates to visit the university and interact with program faculty. This provides an opportunity for interaction between faculty and students to judge quality but also allows students to return to home with details they can share with peers about Boise State University.
2. Faculty and student conference travel (informal): Since one of the key mechanisms is faculty research reputation, enabling students and faculty to travel to conferences to present their research will be a critical "word of mouth" approach to recruiting future students.
3. Faculty collaborations (informal): Another key recruitment mechanism is through collaboration, as faculty are more likely to suggest other faculty members they collaborate with as potential schools for their students. Because of this the program will encourage faculty to develop collaborations outside Boise State University. This effort fits extremely well within the recently launched Mountains and Plains University Innovation Alliance.

10. Minimum Enrollments and Graduates.

a. What are the minimums that the program will need to meet in order to be continued, and what is the logical basis for those minimums?

The minimum enrollment would be six students based on the resources needed to support the program. Since the program leverages a number of existing courses and requires minimal new resources, continuation of the program with a low number of students is viable.

b. If those minimums are not met, what is the sunset clause by which the program will be considered for discontinuance?

The program director will evaluate enrollment and strategize with the program faculty to enhance enrollment on an annual basis. If the minimum number is not met with the first four years we will re-evaluate our recruiting efforts as well as focus on expanding program faculty. Because of the long-time horizon of completing a PhD program, three consecutive years with enrollment below the minimum would result in an evaluation by the graduate college for discontinuing the program.

11. Assurance of Quality. Describe how the institution will ensure the quality of the program. Describe the institutional process of program review. Where appropriate, describe applicable

specialized accreditation and explain why you do or do not plan to seek accreditation.

The following measures will ensure the high quality of the proposed program:

Regional Institutional Accreditation: Boise State University is regionally accredited by the Northwest Commission on Colleges and Universities (NWCCU). Regional accreditation of the university has been continuous since initial accreditation was conferred in 1941. Boise State University is currently accredited at all degree levels (A, B, M, D).

Specialized Accreditation:
Engineering: The Boise State University undergraduate engineering programs (e.g., civil engineering, computer science, electrical and computer engineering, materials science and engineering, and mechanical engineering) have been accredited by ABET, Inc. Engineering disciplines are normally only accredited by the Accreditation Board for Engineering and Technology (ABET) at the undergraduate level. The Civil and Mechanical Engineering program underwent a successful accreditation in fall 2016, and was reaccredited in fall of 2022.

Program Review: Internal program evaluations will take place every five years as part of the normal departmental review process conducted by the Office of the Provost.

Graduate College: The program will adhere to all policies and procedures of the Graduate College, which is a member of the Council of Graduate Schools (Washington, D.C.), the leading authority on graduate education in the United States. The Graduate College has broad institutional oversight of all graduate degree and certificate programs.

Program Oversight: The proposed new PhD in Engineering will build on a significant foundation of experience within two departments (Mechanical and Biomedical Engineering (MBE) and Civil Engineering). Both departments successfully manage MS programs, and the MBE department also manages PhD in Biomedical Engineering.
.
The graduate student community within these two departments currently includes approximately 60 MS students, and 20 PhD students (through various PhD programs on campus). The governance structure, policies and procedures of the PhD program will ensure that students receive the individual mentoring, guidance, and professional development needed to progress through their programs in a timely manner.

Student Mentoring and Program Assessment: On-going program evaluation and assessment at the program level will provide essential information to help ensure the long-term quality of the program. Assessment activities will allow monitoring of individual student progress in the program so challenges can be recognized early and managed effectively. Integrated and evaluated over time, this feedback can also be used to fine-tune and adjust the overall program design, as needed to maintain excellence. Components of the student mentoring and outcomes assessment plan include:

- Appointment of a major advisor who has the primary responsibility for day-to-day mentoring and professional development of their students – Identification of the advisor will be strongly encouraged for admission to the program.
- Planning of academic coursework – Students will work with their advisor and supervisory committee to complete a Program Development Form (PDF), which identifies the calendar of course work necessary for students to complete their degree requirements. Each student's PDF is up-dated on an annual basis, providing an opportunity for the advisor and student to track progress.

12. In accordance with Board Policy III.G., an external peer review is required for any new doctoral program.
Please see attached the peer review report as **Appendix A**.

13. Teacher Education/Certification Programs All Educator Preparation programs that lead to certification require review and recommendation from the Professional Standards Commission (PSC) and approval from the State Board of Education.

Will this program lead to certification?

Yes_____No__X_____

If yes, on what date was the Program Approval for Certification Request submitted to the Professional Standards Commission?

14. Three-Year Plan: If this is a new proposed program, is it on your institution's approved 3-year plan?

Yes X No _____

If yes, proceed to question 15. If no:

a. Which of the following statements address the reason for adding this program outside of the regular three-year planning process.

Indicate (X) by each applicable statement:

	Program is important for meeting your institution's regional or statewide program responsibilities.
	The program is in response to a specific industry need or workforce opportunity.
	The program is reliant on external funding (grants, donations) with a deadline for acceptance of funding.
	There is a contractual obligation or partnership opportunity related to this program.
	The program is in response to accreditation requirements or recommendations.
	The program is in response to recent changes to teacher certification/endorsement requirements.

b. Provide an explanation for all statements you selected.

Educational Offerings: Curriculum, Intended Learning Outcomes, and Assessment Plan

15. Curriculum. Provide descriptive information of the educational offering.

a. Summary of requirements. Provide a summary of program requirements using the following table.

Credit hours in required courses offered by the department (s) offering the program.	9 - 30

Credit hours in required courses offered by other departments:	0 - 21
Credit hours in institutional general education curriculum	0
Credit hours in free electives	3
Total credit hours required for degree program:	62

b. Curriculum. Provide the curriculum for the program, including credits to completion, courses by title and assigned academic credit granted.

Doctoral of Philosophy in Engineering	
Course Number, title and credits	**Credits**
Convergence Course (select 3 credits of course in a transdisciplinary area of study. Suggested courses are below, or alternative convergence course as approved by the graduate program coordinator and advisor) CORE500: Cyber Systems Thinking (3) EEB 616: The Carbon Dilemma (3) HES 500: Foundations in Human Environment-System Science (3) PUBADM542: Science, Democracy and the Environment (3) PUBADM545: U.S. Energy Policy (3) PUBADM546: Climate Change Policy and Administration (3) PUBADM547: Water Resources Policy and Management (3) CS523: Cyber Physical Systems (3)	3
Track Courses (choose a minimum of 6 credits of course approved by the graduate program administrator in one of the following track areas) Students must select from the following four tracks: Infrastructure Systems Water & Environment Energy Systems Mechatronics & Control Systems	6
Technical Elective Courses (choose a minimum of 9 credits in graduate level elective courses in engineering, science or math as approved by the graduate program coordinator)	9
Elective course (choose a minimum of 3 credits outside of your emphasis area or an additional convergence course in consultation with your advisor)	3
ENGR 620 Public Dissemination of Scientific Research	1
ENGR 696 Directed Research	2
Experiential Learning (at least two credits must be filled by ENGR 610, remaining can be filled by one or more of the following) ENGR 590: Internship ENGR 610: Teaching Experience	4
Seminar (Take 2 semesters of 1 cr seminar) ENGR 598: Graduate Seminar (1 cr)	2
Graduate Orientation (1 cr) ENGR 601: Graduate Orientation	1
Comprehensive Exam ENGR 691: Doctoral Comprehensive Examination	1

Dissertation Research ENGR 693: Dissertation	30
Total	62

Course Number and Title
Students must select one of the following 4 tracks and complete a minimum of 6 credits in this area selecting from the following list of suggested courses, or as approved by the graduate program coordinator
Infrastructure Systems Track
The Infrastructure Systems program focuses on innovative solutions that support the fundamental needs and functions of a society including food, water, transportation, communications, and energy. Students can conduct inter/trans-disciplinary research that include opportunities in both built and natural infrastructure systems supporting transportation (highways, waterways, and airways), water, energy and their interconnections.
CE 567 Advanced Soil Mechanics – 3 credits
CE 566 Ground Improvement Design – 3 credits
CE 542 Microstructure properties of concrete – 3 credits
CE 597 Infrastructure Monitoring –3 credits
CE540 - Pavement Analysis and Design – 3 credits
CE552 - Structural Steel Design – 3 credits
CE502 - Computational Techniques – 3 credits
CE560 - Geotechnical Engineering Design I – 3 credits
CE562 - Geotechnical Engineering Design II – 3 credits
CE570 - Highway Systems Design – 3 credits
CE572 - Transportation Planning – 3 credits
CE575 - Traffic Systems Design – 3 credits

Water and Environment Track
Environmental and water systems are increasingly pressured by a myriad of natural and anthropogenic factors, impacting fundamentals of societal well-being and growth. Furthermore, natural systems are interdependent with built infrastructure, with compounding or attenuating impacts on one another. The Water and Environment Track adopts quantitative and qualitative methods from various fields of study to solve the most pressing natural resources issues of our time. The program offers great flexibility in designing an education course that fits student needs and is conducive to cutting edge, interdisciplinary scientific discovery and societal impact.
GEOS516 - Hydrology – 3 credits
GEOS620 - Coupled Land-Atmosphere Modeling – 3 credits
GEOG570 - Earth System Science and Global Warming – 3 credits

HES500 - Foundations in Human-Environment Systems Science – 3 credits
MATH571 - Data Analysis – 3 credits
MATH527 - Introduction to Applied Mathematics for Scientists and Engineers – 3 credits
CE538 - Water Resources Engineering – 3 credits
EEB618 - Earth's Biogeochemical Cycles and Climate Change – 3 credits
GEOPH522 - Data Analysis and Geostatistics – 3 credits

Energy Systems Track **This track focuses on modern energy systems, particularly on energy generation, energy and energy conversion technologies. This emphasis considers a wide range of scales from the material level all the way up to grid scale applications.**
ME 526: Renewable Energy Systems – 3 credits
ME 522: Advanced Thermodynamics – 3 credits
CE 538: Water Resources Engineering – 3 credits
MSE 562: Energy Materials – 3 credits
ECE 573: Power System Analysis 1 – 3 credits
ECE 570: Electric Machines – 3 credits

Mechatronics and Control Systems Track **This track deals with combinations of electronic, mechanical, and material systems to achieve a desired function or outcome. This multidisciplinary approach includes product design, electrical engineering, mechanical engineering, computing and materials science. Many applications are described as "smart" by the inclusion of sensors, actuators, and control systems directly.**
ME578: Design and Analysis of Mechatronic Systems – 3 credits
ME 564: Robotics and Automated Systems – 3 credits
ECE 660: Linear Systems – 3 credits
ME 561: Control Systems – 3 credits
ME566: Dynamic Modeling and Control of Engineering Systems – 3 credits
CS 523: Cyber-physical systems – 3 credits

c. Additional requirements. Describe additional requirements such as comprehensive examination, senior thesis or other capstone experience, practicum, or internship, some of which may carry credit hours included in the list above.

Comprehensive Examination: The objective of the comprehensive examination is to judge depth and breadth of knowledge in the biomedical field. The student must enroll in ENGR 691-Doctoral Comprehensive Examination for the semester during which they plan to take the comprehensive examination. The comprehensive examination includes a written and oral

component. The written component must demonstrate a comprehensive understanding and synthesis of peer-reviewed literature in their emphasis area, identify a gap in knowledge in this area, and design a research study to fill this gap. In the oral component, the student must present their study design to their supervisory committee and be able to justify the decisions made in the formulation of their study, demonstrate an understanding of the limitations of their study, and competently address questions from the committee. The supervisory committee will determine if the student passes or fails. The student needs to pass both the written and oral components. If a student fails the written component, the student is allowed to revise the written examination one time. If a student fails the oral component, the supervisory committee has the option of allowing a student to repeat the oral exam one time. This must be done within the time period specified by the supervisory committee. Failure of the comprehensive examination will result in dismissal from the PhD program.

Dissertation Proposal: The objective of the dissertation proposal and oral defense is to assess the suitability of a PhD student to conduct research in the selected engineering track in a manner that meets rigorous peer-reviewed standards. Satisfactory completion is required for the student to become a PhD candidate. The dissertation proposal should be presented within one year of satisfactory completion of the comprehensive examination. The student must submit a written dissertation proposal to the supervisory committee two weeks before the oral proposal defense. The proposal should describe in sufficient detail the proposed scope of work, anticipated scientific impact, timeline, and a plan for obtaining and utilizing the resources necessary to complete the research. After the supervisory committee reviews the proposal they can give their approval to proceed with scheduling the dissertation proposal defense or they can ask the student to make changes to the proposal and to resubmit it. The dissertation proposal defense consists of the student presenting their proposed doctoral research and answering questions about the proposal, related background material and decisions made in the formulation of their proposal. Majority approval of the supervisory committee is required to pass the proposal defense. If a student fails the oral defense, they may be allowed to reinitiate the dissertation proposal once with the approval of the supervisory committee. Students who fail a second time or do not receive approval to resubmit the proposal will be administratively withdrawn from the program. After the student passes both the written and oral portions of the dissertation proposal, they are admitted to candidacy and should work on their proposed research. Major deviation from the proposed research requires majority approval of the supervisory committee.

Dissertation Requirements: The dissertation must be the result of independent and original research by the student and must constitute a significant contribution to the current knowledge in the selected engineering track, equivalent to multiple peer-reviewed publications. The style and format of the dissertation are to conform to the standards of the Graduate College.

Dissertation Defense: A public defense of the dissertation is scheduled after the supervisory committee has reviewed a draft that is considered to be a nearly final version. The date of the defense is determined jointly by the supervisory committee and the student and must be consistent with any guidelines provided by the Graduate College. The first part of the defense will be a public oral presentation of the dissertation. The second part will be an oral exam administered by the supervisory committee who will decide whether the student passes or fails the defense. A student who fails the defense may be permitted to try again but failure a second time will result in dismissal from the PhD program.

Final Approval of the Dissertation: If the defense is completed with a result of pass, the supervisory committee prepares a statement describing final requirements such as additions or modifications to the dissertation and any additional requirements such as archival of data. When these requirements have been met to the satisfaction of the supervisory committee, the approval

page of the dissertations signed by the members of the committee.

16. Learning Outcomes: Expected Student Learning Outcomes and Connection to Curriculum.

a. Intended Learning Outcomes. List the Intended Learning Outcomes for the proposed program, using learner-centered statements that indicate what students will know, understand, and be able to do, and value or appreciate as a result of completing the program.

Graduates will:
1. Be able to formulate relevant hypotheses and conduct independent research using scientific methods to answer those hypotheses.
2. Be able to effectively communicate their results of scientific research to public audiences.
3. Demonstrate proficiency in new methods for solving problems
4. Demonstrate a high level of expertise in their discipline through contributions to the scientific literature.
5. Demonstrate mastery of knowledge in their chosen emphasis area

17. Assessment plans.

a. Assessment Process. Describe the assessment plan for student learning outcomes that will be used to evaluate student achievement and how the results will be used to improve the program.

Assessment Process: On-going program student mentoring and assessment will ensure that students receive the individual mentoring, guidance, and professional development needed to progress through their programs in a timely manner and achieve the program's intended learning outcomes.

Student Mentoring and Assessment: On-going student mentoring and assessment will provide essential information to help ensure the long-term quality of the program. Assessment activities will allow monitoring of individual student progress in the program so challenges can be recognized early and managed effectively. Integrated and evaluated over time, this feedback can also be used to fine-tune and adjust the overall program design, as needed to maintain excellence. The program director will collect direct and indirect measures to ensure students are achieving the intended learning outcomes. Components of the student mentoring and outcomes assessment plan include:

● Appointment of a major advisor who has the primary responsibility for day-to-day mentoring and professional development of their students – Identification of the advisor will be strongly encouraged for admission to the program.

● Planning of academic coursework – Students will work with their advisor and the supervisory committee to complete a Program Development Form (PDF), which identifies the calendar of course work necessary for students to complete their degree requirements. Each student's PDF is up-dated on an annual basis, providing an opportunity for the advisor and student to review the plan and make corrections, additions, etc., as necessary. Completed PDFs are placed in each student's departmental file.

● Progress and competency in graded coursework – How students perform in the classroom will provide a direct metric of progress and achievement, particularly in the early portion of

the program when much of the required course work is typically taken by students.

● Comprehensive examination - The comprehensive exam represents a significant milestone and an important assessment tool for monitoring how well students have assimilated information from various sources and integrated it into comprehensive knowledge of the Engineering track. It will have both an oral and written component.

● Dissertation proposal – The dissertation proposal and oral defense assess the suitability of a PhD student to conduct research in the selected Engineering track in a manner that meets rigorous peer-reviewed standards. Satisfactory completion is required for the student to become a PhD candidate.

● Dissertation defense – The culminating activity of the program is the oral presentation and public defense of the dissertation.

● Exit interview – Students will work with the program director and faculty steering committee to complete an exit interview. The exit interview will be used to collect student feedback to fine-tune and adjust the overall program design to maintain excellence.

b. Closing the loop. How will you ensure that the assessment findings will be used to improve the program?

Program assessment and review: The program will undergo an annual assessment and internal review every five years (discussed further below). These assessments are the responsibility of the program director and will be used to improve the program by providing recommendation and/or actions to be undertaken by the program to maintain excellence.

c. Measures used. What direct and indirect measures will be used to assess student learning?

Assessment Measures: The program will annually collect direct and indirect measures to evaluate whether students are achieving each of the intended learning outcomes.

Direct Measures: The program director will assess student progress and competency in graded coursework, comprehensive exam, dissertation proposal and defense, compilation of student publications, bibliometrics, awards, and special activities (such as internships, workshops, and extended visits to other institutions). Further, the program will monitor of initial post-graduate employment and ongoing career development, and key metrics of the student pipeline including data for admission, enrollment, degree progress, overall time-to-degree, student financial support, and attrition (including analysis of reasons for attrition).

Indirect Measures: The program will assess the student success indirectly by collecting exit interviews, observations and feedback from faculty, and presentations at professional meetings and conferences.

d. Timing and frequency. When will assessment activities occur and at what frequency?

Assessment activities: The program and student assessment will be conducted annually, while a program-level review will occur every five years.

Program assessment: The program will undergo an annual assessment. This assessment

is the responsibility of the program director assisted by Institutional Effectiveness and the Graduate College. The assessment report will collect and evaluate the direct and indirect measures of student success (as discussed above). The report must include a description of previous actions used to improve the program, the results of those actions, and any newly recommended or modified actions to be undertaken by the program in response to the most recent assessment. The deans are responsible for discussing the report with the provost and for administrative actions necessary for implementation of the improvement plan by the program.

Program Review: Internal program evaluations will take place every five years as part of the normal departmental review process conducted by the Office of the Provost.

Resources Required for Implementation – fiscal impact and budget.

Organizational arrangements required within the institution to accommodate the change including administrative, staff, and faculty hires, facilities, student services, library; etc.

18. **Physical Facilities and Equipment:** Describe the provision for physical facilities and equipment.

a. Existing resources. Describe equipment, space, laboratory instruments, computer(s), or other physical equipment presently available to support the successful implementation of the program.

Sustainable and Resilient Geotechnical Engineering (SuRGE) laboratory consists of a space of 90 m^2 on the fourth floor of Environment Research Building (ERB). This lab includes standard laboratory facilities such as fume hood with acid and solvent storage cabinets, bench space, and chemical storage accompanied by office space with computers and a printer for student use. The lab houses a cyclic triaxial testing machine, which is capable of conducting static and dynamic triaxial tests along with resilient modulus testing on fine grained soils (10.2 cm diameter and 20.3 cm height specimen size). Also available, is an Atomic Absorption Spectrophotometer (Shimadzu AA 6800), which can determine elemental concentrations of various metals in organic and inorganic materials. The AA-6800 is designed and optimized to operate with a flame and graphite furnace and an ASC-6100 auto sampler is utilized for both flame and graphite furnace testing. This lab also has capabilities to conduct various chemical tests on soils including cation exchange capacity, specific surface area, total potassium and soluble sulfate tests. The lab also houses four treatment solution delivery systems which are needed to send nutrients to microorganisms in the compacted soil.

Additionally, the SuRGE group has another lab space in the second floor of ERB that is about 45 m^2 which is well equipped to conduct the tests such as isolating and culturing bacteria. This lab consists of a shaking incubator, spectrophotometer, autoclave, centrifuge, water bath, vortex mixer, and fume hood retrofitted with UV lights to provide clean working space for microbial cultures. This lab also houses Micromeritics Mercury intrusion porosimeter capable of determining pore size and distribution of any solid material.

The Ceramic Microelectrical Mechanical Systems (C-MEMs) Laboratory supports research in Ceramic Micro-Electro-Mechanical systems. The C-MEMs lab supports research in the fabrication of devices from 'green' ceramic tape through the use of laser driven cutting, x-y plotter-cutters, presses, and ovens. The lab has produced a wide variety of devices, including thermoelectric modules, miniature electric propulsion ion thrusters, both chemical and electrical micro-propulsion thrusters, devices that scavenge energy from vibration, and ion mobility

spectrometers.

The Energizing Engineering Education (E3) lab is focused on engineering education research serving as an engine to explore novel classroom techniques that can help the professional formation of engineers through understanding of the formal and informal education and value systems by which people become engineers. Our lab's research focus is in innovative teaching and learning strategies, use of emerging technologies, and mobile teaching and learning strategies.

The mission of the Robot Control Lab (RCL) is to enable robots to efficiently and robustly perform desired manipulation and locomotion tasks by designing low-level feedback control and estimation algorithms. RCL is located on the first floor of Micron Engineering Building and occupies approximately 1,000 square foot in room 103. The lab houses several robots, some of which have been built in house and a few purchased for robotics education in the Boise State University. In particular, RCL houses an air-hockey playing robot, whose playing strategy is being developed right now using machine learning techniques. We have recently purchased a computer with a great graphics processing unit (NVIDIA GeForce 2080 and 3080 RTX) in order to perform machine learning computations rapidly in parallel.

The overall objective of the Smart Materials and Systems (SMS) Lab is to investigate the potential of advanced smart materials in structural health or human health monitoring. The on-going projects cover both fundamental research and applied research. The SMSL consists of approximately 900 ft^2 of total research space, primarily in MEC 305. It has the capability of modeling, designing, fabricating, and testing smart materials and systems. The finite element modeling in SMSL is enabled by two workstations with COMSOL Multiphysics and INL MOOSE software access. Lab includes: load cells, signal conditioners, power supplies, drying oven, NI data loggers, and miscellaneous power electronics.

The Thermal Transport and Solar Energy (TTSE) Lab is focused on the intersection of thermal and mass transport with a variety of different energy systems. Our research has investigated radiative properties of nanoparticles, erosion in high temperature environments, desalination, and the design of hybrid thermal/photovoltaic solar collectors. This 1,200 square foot lab space includes: a Shimadzu UV-VIS scanning wavelength spectrophotometer including integrating sphere attachment, Perkin Elmer Spectrum Two Fourier transform infrared (FTIR) spectrometer, spin coater, dip coater, blade coater, and a HotDisk TPS2500S thermal conductivity measurement system capable of measurements up to 1000°C, with accessories for use in a muffle furnace and a vacuum tube furnace.

The goal of the Computational Materials Design (CMD) lab is to develop physics-based and data-driven models to understand the inter-relationships between chemistry, processing, structure, and property in materials. The goal of the CMD group research is to accelerate the process of materials design and discovery through advancing the science and engineering of materials microstructure. CMD lab utilizes a range of computational supercomputing resources available to Boise State.

b. Impact of new program. What will be the impact on existing programs of increased use of physical resources by the proposed program? How will the increased use be accommodated?

Currently, the two primary programs (Mechanical Engineering and Civil Engineering) have over 40 Masters students. Additionally, a few of the program faculty support PhD students in other

programs It is expected that some of the resources currently utilized by these Master's students will transition to incoming PhD students during the first two years of the program. It is expected that PhD students will act as mentors to undergraduate students, and this will facilitate additional undergraduates participating in research projects. Program faculty currently have access to multiple seating and laboratory spaces for graduate students. Any participating department will provide access to research space which includes multiple conference rooms and graduate research spaces to accommodate additional growth and foster interaction and peer learning across the student community. These spaces will be primarily organized by research advisors, not by degree program.

c. Needed resources. List equipment, space, laboratory instruments, etc., that must be obtained to support the proposed program. Enter the costs of those physical resources into the budget sheet.

No additional physical resources are required for the program.

19. Library and Information Resources: Describe adequacy and availability of library and information resources.

a. Existing resources and impact of new program. Evaluate library resources, including personnel and space. Are they adequate for the operation of the present program? Will there be an impact on existing programs of increased library usage caused by the proposed program? For off-campus programs, clearly indicate how the library resources are to be provided.

No additional library resources are needed. No new courses were added; therefore, no new textbooks are required. The research areas participating in the program are already active at the Masters level. Hence, required resources are already in place.

b. Needed resources. What new library resources will be required to ensure successful implementation of the program? Enter the costs of those library resources into the budget sheet.

None

20. Faculty/Personnel resources

a. Needed resources. Give an overview of the personnel resources that will be needed to implement the program. How many additional sections of existing courses will be needed? Referring to the list of new courses to be created, what instructional capacity will be needed to offer the necessary number of sections?

No new large lecture courses will be created in this program. While there are some "new courses" for dissertation research and professional development, the courses will not require new instructional resources. We anticipate 3-6 incoming students per year, and the vast majority of graduate courses are not capacity limited. Further, the interdisciplinary nature of the program means that courses are supported across a wide range of disciplines and utilize existing courses to build upon, limiting the need for increased instructional resources.

Additional support is needed for administrative support to maintain the program. The College of Engineering is planning to hire a joint Ph.D. program coordinator to support existing Ph.D.

programs in Electrical Engineering, and Biomedical Engineering with the plan to also support this program once launched. This position has an estimated salary of $56,000 and fringe at 42%, from which 33 percent of the effort will support this program and will come from ongoing support within the College of Engineering.

We will utilize existing College of Engineering GA resources which will be allocated according to a new policy under development within the college. Existing GA resources are to be allocated by faculty request and not to programs, the projected numbers here are estimates based on likely requests and not guaranteed GA allocations. We do expect the program to generate additional new resources in the form of federally supported GA lines (3 in FY 25 increasing to 8 by FY 28). Each federally supported GA line includes a stipend at $28,000, insurance at $7,000, fringe at 7% of the stipend and tuition at $10,062 for a total of $47,022 per student.

b. Existing resources. Describe the existing instructional, support, and administrative resources that can be brought to bear to support the successful implementation of the program.

Existing faculty lines will be used to support graduate advising as faculty seek PhD students to support their research agenda. Additionally, existing faculty lines throughout the college support the instructional requirements as the PhD program doesn't create new instructional needs, rather it leverages existing course offerings. The following faculty represent faculty who would actively recruit and support PhD students within the program.

Program Faculty:

1. Bhaskar Chittoori, Department of Civil Engineering, College of Engineering. Dr. Chittoori's area of expertise is in geotechnical engineering, more specifically, in expansive soils, developing environment-friendly solutions to mitigate the ill effects of these soils.

2. Mojtaba Sadegh, Department of Civil Engineering, College of Engineering. Dr. Sadegh's research interests encompass a broad range of hydroclimate extremes, including multi-hazard events, droughts, heatwaves, and specifically wildfires. He uses geospatial analysis, machine learning, statistical methods and data fusion/integration techniques, as well as satellite and airborne imagery and products, climate reanalysis data, gridded and in situ observations, and socioeconomic data to unravel mechanisms that drive climate extremes and their societal impacts.

3. Kevin Roche, Department of Civil Engineering, College of Engineering. Dr. Roche's research has spanned disciplines ranging from fluid mechanics to microeconomics, it is unified by a need for improved predictive models that respect the natural variability of hydrologic processes. His work involves a combination of (1) novel observations at scales ranging from the laboratory (mm – m) to the field (m – km); and (2) developing mechanistic models that establish a parsimonious link between these scales. He uses this combined experimental and modeling approach to improve the physical basis of stream- and watershed-scale models of contaminant and nutrient fate.

4. Nick Hudyma, Department of Civil Engineering, College of Engineering. Dr Hudyma's research interests include the characterization of brittle materials using destructive

testing, non-destructive testing, imaging, and simulations; imaging applications for geotechnical engineering and construction; and the assessment of surface roughness for quantifying weathering in rock.

5. Arvin Farid, Department of Civil Engineering, College of Engineering. Dr. Farid's research interests include Electromagnetic Stimulation of Geomechanisms, Effect of EM Waves and Soil Properties, Energy Piles in Clayey Soils, Sensor Fusion for Rapid Soil Characterization, Real-time monitoring of contaminant fate and transport, and Contaminant Transport Modeling.

6. Yang Lu, Department of Civil Engineering, College of Engineering. Dr. Lu's research integrates multimodal characterization and multiscale/multiphysics modeling techniques to unravel the link between composition, microstructure, and performance of transportation infrastructure materials under various environmental and mechanical loads
7. Sondra Miller, Department of Civil Engineering, College of Engineering. Dr. Miller's areas of expertise are in contaminant fate and transport in natural and engineered systems. She has taught or offered courses in environmental engineering principles, environmental chemistry, water and wastewater treatment design, and air pollution control. Dr. Miller's research includes emerging constituents within wastewater treatment facilities, impacts of drive through emissions on air quality, recycled earth products, and STEM education.

8. Daicong Da, Starting Fall 2023, Department of Mechanical and Biomedical Engineering, College of Engineering. Dr. Da's research is in the broad area of Mechanics of Materials and Structures with emphasis on multiscale modeling, structural and material design including lightweight structures, and sustainable and fracture-tolerant materials design for additive manufacturing. His work also utilizes explainable machine learning as well as data-driven techniques.

9. Zhangxian Deng, Department of Mechanical and Biomedical Engineering, College of Engineering. The fundamental goal of Dr. Deng's research is to tackle challenging engineering problems by utilizing novel functional/smart materials. The research advances understanding of smart materials via multiphysics experiments and modeling.

10. Mahmood Mamivand, Department of Mechanical and Biomedical Engineering, College of Engineering. The ultimate goal of Dr. Mamivand's research is to accelerate the process of materials design and discovery through developing multiscale multiphysics models. Specifically, Dr. Mamivand and his team are developing mesoscale models for materials phase transformation, nanoparticles growth, and materials performance in extreme environments.

11. Todd Otanicar, Department of Mechanical and Biomedical Engineering, College of Engineering. Dr. Otanicar directs the Thermal Transport and Solar Energy Laboratory. His work focuses on the role of heat transfer in novel energy generation and storage systems as well as fundamental investigations into thermal transport.

12. Krishna Pakala, Department of Mechanical and Biomedical Engineering, College of Engineering. Dr. Pakala's research is in innovative teaching and learning strategies, use of emerging technologies, and mobile teaching and learning strategies

13. Donald Plumlee, Department of Mechanical and Biomedical Engineering, College of Engineering. Dr. Plumlee directs the C-MEMS laboratory which focuses on developing microfluidic applications in Low Temperature Co-Fired Ceramics (LTCC). They also have

created a process to develop ceramic devices with embedded multi-layer fluidic channels, conductor electrodes, resistors and capacitors

14. Aykut Satici, Department of Mechanical and Biomedical Engineering, College of Engineering. Dr. Satici's research aims to enable robots to efficiently and robustly perform desired manipulation and locomotion tasks by designing low-level feedback control and estimation algorithms. This avenue of research lies in the intersection of dynamical systems, robotics, control, and applied mathematics.

c. Impact on existing programs. What will be the impact on existing programs of increased use of existing personnel resources by the proposed program? How will quality and productivity of existing programs be maintained?

Impact to existing programs will be minimal as existing faculty are already engaged in M.S. level programs and the proposed Ph.D. level program will only enhance research. Administrative needs will be provided in the way of part-time support through a Ph.D. coordinator.

d. Needed resources. List the new personnel that must be hired to support the proposed program. Enter the costs of those personnel resources into the budget sheet.

The program will require part time support for a Ph.D. coordinator, provided by the College of Engineering. The Ph.D. coordinator position will be shared across three Ph.D. programs across the college. The position is currently in the recruiting and search phase at the university.

Another critical resource will be support for graduate students in the form of graduate assistantships (GA). While we are not proposing new graduate assistantships, we will work within the existing College of Engineering GA allocations. The allocation process for the college GA positions is undergoing a college wide revision, this revision is considering the existence of the Ph.D. in Engineering being part of the decision structure. Furthermore, the goal of the program is to support students using grant support and not be reliant on appropriate GA lines except in the cases of recruiting and support of students whose grant funds might lapse. Existing GA resources are to be allocated by faculty request and not to programs, the projected numbers here are estimates based on likely requests and not guaranteed GA allocations.

21. Revenue Sources

a) **Reallocation of funds:** If funding is to come from the reallocation of existing state appropriated funds, please indicate the sources of the reallocation. What impact will the reallocation of funds in support of the program have on other programs?

Except for the grant-funded graduate assistantships, we anticipate that all funds for the program will derive from reallocation of funds within the college. As noted above, the College of Engineering is developing a new process for allocation of graduate assistantships, including the planned Ph.D. program here. Additionally, further reallocation will be used for the shared Ph.D. coordinator position discussed above.

b) **New appropriation**. If an above Maintenance of Current Operations (MCO) appropriation is required to fund the program, indicate when the institution plans to include the program in the legislative budget request.

At this time, we do not anticipate asking for a new appropriation to fund this program.

c) **Non-ongoing sources**:

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

Not applicable.

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

Grant funds will be the primary source of funding for graduate assistantships within the program and will be critical for the program success. The long-term viability depends upon continued grant writing success of program faculty, all of whom have demonstrated long-term funding success.

d) **Student Fees**:

i. If the proposed program is intended to levy any institutional local fees, explain how doing so meets the requirements of Board Policy V.R., 3.b.

N/A

ii. Provide estimated cost to students and total revenue for self-support programs and for professional fees and other fees anticipated to be requested under Board Policy V.R., if applicable.

N/A

22. Using the excel **budget template** provided by the Office of the State Board of Education, provide the following information:

- Indicate all resources needed including the planned FTE enrollment, projected revenues, and estimated expenditures for the first **four** fiscal years of the program.
- Include reallocation of existing personnel and resources and anticipated or requested new resources.
- Second- and third-year estimates should be in constant dollars.
- Amounts should reconcile subsequent pages where budget explanations are provided.
- If the program is contract related, explain the fiscal sources and the year-to-year commitment from the contracting agency(ies) or party(ies).
- Provide an explanation of the fiscal impact of any proposed discontinuance to include impacts to faculty (i.e., salary savings, re-assignments).

I. PLANNED STUDENT ENROLLMENT

		FY 25		FY 26		FY 27		FY 28	
		FTE	Headcount	FTE	Headcount	FTE	Headcount	FTE	Headcount
A. New enrollments	State Funded*	3	3	3	3	3	3	3	3
	Federal Funded	3	3	4	4	6	6	8	8
B. Shifting enrollments									
	Total Enrollment	6	6	7	7	9	9	11	11

II. REVENUE (includes any reallocated funding for students or coordinator)

		FY 25		FY 26		FY 27		FY 28	
		On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
1. New Appropriated Funding Request		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2. Institution Funds		$26,506.67	$134,646.00	$27,301.87	$134,646.00	$28,120.92	$134,646.00	$28,964.55	$134,646.00
3. Federal		$0.00	$141,066.00	$0.00	$188,088.00	$0.00	$282,132.00	$0.00	$376,176.00
4. New Tuition Revenues from Increased Enrollments		$0.00	$0.00	$0.00	0 $0.00	$0.00	$0.00	$0.00	$0.00
5. Student Fees		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00		$0.00
6. Other (i.e., Gifts)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00		$0.00
	Total Revenue	$26,507	$275,712	$27,302	$322,734	$28,121	$416,778	$28,965	$510,822

III. EXPENDITURES

	FY 25		FY 26		FY 27		FY 28	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
A. Personnel Costs								
1. FTE	0.33	0.00	0.33	0.00	0.33	0.00	0.33	0.00
2. Faculty	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3. Adjunct Faculty	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
4. Graduate/Undergrad Assistants		$162,000.00		$190,000.00		$246,000.00		$302,000.00
5. Research Personnel	0	$0.00	0	$0.00	0	$0.00	0	$0.00
6. Directors/Administrators	$ 18,666.67	$0.00	$ 19,226.67	$0.00	$ 19,803.47	$0.00	$ 20,397.57	$0.00
7. Administrative Support Personnel	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
8. Fringe Benefits	$ 7,840.00	$53,340.00	$ 8,075.20	$62,300.00	$ 8,317.46	$80,220.00	$ 8,566.98	$98,140.00
9. Other: Tuition		$60,372.00		$70,434.00		$90,558.00		$110,682.00
Total Personnel and Costs	$26,507	$275,712	$27,302	$322,734	$28,121	$416,778	$28,965	$510,822

	FY 24		FY 25		FY 26		FY 27	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
B. Operating Expenditures								
1. Travel	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2. Professional Services	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3. Other Services	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
4. Communications	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
5. Materials and Supplies	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
6. Rentals	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
7. Materials & Goods for Manufacture & Resale	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
8. Miscellaneous	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Operating Expenditures	$0	$0	$0	$0	$0	$0	$0	$0

	FY 24		FY 25		FY 26		FY 27	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
C. Capital Outlay								
1. Library Resources	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2. Equipment	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Capital Outlay	$0	$0	$0	$0	$0	$0	$0	$0

	FY 24		FY 25		FY 26		FY 27	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
D. Capital Facilities Construction or Major Renovation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E. Other Costs								
Utilities	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Maintenance & Repairs	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Other	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Other Costs	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL EXPENDITURES:	$26,507	$275,712	$27,302	$322,734	$28,121	$416,778	$28,965	$510,822
Net Income (Deficit)	$0	$0	$0	$0	$0	$0	$0	$0

I.A	Headcount and FTE are equivalent for students as the assumption is they are full time students. Assumes 3 state funded GAs in first 4 years and 3 federally funded in first year increasing to 8 by 4th year. *State funded GA lines in the College of Engineering will be allocated via a new policy under development that goes with faculty not program. Projections here are estimates and not guaranteed.
II.2	On-going revenue is for 1/3rd of PhD coordinator at estimated salary of $56k and fringe at 42%, including 3% raise pool year over year. One-time institutional funds for 3 state GA lines at a stipend of $26k, insurance at $7,000, fringe at 7% of the stipend, and includes tuition at $10,062 (total is $44,882/student).
II.3	One-time federal revenue for corresponding number of federal GA lines at a stipend of $28k, insurance at $7,000, fringe at 7% of the stipend, and includes tuition at $10,062 (total is $47,022/student). Increasing number of federally supported GAs seen in numbers beyond FY25
III.A.1	0.33 FTE is shared PhD coordinator for Engineering, Biomedical, and Electrical PhD programs.
III.A.4	Includes stipend for state and federal students. In FY 25 this is 3*$26,000 (state GAs) + 3*$28,000 (federal GAs), increasing over program as more federal GAs are funded
III.A.6	PhD coordinator is based on $56K salary adjusted to 0.3 FTE for this program ($56,000/3). In future years includes a 3% assumed increase in pay as part of raise pool
III.A.8	Fringe estimate for PhD coordinator at 42% (0.42*$56,000/3) in the on-going column. Student fringe is based upon 7% of stipend ($1820/student on state GA, $1920/student on federal funds) and insurance at $7,000 per student, total is $8,820/student on state GA and $8,920 on federal GA. In FY 25 this is 3*$8,820 + 3*$8,920. Number is increasing beyond FY25 due to growth in projected number of federally funded GA positions.

Appendices:

Appendix A: External Peer Review Report

Appendix B: Response to External Peer Review Report

Appendix C: Letters of Support

Appendix D: Curricula Vitae of Participating Faculty

Appendix A

External Peer Review Report

BOISESTATEUNIVERSITY

SITE VISIT REPORT

Reviewing the proposal for Doctor of Philosophy (PhD) in Engineering

to be housed in the College of Engineering

with four tracks:

1. Infrastructure Systems
2. Water and Environment
3. Energy Systems
4. Mechatronics and Control Systems

Represented primarily by faculty from

Mechanical and Biomedical Engineering (College of Engineering)

Civil Engineering (College of Engineering)

Chandra Kothapalli, PhD, Professor, Director of PhD in Engineering, Cleveland State University

Jeffrey Heys, PhD, Professor, Assoc. Dean of Engineering, Montana State University

A. Executive Summary

Based upon the proposal, CVs, interviews, facility tour, and other information provided by the Boise State group, the review team is very supportive of the proposed Doctor of Philosophy (PhD) in Engineering. The current lack of a broad, interdisciplinary PhD in Engineering is limiting opportunities for students and faculty. For example, students wanting to pursue a PhD are limited to a few more specialized programs like the PhD in Material Science or the PhD in Computing. This limitation on students also impacts faculty because it can create challenges in recruiting prospective PhD students. Creating a PhD in Engineering will likely support goals in the Boise State strategic plan including increasing the number of PhDs awarded, increasing research expenditures, and supporting the recruitment and retention of faculty. Even though the proposed program is a PhD program, the students and faculty associated with the program will be able to expand and enhance the related undergraduate programs in engineering, which will improve workforce development.

The recommendations related to the proposal are largely connected with the challenges associated with interdisciplinary graduate programs. We recommend tailored policies for graduate student admissions, remedial coursework requirements, graduate committee composition, examination requirements, etc. that recognize the interdisciplinary nature of the proposed program. Program assessment may also require unique measures because the program crosses departmental boundaries.

B. Review Process

Drs. Chandra Kothapalli (Director of PhD in Engineering, Cleveland State University) and Jeff Heys (Assoc. Dean of Engineering at Montana State University) visited Boise State University on July 13 and 14, 2023. Prior to the visit, the reviewers were provided with the full proposal to be submitted to the Idaho State Board of Education for a PhD in Engineering program. The proposed program was 100% face-to-face and did not include an online component. Additionally, the reviewers received the CVs for the engineering faculty that were anticipated to be the primary participants in the PhD program initially, if it is approved. After reading the initial proposal, the reviewers met over Zoom on June 27, 2023 to discuss any concerns or major questions that were raised during the initial reading. The result of this discussion was that the reviewers did not have any major concerns that might require an initial response from the proposers at Boise State. The reviewers sent one question regarding the data used to estimate demand for graduates of the program.

On Thursday, July 13, 2023 and Friday, July 14, 2023, the reviews met with a number of Boise State University administrators, faculty, and students, including:

- Dr. JoAnn Lighty (Dean of the College of Engineering)
- Dr. Scott Lowe (Dean of the Graduate College)
- Dr. John Buckwalter (Provost & Vice President for Academic Affairs)
- Dr. Zeynep Hansen (Vice Provost for Academic Planning and Institutional Effectiveness)
- Numerous faculty in Mechanical and Biomedical Engineering, including the Chair, Dr. Todd Otanicar
- Numerous faculty in Civil Engineering, including the Chair, Dr. Bhaskar Chittoori
- Current graduate students in the College of Engineering

In addition to these meetings, the reviewers received a tour of facilities in the College of Engineering that would likely be utilized by the proposed program.

C. Observations

Boise State is a relatively young University (~50 years as a member of the State system) with a College of Engineering (COEN) that is approximately 25 years old. Research in the COEN has increased significantly over the past 6 years; growing from approximately $6M per year to nearly $18M per year. This growth in research is commendable and has a strong, positive impact on the regional economy.

Faculty in the COEN currently support PhD programs in numerous areas including the PhD in Material Science Engineering, Electrical Engineering, Computing, and Biomedical Engineering. ***However, there is a clear gap for students that want to pursue PhD-level research in engineering, but their interests fall outside the current, limited set of PhD programs. Our primary observation is that there is a clear need for a broad, engineering PhD program for students and faculty beyond the current set of PhD programs.*** The proposed PhD in Engineering will significantly benefit faculty in Civil Engineering, including Environmental Engineering, and Mechanical Engineering. These faculty are limited because they currently have to recruit PhD students into existing PhD programs outside their primary field of interest, and these outside programs may not be a good fit for the prospective students. Establishing a PhD in Engineering will help recruit new faculty, new students, and allow current faculty to expand their

research programs. These benefits will come at almost no cost because the required coursework largely exists for the current Masters programs.

Beyond this central observation, the reviewers made several additional observations while reviewing the program proposal and interviewing individuals at Boise State University.

- The COEN has a demonstrated track-record of successfully operating interdisciplinary graduate programs that serve faculty and students from multiple academic departments and academic areas. The PhD in Materials Science Engineering is a good example of such a program.
- The proposed PhD in Engineering will support several goals in the strategic plan including growing research expenditures, increase the number of PhDs award, and other measures that are important for growing into an R1 institution.
- Economic growth in Idaho has led to a need for more engineering graduates to join the workforce at both the undergraduate and graduate levels. The proposed program will support growth at both levels. We spoke with both a small business owner and leadership from a larger company and they were unanimous in their support for the proposed program and the need for additional, highly trained engineers.
- The current lack of PhD programs in engineering is making new faculty recruitment difficult. The proposed program is needed to help recruit and retain the best engineering faculty.
- While there is not a surplus of research space on the Boise State University campus, there appears to be adequate research space for the proposed program.
- We interviewed administrators, faculty from numerous departments, and students, and there was very consistent, unanimous support for the proposed program. The level of unified support for the proposed program is very encouraging for its future success.
- The students who we interacted with were unanimous in their desire to pursue a PhD in Engineering at Boise State. They intend to stay in and around Boise and contribute to the local workforce. They do recognize the professional and personal benefits of receiving a doctoral degree in their respective fields.

The proposed PhD in Engineering program will respond to the changing needs of the region served by Boise State, enhance college of engineering visibility and stature for better outcomes, increase the career options of engineering doctoral graduates from Boise State, utilize faculty resources more productively by reflecting their research interests, and contribute to the recruitment and retention of outstanding faculty into the program who will teach and train undergraduates enrolled in these programs.

D. Recommendations

The review team was very supportive of the proposed PhD in Engineering program, but we also have recommendations based on our experiences in managing similar programs and based on the information we learned during the interviews. Specific recommendations include:

- Establish a clear oversight plan for the PhD in Engineering for decisions including student admissions, dissertation committee composition, remedial course requirements for students entering the program without an undergraduate degree in engineering, and productivity

expectations of all the students prior to receiving the degree (e.g., two peer-reviewed journal publications or conference proceedings). One option that we have favorable experience with is having committees at the department level for these decisions. A second option is to have an interdisciplinary committee at the program level.

- Develop clear policies for dissertation defenses and comprehensive exams that minimize any possible bias. This could include the timing of the exams and the scope of the testing procedure.
- Include additional quantitative measures that can be used to assess the program. For example, time-to-degree measures and comprehensive exam pass rates. These measures will need to be independent of courses because the proposed degree can be individualized for students in the various tracks.
- The proposed Curriculum for the program should be differentiated between students entering the program directly after their bachelors versus those joining after receiving a MS degree. The exit strategy for those students who do not meet the expectations (e.g., fail comprehensive exam, receive lower grades) or who had a change of circumstances, should be included. One typical option is to award them a MS degree, and the requirements should be detailed.
- The opportunities available for student growth could be elaborated to recruit and retain a cohort of high-quality students. Examples include internal funding mechanisms that could support their travel to conferences, student recognition awards, and professional career development mentoring.
- A quick, formal survey of current students and alumni in the mechanical and civil engineering departments could be done to gauge their interest in (a) pursuing a doctoral degree in engineering, and (b) pursuing the doctoral degree at Boise State. Including their comments and quantitative feedback (as a Table or Figure) in section b of page 6 could further strengthen the proposal.
- Perhaps including a breakdown of the external funding received by the mechanical and civil engineering faculty (& from peripheral disciplines who might recruit these incoming PhD students into their labs) would strengthen the proposal.
- Some details on the admission requirements of the incoming students would be beneficial.
- Perhaps including a Table on the current enrollment and graduation rates of other PhD programs in with the College of Engineering would strengthen the proposal. In a similar vein, a table on the enrollment trends of BS and MS students in the civil and mechanical engineering departments would showcase the feeder channel to the proposed doctoral program.

Appendix B

Response to External Peer Review Report

Response to External Evaluator Comments

The review team was very supportive of the proposed PhD in Engineering program, but we also have recommendations based on our experiences in managing similar programs and based on the information we learned during the interviews. Specific recommendations include:

1. Establish a clear oversight plan for the PhD in Engineering for decisions including student admissions, dissertation committee composition, remedial course requirements for students entering the program without an undergraduate degree in engineering, and productivity expectations of all the students prior to receiving the degree (e.g., two peer-reviewed journal publications or conference proceedings). One option that we have favorable experience with is having committees at the department level for these decisions. A second option is to have an interdisciplinary committee at the program level.

   We are in the process of developing a comprehensive graduate program handbook for the PhD in Engineering. This handbook will include many of the policy questions outlined in this question as well as additional information on program expectations, resources, values, and how to navigate the program. Oversight of the Engineering PhD Program will be provided by a graduate committee formed of at least 3 faculty members from the graduate faculty supporting this program, with at least 2 different departments in the College represented. The Graduate Committee will be responsible for working with the Program Director on official policies and procedures that get implemented. At least once per year the Program Director will present a program update to the department heads of departments who have faculty on the graduate faculty within the program. Specific details are outlined below:
   - *Admissions: Admissions requirements are proposed as follow:*
     - *Prior to commencing graduate study, applicants must hold a minimum of a Bachelor of Science degree from an accredited institution. Although no single field of undergraduate specialization is required for admission, applicants to the program should have an undergraduate degree that is appropriate to the track area of interest. An applicant may be conditionally admitted where the graduate committee recommends completion of additional classes at a satisfactory level. Applicants must also satisfy the minimum admission requirements for the Graduate College, which includes having an undergraduate grade point average of at least 3.00 (based on a 4-point scale). International applications must also satisfy the international admissions requirements.*
     - *Admission to the doctoral program is competitive and requires submission of the following application materials:*
       - *Official transcripts from all colleges attended*
       - *A brief personal statement (no more than two pages) describing the applicant's academic and professional background, research experiences and interests, career goals, and motivation for graduate study. This statement should clearly state the study track(s) of interest and at least one Ph.D. faculty member as a prospective advisor.*
       - *A current resume or curriculum vitae*
       - *Three letters of recommendation from academic or professional references that address your preparation for graduate study.*
       - *(Optional) Official Graduate Record Examinations (GRE) General Test scores. Although the GRE is optional, it is highly recommended for*

students who may have weaknesses in other areas (e.g. GPA, prior research experience) or have transcripts from international schools

- *Dissertation Committee: The supervisory committee consists of a research advisor who serves as chair, and at least 2 but no more than 4 additional members. At least 2 members of the faculty must be faculty participating in the Engineering PhD program. The committee's members are selected by the student and the research advisor and approved by the program director. All committee members must be members of the Graduate Faculty.*
- *Productivity Expectations: Because of the differences in publications between fields there is no explicit productivity requirement. That being said it is expected that each dissertation contributes substantially to the body of knowledge in the field of work, and should be able to lead towards multiple scholarly publications.*

2. Develop clear policies for dissertation defenses and comprehensive exams that minimize any possible bias. This could include the timing of the exams and the scope of the testing procedure.

- *Dissertation Defense: A public defense of the dissertation is scheduled after the dissertation committee has reviewed a draft that is considered to be a nearly final version. The date of the defense is determined jointly by the dissertation committee and the student and must be consistent with any guidelines provided by the Graduate College. The first part of the defense will be a public oral presentation of the dissertation. The second part will be an oral exam administered by the dissertation committee who will decide whether the student passes or fails the defense. The defense should last no more than 3 hours. A student who fails the defense may be permitted to try again but failure a second time will result in dismissal from the PhD program. Majority approval of the Dissertation Committee is required to pass the defense. If the defense is completed with a result of pass, the Dissertation Committee prepares a statement describing final requirements such as additions or modifications to the dissertation and any additional requirements such as archival of data. When these requirements have been met to the satisfaction of the Dissertation Committee, the approval page of the dissertation is signed by the members of the committee. Additionally, PhD candidates are to nominate a Graduate Faculty Representative who serves as a symbol of campus-wide fairness, upholds the rigor of the graduate process, and is an impartial representative of the Graduate College to the doctoral student and their supervisory committee.*
- *Comprehensive Exam: The comprehensive exam is to judge the depth and breadth of knowledge within the engineering field. It has 2 elements, and includes a written component. The two elements are: completion of your track course requirements with a B or better, and a written examination. The written examination requires the student to complete a journal article review for an article submitted by each member of their committee. Majority approval of the committee is required to pass. If failed, the exam can be retaken 1 time before the student is dismissed from the program.*
- *Dissertation Proposal: The dissertation proposal is normally completed within one year of completing the comprehensive exam and typically approved by the dissertation committee one year before the dissertation defense. It is a comprehensive statement about proposed research that will contribute to the knowledge base of your focus area in the program. The dissertation proposal should be presented within one year of satisfactory completion of the comprehensive exam. The student must submit a written dissertation proposal to the Dissertation Committee prior to the oral proposal defense. The oral defense is to not exceed 2 hours. Majority approval of the committee is required*

to pass. If failed, the proposal can be redone 1 time before the student is dismissed from the program.

- *Dismissal from Program: Students who do not meet the requirements of the program will be dismissed from the Engineering PhD program (i.e. failing the comprehensive program). If allowed by the chosen program the student has the option to complete one of the M.S. programs within the college of Engineering (i.e. Civil Engineering or Mechanical Engineering), but is required to meet the program criteria of the program chosen.*

3. Include additional quantitative measures that can be used to assess the program. For example, time-to-degree measures and comprehensive exam pass rates. These measures will need to be independent of courses because the proposed degree can be individualized for students in the various tracks.
    - *Milestones and Timeline: The milestones of the PhD study include appointment of a major advisor and Supervisory Committee, formulation of plan of study, completion of course work, completion of the comprehensive examination, dissertation proposal defense, and final dissertation defense. The major advisor is appointed when the student is admitted to the program. An Appointment of Supervisory Committee form must be submitted before sitting for the comprehensive examination. A student will be eligible to sit for comprehensive examination after completing the Convergence and Track courses (9 credit hours), but the student must take the comprehensive examination prior to completing the dissertation proposal. Once the student has passed the comprehensive examination, the student is eligible to defend their dissertation proposal. The dissertation proposal should be complete within one year of the comprehensive examination. After successful proposal defense, the student is recommended for Advancement to Candidacy.*
    - *A majority "pass" vote is required for a student to pass the comprehensive exam, proposal defense and thesis defense.*
    - *Suggested timeline for the students is to complete their comprehensive exam and defend their proposal is by the end of year 1 and 2 of their PhD studies, respectively. Suggested time to graduation for traditional, full time students is 4 to 5 years from the start of the PhD program, starting from BS. PhD in Engineering coordinator should report any considerable deviation (more than one year) from this timeline to the program director, who will assess student's progress with the major advisor and committee, and put together a plan for timely graduation of the student.*
    - *Appeal Process: Students have the right to file a written appeal regarding the decisions on their comprehensive examination, dissertation proposal defense, and final dissertation defense. The faculty steering committee serves as an appeal mechanism for decisions made by student's supervisory committee. The program director offers an appeal mechanism for decisions and recommendations of the faculty steering committee. The Boise State University Graduate Council and Graduate Dean serves an appeal mechanism for decisions made by the program director.*

4. The proposed Curriculum for the program should be differentiated between students entering the program directly after their bachelors versus those joining after receiving a MS degree. The exit strategy for those students who do not meet the expectations (e.g., fail comprehensive exam, receive lower grades) or who had a change of circumstances, should be included. One typical option is to award them a MS degree, and the requirements should be detailed.
    - *Graduate coursework can be transferred to Boise State University and applied for credit the Engineering Ph.D. program in accordance with Graduate College Policy. Students with a master of science degree in a related field may transfer up to 21 credits toward the Ph.D. program degree requirements. For a student entering with a bachelor of science degree in a relevant field, a maximum of 9 credits of graduate coursework may be applied toward the Ph.D. program degree requirements. In all cases, the transfer credit must meet Graduate College requirements and be approved by the Program Director. Transfer credit accepted into the program will be applied on a course-by-course basis toward the degree requirements.*
    - *For questions relating to exit strategy see response to comment 2.*

5. The opportunities available for student growth could be elaborated to recruit and retain a cohort of high-quality students. Examples include internal funding mechanisms that could support their travel to conferences, student recognition awards, and professional career development mentoring.

    The opportunities available for student growth could be elaborated to recruit and retain a cohort of high-quality students. Examples include internal funding mechanisms that could support their travel to conferences, student recognition awards, and professional career development mentoring.
    - *Recruitment to the program will be coordinated with the recruiting staff of the graduate college. Recruitment at a local level will occur primarily by informal contact between faculty members and local professionals and their organizations. We anticipate some recruitment of highly qualified Boise State undergraduate and master's-level students. Because of the interdisciplinary nature of the program, we believe that the program will have broad appeal, enabling us to recruit students nationally and internationally as well. We recognize that students are motivated to apply to graduate programs because of the strength of faculty research and program reputation. Boise State Engineering faculty are establishing themselves among nationally renowned scientists.*
    - *Our recruitment plan has a 3-pronged approach for attracting high quality applicants:*
        - *Support of faculty travel to recruiting events. Faculty attendance at recruiting events such as conferences serves several important functions for research, including networking to recruit students into labs. Students attend conferences to meet potential mentors, and conferences provide excellent opportunities for faculty members to meet applicants in-person and to judge the quality of their past research experience by attending oral or poster presentations.*
        - *Create a highly visible and informative web presence. Potential applicants will likely make use of the internet to search for graduate programs. We intend to have a highly visible web presence. Our web presence will include websites for the PhD program as a whole, but also for each Engineering faculty member and their lab. These sites will include up-to-*

date information on opportunities, current students, success stories, and where-are-they-now information about graduates, as well as recent publications, presentations and funded research proposals.

- *Support the visits of colleagues from external institutions. We will host regular visits from colleagues at other research institutions to give seminars and have informal meetings with graduate students and faculty. Such visits are key to publicizing a strong and successful training program. These colleagues facilitate recruiting at their home institutions when they suggest their students apply to Boise State. Further, each engineering faculty member will be encouraged to travel to other institutions to give seminars and informal meetings to enhance our visibility at external institutions.*

- *We expect a majority of these activities to be funded through extramural grants, but will also leverage internal resources such as the Graduate College student travel grants. We will also encourage and support students to apply for external travel grant opportunities. Furthermore, we will leverage literature-grounded strategies of community building, providing opportunities for peer-to-peer and vertical mentoring, and other avenues to enhance the sense of belonging and increase retention.*

6. A quick, formal survey of current students and alumni in the mechanical and civil engineering departments could be done to gauge their interest in (a) pursuing a doctoral degree in engineering, and (b) pursuing the doctoral degree at Boise State. Including their comments and quantitative feedback (as a Table or Figure) in section b of page 6 could further strengthen the proposal.
   - Please see Figure 2 for results of a recently conducted informal survey of mechanical engineering and civil engineering students (both graduate and undergraduate) on interest in the program. Survey had over 30 students respond in under 24 hours!!

7. Perhaps including a breakdown of the external funding received by the mechanical and civil engineering faculty (& from peripheral disciplines who might recruit these incoming PhD students into their labs) would strengthen the proposal.
   - The table below represents research expenditures by program faculty affiliated with the program for fiscal year 2022. As can be seen, the faculty who would be affiliated with this program generated over $1.5 million in expenditures in FY22

PI	FY22 Expenditures ($)
Chittoori, Bhaskar (Bhaskar)	$220,511
Deng, Zhangxian (Zhangxian)	$150,650
Farid, Arvin (Arvin)	$248,369
Lu, Yang (Yang Frank)	$147,898
Mamivand, Mahmood (Mahmood)	$72,860
Miller, Sondra	$78,196
Otanicar, Todd (Todd)	$100,230
Pakala, Krishna	$253,579
Plumlee, Donald Gene (Donald)	$139,777
Sadegh, Mojtaba (Mojtaba)	$62,981
Satici, Aykut Cihan (Aykut)	$65,505
Grand Total	**$1,540,556**

8. Some details on the admission requirements of the incoming students would be beneficial.
    - *See response to comment 1.*

9. Perhaps including a Table on the current enrollment and graduation rates of other PhD programs in with the College of Engineering would strengthen the proposal. In a similar vein, a table on the enrollment trends of BS and MS students in the civil and mechanical engineering departments would showcase the feeder channel to the proposed doctoral program.
    - *Please see Table 4 in the full application for enrollment data on the program*

Appendix C

Letters of Support

Idaho National Laboratory

September 9, 2023 CCN 254405

Dr. Zeynep Hansen, Ph.D.
Vice Provost for Academic Planning & Institutional Effectiveness 1910
University Drive
Boise State University Boise, ID
83725-2060

SUBJECT: Letter of Support Dear

Dr. Hansen:

I am writing this letter to express my support for the establishment of a PhD program in Engineering at Boise State University.

As the Associate Laboratory Director (ALD) for Energy & Environment Science & Technology (EES&T) at Idaho National Laboratory (INL) I am providing my support for the development of a Ph.D. program in engineering at Boise State University. In my position, I have a good understanding of why Idaho needs this Ph.D. program. Here at INL and elsewhere in the state, opportunities are needed for students to receive a holistic approach to engineering. This program provides that for students. It also helps address the growing need for researchers in Idaho.

The vision for the Ph.D. in engineering program is to create an interdisciplinary doctoral program that integrates engineering research with non-engineering disciplines to improve the research products and their community impact. The Ph.D. in engineering program is proposed with a broad and inclusive agenda that can include all engineering fields of research and bring non-engineering perspectives into engineering research. The program offers great flexibility in designing an education that fits student needs and is conducive to cutting-edge, interdisciplinary scientific discovery, and societal impact.

Sincerely,

Todd E. Combs, Ph.D., Associate Laboratory Director Energy &
Environment Science & Technology

Todd E. Combs

BER

cc: M. C. Walck (w/o Att.)
Phil Reppert

United States Department of the Interior

BUREAU OF RECLAMATION
1150 North Curtis Road

IN REPLY REFER TO:

May 24, 2023

Dr. Zeynep Hansen, Ph.D.
Vice Provost for Academic Planning & Institutional Effectiveness
1910 University Drive,
Boise State University
Boise ID, 83725-2060

Dr. Hansen,

I am writing this letter to express my support for establishment of a PhD program in Engineering at Boise State University.

I am currently working as a civil engineer with the Bureau of Reclamation at the Columbia-Pacific Northwest Regional office in Boise Idaho. I perform inspections and examinations of critical infrastructure to include bridges, dams, canals, and buildings. From my experience, I believe that having PhD students from Boise State University is incredibly important to the success of the industry by utilizing competent individuals for examination of infrastructure. Many of the facilities that I examine are critical in nature and require a multidisciplinary approach from many experts. For example, examinations of Arrowrock Dam just north of Boise Idaho, require participation from mechanical, civil, and electrical engineers for gate operations, power plant functions, and structure analysis. Also, participants may include examiners with backgrounds in geoscience to perform analysis on topics such as water inflow, landslide susceptibility and seismic impact on the dam. Other disciplines may be required such as biology for fish and wildlife impact, security forces for national security and safety, and legal teams to determine public impact, land use and ownership responsibilities.

Having engineers with a PhD aids the total comprehensive review of infrastructure as it brings individuals with a research background into the examination teams. An example of this expert background can include but is not limited to research that is already being performed at Boise State University, such as Microbial-induced-calcite-precipitation (MICP). I am aware that currently the lead Reclamation office in Denver Colorado is looking into the use of MICP to potentially mitigate seepage issues in embankment dams. Having a PhD student directly from Boise State University who has familiarity with this research could significantly aid the Bureau of Reclamation's mission and goals.

The vision for the Ph.D. in Engineering program is to create an interdisciplinary doctoral program that integrates engineering research with non-engineering disciplines to improve the research products and their community impact. The Ph.D. in Engineering program is proposed

United States Department of the Interior

BUREAU OF RECLAMATION
1150 North Curtis Road

IN REPLY REFER TO:

with a broad and inclusive agenda that can include all engineering fields of research and bring non-engineering perspectives into engineering research. The program offers great flexibility in designing an education that fits student needs and is conducive to cutting- edge, interdisciplinary scientific discovery, and societal impact.

THOMAS ROBBINS

Digitally signed by THOMASROBBINS
Date: 2023.05.24 19:29:27 -06'00'

Thomas A. Robbins, P.E.

Boise State University COEN Alumni
Email: Trobbins@usbr.gov
Cell: (208).473.9234

Dave Sherman, P.E.
Vice President, Local Business Lead
WSP USA
1444 S. Entertainment Ave, Ste. 300
Boise, Idaho 83709
dave.sherman@wsp.com (M) 208-559-0932

23 August 2023

To Whom It May Concern,

I am writing to express my enthusiastic support for the establishment of the new PhD in Engineering program at Boise State University. As the Local Business Lead at WSP, I am acutely aware of the importance of advanced education in engineering and the positive impact it can have on both academia and industry.

The field of engineering is continuously evolving, demanding professionals who possess not only a deep understanding of existing principles but also the ability to innovate and adapt to new challenges. The introduction of the PhD in Engineering program is a commendable step towards nurturing a generation of engineers who are not only equipped with advanced technical knowledge but are also adept at pushing the boundaries of knowledge in their respective fields. One particularly appealing aspect of this program is its alignment with the dynamic needs of the industry. The specialized focus on infrastructure, with an emphasis on water and environment, holds significant promise for addressing real-world challenges in infrastructure development, environmental sustainability, and construction practices. This program demonstrates a forward-thinking approach that directly addresses industry demands, fostering a bridge between academia and practical application.

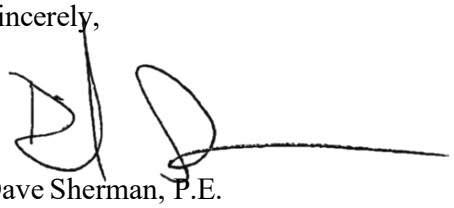
Furthermore, the research initiatives being pursued within this program have the potential to bring about transformative advancements in our understanding of fine-grained soils and their behavior. The collaboration between faculty, students, and industry partners in this research effort not only enriches academic discourse but also translates into tangible benefits for the engineering community at large.

As someone deeply invested in the growth of future engineers and the advancement of geotechnical engineering practices, I firmly believe that the PhD in Engineering program at Boise State University will contribute significantly to the educational landscape and the field of engineering as a whole. The program's commitment to excellence, innovation, and interdisciplinary collaboration is both commendable and inspiring.

In closing, I offer my full endorsement and support for the establishment of the Ph.D. in Engineering program. The potential impact of this program on the development of well-rounded, innovative engineers cannot be understated. I eagerly anticipate witnessing the program's initiation and success, and I am confident that it will be a beacon of excellence in engineering education.

Thank you for your dedication to advancing engineering education and for considering my perspective on this matter.

Sincerely,



Dave Sherman, P.E.
Vice President, Local Business Lead
WSP USA

GEoENGINEER

412 East Parkcenter Blvd, Suite 305
Boise, Idaho 83706

May 24, 2023

Dr. Zeynep Hansen, Ph.D.
Vice Provost for Academic Planning & Institutional Effectiveness
1910 University Drive
Boise State University
Boise ID, 83725-2060

Re: PhD Program in Engineering for Boise State University

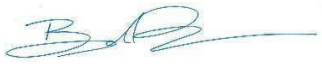
Dr. Hansen,

I am writing this letter to express my support for establishment of a PhD program in Engineering at Boise State University (BSU).

I am a Principal Geotechnical Engineer at GeoEngineers' Boise, Idaho, office, which is located less than five minutes away from the BSU campus. Our firm hires graduate level engineering students from universities across the county. We have also hired interns and gradutate level student engineers from BSU over the years, who have continued on in the engineering field across Idaho and beyond. Our firm routinely partners with academia to support both research and consulting projects. We would love to see BSU develop a PhD in Engineering program, helping grow the engineering fields and researching interdisciplinary scientific discoveries that could impact our regional and state communities. A local PhD program would enhance the level of practice in our local community and elevate the undergraduate and graduate programs already in place at BSU. BSU's civil engineering program has grown substantially since I moved to Boise 10 years ago and I would love to see the growth continue.

I'd be happy to discuss the importance of developing this program in further detail at any time. Thanks for all you're doing to advance this.

Sincerely,
GeoEngineers, Inc.



Braydan DuRee, PE, Principal Geotechnical Engineer
GeoEngineers, Inc. | E: bduree@geoengineers.com | P: 208.433.8098

Dynamik4 US
www.D4US.com | contact@D4US.com

August 28, 2023

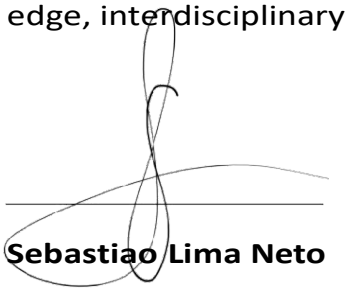
Sebastiao Lima Neto, BSE., MSc.
CEO & Co-Founder at Dynamik4
16376 Star Rd #200
Nampa, ID 83687

Dr. Hansen,

I am writing this letter to express my support for establishment of a PhD program in Engineering at Boise State University.

As the CEO & Co-Founder of Dynamik4 (one of the biggest BIM Consulting Companies in both North & South America), I feel compelled to send you this letter as I know, from more than a decade of experience working in this industry, that our challenges are getting harder and harder to overcome. Some of these challenges are driven by new technologies, lack of resources, political, and even environmental constraints. Either way, having more PhD student graduates from Boise State University would enable us to continue driving our industry forward while developing and implementing new processes instead of relying on off the shelf technologies that are available in the market.

The vision for the Ph.D. in Engineering program is to create an interdisciplinary doctoral program that integrates engineering research with non-engineering disciplines to improve the research products and their community impact. The Ph.D. in Engineering program is proposed with a broad and inclusive agenda that can include all engineering fields of research and bring non-engineering perspectives into engineering research. The program offers great flexibility in designing an education that fits student needs and is conducive to cutting-edge, interdisciplinary scientific discovery, and societal impact.



Sebastiao Lima Neto
bas@d4us.com | (208) 965-0109

PITCH
AERONAUTICS

\17 May 2023

Dr. Zeynep Hansen, Ph.D.
Vice Provost for Academic Planning & Institutional Effectiveness
1910 University Drive,
Boise State University
Boise ID, 83725-2060

Dr. Hansen,

I am writing this letter to express my support for establishment of a PhD program in Engineering at Boise State University.

I am the CEO and Co-Founder of Pitch Aeronautics. Our company has built a large ultra-precise drone for component installations on power lines and other infrastructure. We rely on engineers with the level of perception, research independence, technical communication and depth of knowledge that students obtain in PhD programs. It is presently difficult to locate robotics professionals with this level of experience in Idaho and prohibitively expensive to hire them from other places. We have been grateful to work with Boise State University students and faculty. I have personally seen students need to graduate in alternate programs because no PhD program existing in mechanical engineering.

I firmly believe that Idaho will be a better state by the establishment of more PhD level science and engineering programs. Please contact me or visit our facility in South East Boise (6323 S Federal Way, Unit 17) with any questions. I wholeheartedly support the establishment of a PhD mechanical engineering program at Boise State University.

Respectfully,

Zach Adams, **PhD**
CEO & Co-Founder, Pitch Aeronautics
303-710-5570

IGEO INNOVATE GEOTECHNICAL

August 31, 2023

Attention: Bhaskar Chittoori, Ph.D., P.E.

Subject: Boise State University
PhD in Engineering Support

I am writing to express my wholehearted support for the launch of the new PhD in Engineering program at Boise State University. As a practitioner in the field of geotechnical engineering at Innovate Geotechnical, a small yet dedicated firm specializing in geotechnical solutions, I recognize the significance of this program in advancing engineering education and fostering collaboration between academia and industry.

The geotechnical engineering landscape is marked by challenges that demand innovative approaches and a deep understanding of soil behavior and ground improvement techniques. The introduction of the PhD in Engineering program, with a specific focus on ground improvement and microbial-induced calcite precipitation, aligns perfectly with the practical needs of firms like ours that are engaged in solving complex soil-related issues.

One of the most appealing aspects of this program is its potential to bridge the gap between academic research and real-world application. The collaboration between faculty, students, and industry professionals fosters an environment where groundbreaking research can be translated into effective solutions that address the unique challenges faced by geotechnical engineers daily.

I wholeheartedly endorse the establishment of the PhD in Engineering program. The program's commitment to practical research, industry collaboration, and innovative thinking is commendable and aligns seamlessly with the values that our firm holds dear. I am confident that graduates of this program will contribute valuable insights to the geotechnical engineering community and drive positive change within our industry.

In conclusion, I extend my sincere appreciation to Boise State University for taking this bold step towards advancing engineering education and fostering a strong connection between academia and industry. The potential of the PhD in Engineering program to elevate the capabilities of geotechnical engineers is something that I wholeheartedly support and look forward to witnessing.

Sincerely,
Innovate Geotechnical

Seth P. Olsen, P.E.
Senior Geotechnical Engineer

GEOTECHNICAL ENGINEERING
2006 E Franklin Rd., #110 MERIDIAN, ID (208) 484-1090

27 January 2023

To whom it may concern:

My name is Jason Mick, and I am an engineering student at Boise State University. I earned my bachelor's degree in civil engineering from BSU before continuing toward a master's. While deciding upon graduate school I considered potential doctoral programs but realized they would require me to switch universities or switch disciplines.

My wife and I choose to live in Boise to be close to our families as we begin a family of own. We are local homeowners, and she has established herself in a successful career. I cannot uproot that investment to move to another university. Similarly, I have devoted much time and energy into the study of civil engineering. This is the academic field I am most interested in and the one I hope to make a career of. With these considerations in mind, I opted into the master's program.

If Boise State University were to offer a doctoral degree in engineering—one which would allow me to continue my focus in civil engineering—it would significantly influence my decision to pursue a PhD.

Thank you for your time,

Jason Mick

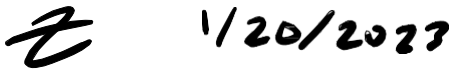
To whom it may concern,

My name is Matt Zuzelski and I am a master of science in mechanical engineering student at Boise State University. I am writing this letter to recognize the challenges that students at Boise State are facing due to the lack of a mechanical or general engineering PhD option at the university. I arrived in Boise in 2017 while looking for a good school to continue my education at. I toured at least 5 other campuses and looked at many more schools online yet, none of them had the same effect that Boise State had. I quickly decided to come to school here, not knowing what else may be in store for me in Boise.

Near the end of my undergraduate in mechanical engineering, I was fortunate to join Dr. Todd Otanicar's lab as an undergraduate research assistant which lead into my graduate program as well. Throughout these two experiences, I realized that I wanted to pursue a PhD along with the harsh reality that I would have to shift focus to biomechanical, electrical, or materials science engineering. This is unfortunate for someone who is particularly interested in things like heat transfer or design regarding applications unrelated to the previous PhD programs. Granted, materials science is a decent fit but the transition to graduate level materials science courses with a mechanical engineering background has been noted as nothing less than unpleasant.

The next option would be relocating to a school with a mechanical or general engineering program. This may work for some but, in my six years at Boise State University, I have developed meaningful friendships and relationships that make moving a massive disappointment. The lack of a mechanical or general engineering PhD affects both the student and faculty body. Many faculty members conducting research that requires a mechanical engineer at the PhD level struggle to find students since they are deterred by the lack of this program.

I hope these examples show how well a mechanical or general engineering PhD would be received here at Boise State University. If you would like to know anything more please feel free to contact me at mattzuzelski@u.boisestate.edu or (360)-620-9773. Thank you for your time.



Appendix D

Curricula Vitae for Participating Faculty

Yang Lu

EDUCATION

Degree	Discipline	Institution	Year
BS	Civil Engineering	Tianjin Institute of Urban Construction	2001
MS	Civil Engineering	Tsinghua University	2005
PhD	Civil Engineering	Virginia Polytechnic Institute and State University	2010

ACADEMIC EXPERIENCE

Boise State University – Civil Engineering Department, Associate Professor (2019 – present, Full Time)
Boise State University – Civil Engineering Department, Assistant Professor (2013 – 2019, Full Time)

NON-ACADEMIC EXPERIENCE

National Institute of Standards and Technology – Engineering Lab, Fellow Research Associate (2010 – 2013, Full Time)
Virginia Tech Transportation Institute – Smart Infrastructure Institute, Postdoctoral Research Associate (2010, Full Time)

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

Professional Engineer (P.E.) in State of Idaho, Registration Number: 15792

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- American Concrete Institute (ACI), Committee Member, since 2010
- American Society of Civil Engineers (ASCE), Committee Member, since 2008
- American Society for Nondestructive Testing, Committee Member, since 2019
- International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM), Committee Member, since 2019

HONORS and AWARDS

- Center for Advanced Energy Studies (CAES) Summer Visiting Faculty Program Awardee 2021
- NIST Distinguished Associate Award - For outstanding development and application of computational techniques to compute important structure-property relationships for cement-based composite materials. National Institute of Standards and Technology (NIST) for FY2013
- Best Paper Award (top one over 200+ papers), Proceedings of the COMSOL Conference 2012 Boston

SERVICE ACTIVITIES

- Faculty Advisor of ASCE Student Chapter, Boise State University
- COEN Creating Pathways and Forward Progress Task Force, Boise State University
- Graduate Subcommittee, Civil Engineering Department, Boise State University
- Interdisciplinary PhD Computing Program, Boise State University

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

1. Golrokh, A.J., X. Gu, and **Y. Lu**, "Real-Time Thermal Imaging-Based System for Asphalt Pavement Surface Distress Inspection and 3D Crack Profiling," *Journal of Performance of Constructed Facilities*, Vol. 35(1): p. 04020143, 2021
2. **Lu, Y.**, Islam, M. A., Thomas, S., and Garboczi, E. J. "Three-dimensional mortar models using real-shaped sand particles and uniform thickness interfacial transition zones: Artifacts seen in 2D slices." *Construction and Building Materials*, Vol 236: 117590, 2020
3. Qu, L. and **Lu, Y.**, "Copula Density Estimation by Finite Mixture of Parametric Copula Densities," *Communications in Statistics - Simulation and Computation*, pp. 1-23, 2019
4. Rahman, A. and **Lu, Y.**, A time-dependent chemo-mechanical analysis of alkali-silica reaction for the disparate geometry of concrete meso-structure, *Construction and Building Materials*, Vol 211: pp. 847-857, 2019
5. **Lu, Y.** and Wang, L., Nanomechanics Modeling of Interface Interactions in Asphalt Concrete: Traction and Shearing Failure Study, *Journal of Multiscale Modelling*, Vol 10(01): pp. 1841004, 2019
6. Golrokh, A., **Lu, Y.**, An Experimental Study of the Effects of Climate Conditions on Thermography and Pavement Assessment, *International Journal of Pavement Engineering*, pp. 1-12, DOI: 10.1080/10298436.2019.1656809, 2019
7. Islam, A., Golrokh A., **Lu, Y.**, Chemo-mechanical Modeling of Sulfate Attack-induced Damage Process in Cement Stabilized Pavements, *ASCE Journal of Engineering Mechanics*, Vol. 145(1): pp. 04018117, 2018
8. Yano, K.H., Thomas, S., Swenson, M.J., **Lu, Y.**, Wharry, J.P., "TEM in situ Cube-Corner Indentation Analysis Using ViBe Motion Detection Algorithm," *Journal of Nuclear Materials*, Vol. 502, pp. 201-212, 2018
9. Ye, Z., **Lu, Y.**, Wang, L., "Investigating the Pavement Vibration Response for Roadway Service Condition Evaluation", *Advances in Civil Engineering*, Vol. 2018, Article ID 2714657
10. Wu, J., Wang, L., Hou, Y., **Lu, Y.**, and L. Zhang, "A digital image analysis of gravel aggregate using CT scanning technique," *International Journal of Pavement Research and Technology*, Vol 11(2): pp. 160-167, 2018
11. Spragg, R., Jones, S., **Lu, Y.**, Bentz, D., Snyder, K., Weiss, J., "Leaching of conductive species: Implications to measurements of electrical resistivity," *Cement and Concrete Composites*, Vol. 79(Supplement C), pp. 94-105, 2017
12. **Lu, Y.**, Golrokh, A., and Islam, A., "Concrete Pavement Service Condition Assessment Using Infrared Thermography," *Advances in Materials Science and Engineering*, Vol. 4, pp. 1-8, 2017
13. **Lu, Y.** and Wang, L., Atomistic Modelling of Moisture Sensitivity: A Damage Mechanisms Study of Asphalt Concrete Interfaces, Road Materials and Pavement Design, Vol. 18: pp. 200-214, 2017
14. Thomas, S., **Lu, Y.**, Garboczi, E., "Improved Model for Three-Dimensional Virtual Concrete: Anm Model," *Journal of Computing in Civil Engineering*, Vol. 30(2), pp. 04015027, 2016
15. Jones, S., Martys, N., **Lu, Y.**, Bentz, D., "Simulation Studies of Methods to Delay Corrosion and Increase Service Life for Cracked Concrete Exposed to Chlorides," *Cement and Concrete Composites*, Vol. 58, pp. 59-69, 2016

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

- ITD Application and use of AASHTOWare Pavement ME Design Software, Boise, ID, October 2021.
- Machine Learning and Molecular Dynamics Webinar, Virtual event, October 2021
- CAES Data Science Boot Camp, Virtual event, July 2021
- NIST 2020 Atomistic Simulations for Industrial Needs Workshop, Virtual event, August 2020
- CAES-INL C3 Summer Boot Camp, Virtual event, June 2020
- CTL workshop, Teaching First Generation College Students Supporting their Success, November 2019
- CTL workshop, Laying the Foundation for Meaningful Conversations about Diversity, August 2018
- CTL workshop, An Introduction to Effective Course Design, November 2017
- NCAT Professor Training in Asphalt Technology for professional development, Auburn, AL, 2015
- PCA Professor Workshop in Portland Cement Association for professional development, Skokie, 2014

NAME: MANDAR KHANAL

EDUCATION

Degree	Discipline	Institution	Year
B.Sc.	Civil Engineering	Delhi University, Delhi, India	1976
Post Grad Diploma	Town & Country Planning	School of Planning & Architecture, New Delhi	1977
M.S.	Civil Engineering	Northwestern University, Evanston, IL	1981
Ph.D.	Civil Engineering	University of California, Irvine	1994

ACADEMIC EXPERIENCE

- Boise State University – Civil Engineering, Associate Professor. (1997 – present, FT)
- Louisiana State University – Civil Engineering, Research Associate. (1996 – 1997, FT)
- University of California, Irvine – Civil Engineering, Lecturer. (1995, PT)

NON-ACADEMIC EXPERIENCE

- California Department of Transportation, District 12, Orange County – Transportation Engineer. (1993 – 1996)
- Department of Roads, Kathmandu, Nepal – District Engineer. (1981 – 1985)
- TAEC Consult, Kathmandu, Nepal – Principal. (1977 – 1979)

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

PE (Civil) in the states of California and Idaho

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- American Society of Civil Engineers (ASCE)
- Institute of Transportation Engineers (ITE)

HONORS and AWARDS

Recipient of the US Permanent Residency (Green Card) under the Outstanding Researcher/People with Exception Quality category.

Recipient of the University of California, Transportation Center Dissertation Grant.

Appointed as a University Scholar, Northwestern University, Evanston, IL.

Recipient of a full ride scholarship under the Colombo Plan, to pursue an engineering degree at Delhi University

SERVICE ACTIVITIES

- Chair, Civil Engineering Department (2017 – 2018)

- Chair, Civil Engineering Department (2012 – 2016)
- Associate Chair, Civil Engineering Department (2005 – 2011)
- Panel Member D03126: NCHRP Project Panel on Operational Standards for Highway Infrastructure (2019 – Present)
- Panel Member D08111: NCHRP Project Panel on Quantifying the Impact of Freight-Efficient Land Use Patterns to Support Effective Decision Making (2016 – Present)
- Panel Member D08110: NCHRP Project Panel on Traffic Forecasting Accuracy Assessment Research (2016 – 2020)
- Panel Member Project 17-65: NCHRP Project Panel on Improved Analysis of Two-Lane Highway Capacity and Operational Performance (2014 – 2018)
- Committee Member: Transportation Research Board Standing Committee on Operational Effects of Geometrics – AHB 65 (2016 – 2019)
- Technical Editor: *International Journal of Engineering Research and Innovation* (2021 – Present)

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

- **Khanal M**. and Hasan M. (2021) "Assessment of the Highway Safety Manual's Empirical Bayes Method." *The Technology Interface International Journal,* Vol 21, Number 2, Spring/Summer 2021, pages 40-46.
- **Khanal M.** (2021) "Estimating Demand for a New Travel Mode in Boise, Idaho." *Sustainability* 2021, 13(3), 1209; **https://doi.org/10.3390/su13031209** .
- **Khanal M.** Hasan M., Sterbentz N., Johnson R., and Weatherly J. (2020) "Accuracy Comparison of Aerial Lidar, Mobile-Terrestrial Lidar, and UAV Photogrammetric Capture Data Elevations over Different Terrain Types." *Infrastructures* 2020, 5(8), 65; **https://doi.org/10.3390/infrastructures5080065**.
- Hasan M. and **Khanal M.** (2020) "Crash Prediction Model for I-84 in Boise, Idaho", Proceedings of the 2020 ATMAE and IAJC Virtual Joint Conference, 4 November 2020,;ISBN 978-1-60643-379-9.
- **Khanal M**. (2016) Proactive-Adaptive Ramp Metering Scheme for Urban Highways. *Journal of Civil & Environmental Engineering* 6:e120. doi: 10.4172/2165-784X.1000e120.

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

- Invited Talk: "Use of Terrain Model Developed from Publicly Available Lidar Data". Inviting Institution: V-Appliedscience2021: 4th Edition of Applied Science, Engineering and Technology, 20-21 August, 2021, https://www.sciwideonline.com/applied-virtual-2021.
- Invited Talk: "Road Design Using Alternative Data Sources". Inviting Institution: Global Summit on Civil, Architectural and Environmental Engineering – 2021 (GSCAEE-2021). Barcelona, Spain. July 20, 2021, https://www.thescientistt.com/civil-structural-environmental-engineering/.
- Engineering Division Co-Chair, 2014 IAJC/ATMAE Joint Conference, Louisville, Kentucky. October 7-9, 2020.

NAME: ARVIN FARID

EDUCATION

DEGREE	DISCIPLINE	INSTITUTION	YEAR
Ph.D.	**Civil Engineering**	**Northeastern University**	**2004**
M.Sc.	**Civil Engineering**	**Shiraz (formerly Pahlavi) University**	**1997**
B.Sc.	**Civil Engineering (Electrical Engineering Minor)**	**Shiraz (formerly Pahlavi) University**	**1993**

ACADEMIC EXPERIENCE

Boise State University – Civil Engineering, Professor (2020- present, FT)

NONACADEMIC EXPERIENCE

Alborz Consulting, Geotechnical & Structural Consultant (1997-2001, FT)

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

Professional Engineer (PE), ASCE/NCEES, State of Idaho, Date Obtained: 12/18/2009

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- American Society of Civil Engineers (ASCE)
- ASCE Geo-Institute (GI)
- American Society for Engineering Education (ASEE)

HONORS and AWARDS

2019, NSF, SEnS-GPS: Stellar Engineering Students - Graduate Program Scholarship, $999,867.00, PI

2019, Fulbright, Indo-US Joint Center of Development of Sustainable Materials for Soil Remediation, $72,000, PI

2018, NSF, Planning Grant: Engineering Research Center for Fire Impacts, Remediation, and Education, $100,000, PI

2017, ASCE Hong Kong Section Award for Outstanding Contribution, Hong Kong University of Science & Technology, Hong Kong, November

2014, NSF, I-Corps: Electromagnetically Induced Groundwater Remediation, $50,000, PI

2011, NSF, NEESR: Induced-Partial Saturation Through Transport and Reactivity for Liquefaction Mitigation. $1,197,461.00, Co-PI

2009, NSF, IDR: Remote and Directive Stimulation of Transport Mechanisms to Enhance Soil Remediation, $371,782.00, PI

2007, Award for Outstanding Contribution to the Phi Beta Delta Education, Boston, MA, March.
2004, Award for Outstanding Contribution to Environmental & Subsurface Science Symposium, INRA (Inland Northwest Research Alliance), Spokane, WA, September.

SERVICE ACTIVITIES

Chair of ASCE-GI Technical Committee on Geoenvironmental Engineering, Oct/2021-Present
Vice-chair of ASCE-GI Technical Committee on Geoenvironmental Engineering, Oct/2015-Sep/2021
Award Subcommittee Chair, ASCE-GI Technical Committee on Geoenvironmental Engineering, Oct/2015-Sep/2017
Secretory of ASCE-GI Technical Committee on Geoenvironmental Engineering, Oct/2012-Sep/2015.
Graduate Coordinator, Boise State University, Civil Engineering, Jan/2013-May/2018

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

Alizadeh, M. R., Abatzoglou, J. T., Luce, C. H., Adamowski, J., **Farid, A.**, and Mojtaba Sadegh (2021) "Warming Enabled Upslope Advance in Western U.S. Forest Fires," *PNAS, Proceedings of National Academy of Science*, DOI: https://doi.org/10.1073/pnas.2009717118

Paleologos, E. K., Kelly, b. C. O., Tang, C. S., Cornell, K., Rodríguez-Chueca, J., Abuel-Naga, H., Koda, E., **Farid, A.**, Vaverková, M. D., Kostarelos, K., Sai Goli, V. S., N., Guerra-Rodríguez, S., Leong, E. C., Jayanthi, P., Shashank, B. S., Sharma, S., Shreedhar, S., Mohammad, A., Jha, B., Kuntikana, G., Win Bo, M., Mohamed, A. M. O., Singh, D. N. (2021) "Post COVID-19 Water and Wastewater Management to Protect Public Health and Geoenvironment," *ICE* Journal of *Environmental Geotechnics*, Vol. 8, Issue 3, pp. 193-207, May, DOI: 10.1680/jenge.20.00067

Sadegh, M., AghaKouchak, A., Mallakpour, I., Huning, L., Davis, S., Mazdiyasni, O., **Farid, A.,** and Martinez, A. (2020) "Data and Analysis Toolbox for Modeling the Nexus of Food, Energy, and Water," *Elsevier Journal of Sustainable Cities and Societies*, Vol. 61, October, DOI: https://doi.org/10.1016/j.scs.2020.102281

Farid, A. (2020) "Environmental Geotechnics for Sustainability," *ICE Journal of Environmental Geotechnics*, July, Vol. 7, No. 3, editorial, pp. 160-162, DOI: https://doi.org/10.1680/jenge/2020.7.3.160

Tang, C. S., Paleologos, E. K., Vitone, C., Du, Y. J., Li, J. S., Jiang, N. J., Deng, Y. F., Chu, J., Shen, Z. Koda, E., Dominijanni, A., Fei, X., Vaverková, M. D., Osiński, P., Chen, ., Asadi, A., Takeuchi, M. R. H., Bo, M. W., Abuel-Naga, H., Leong, E. C., **Farid, A.**, Jha, B., Singh, D. N., Baser, T. (2020) "Environmental Geotechnics: Challenges and Opportunities in the Post COVID-19 World," *ICE* Journal of *Environmental Geotechnics*, May, DOI: 10.1680/jenge.20.00054

Farid, A., Najafi, A.*, Browning, J., Barney Smith, E. (2019) "Effects of Air Injection Pressure on Airflow Pattern of Air Sparging," *Environmental Geotechnics*, August, DOI: https://doi.org/10.1680/jenge.18.00096

Bender, J.* and **Farid, A.** (2019) "Predicting Power Transformer Bushing Seismic Vulnerability: Mounting Stiffness and Coupling," *ASCE Journal of Performance of Constructed Facilities*, Vol. 33, No. 3, June, DOI: https://doi.org/10.1061/(ASCE)CF.1943-5509.0001286

Farid, A., Najafi, A.*, Browning, J., & Barney Smith, E. (2019). Electromagnetic Waves' Effect on Airflow during Air Sparging, *Elsevier Journal of Contaminant Hydrology,* Vol. 220, pp. 49-58, DOI: https://doi.org/10.1016/j.jconhyd.2018.11.004

Bender, J.*, **Farid, A.** (2018) "Seismic Vulnerability of Power Transformer Bushings Complex Structural Dynamics and Seismic Amplification, *Elsevier Journal of Engineering Structures*, Volume 162, No. 1, pp. 1-10, May, DOI: https://doi.org/10.1016/j.engstruct.2018.01.052

Bender, J.*, **Farid, A.**, Cornell, K. A., Browning, J. J., & Barney Smith, E. H. (2017). *Chapter 32 – Electromagnetic Enhancement of Microbially Induced Calcite Precipitation*. Springer.

Nadelson, L. S. McGuire, S., Davis, K., **Farid, A.**, Hardy, K., Hsu, Y., Kaiser, U., Nagarajan, R. & Wang, S. (2016) Am I a STEM professional? The development and results of a measure of student professional identity development. *Studies in Higher Education,* Vol. 42, No. 4, pp. 701-720, DOI: 10.1080/03075079.2015.1070819

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

Ghahremani, Z., Iradukunda, P., and **Farid, A**. (2021) "Post wildfire soil and groundwater contamination, A Review," CPEG 2021, Kyoto, Japan, October.

Farid, A., Sadegh, M., Hart, M., (2019) "Understanding Components to Establish Framework for Convergent Approach to Wildfire Mitigation," The 8th International Fire Ecology and Management Congress, Tuscan, AZ, October

Farid, A., Zimmerman, D. (2019) "Coupled Numerical Analysis of Variations in the Capacity of Driven Energy Piles in Clay," *Proceedings of ASCE, GeoCongress 2019*, Philadelphia, FL

Acharya, R. and **Farid, A.** (2017) "Study of Electromagnetic-Induced Liquefaction Mitigation and Alteration of the Hydraulic Conductivity of Coarse-Grained Soils," *Proceedings of ASCE, GeoFrontiers 2017*, Orlando, FL

Bender, J., **Farid, A.**, Cornell, K., Browning, J., and Barney Smith, E. (2016) "Electromagnetic enhancement of microbially induced Calcite precipitation," *Indo-US Bilatteral Workshop, ASCE, GeoChicago 2016*, Chicago IL, August

Nazari, A., **Farid, A.**, and Cornel, K. (2016) "Impedance-Based Water-Quality Monitoring Using Parallel Plate Method," *Proceedings of ASCE GeoChicago 2016, August*.

Kevin R. Roche

EDUCATION

Degree	Discipline	Institution	Year
BS	Chemical Engineering	Purdue University	2004
PhD	Civil and Environmental Engineering	Northwestern University	2017

ACADEMIC EXPERIENCE

Boise State University – Civil Engineering, Assistant Professor (2020-Present, FT)
Institute of Environmental Assessment and Water Research, Spanish National Research Council – Fulbright Research Scholar (2019-2020, FT)
University of Notre Dame – Civil & Environmental Engineering and Earth Sciences, Postdoctoral Scholar (2017-2019, FT)
Northwestern University – Civil and Environmental Engineering, Graduate Research Assistant (2012-2017, FT)

NON-ACADEMIC EXPERIENCE

US Peace Corps, Youth Development Volunteer (2009-2012, FT)
Eli Lilly and Company, Process Control Engineer (2004-2009, FT)

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

None

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Geophysical Union (AGU)

HONORS and AWARDS

Fulbright Junior Scholar Award (Barcelona, Spain), 2019 – 2020
Editor's Choice Award, *Water Resources Research*, "Turbulence links momentum and solute exchange in coarse-grained streambeds," Vol. 54, No. 5, 2018. (awarded to not more than 1% of papers published in AGU journals in each calendar year).
Outstanding Student Presentation Award, AGU Fall Meeting, 2015
NSF Graduate Research Fellowship, 2013 – 2016
Walter P. Murphy Graduate Fellowship, Northwestern University, 2012

SERVICE ACTIVITIES

Session Chair and Primary Convener - Groundwater-Surface Water Interactions: Integrating Physical, Biological, and Chemical Patterns and Processes Across Systems and Scales, AGU Fall Meeting (2020)

AGU Hydrology Section Student Subcommittee Member (2015-2017)

Panel Reviewer, Dept of Energy Subsurface Biological Research Program (2020)

External Referee, Journals: Earth-Science Reviews, Geophysical Research Letters, Hydrological Processes, JGR-Biogeosciences, Journal of Hydrology, npj Biofilms and Microbiomes, PLOS One, Stochastic Environmental Research and Risk Assessment, Water Resources Research; Funders: NSF EAR Instrumentation and Facilities, NSF Hydrologic Sciences, DOD Army Research Office

Thesis/Dissertation committee for five Civil Engineering graduate students (1 chair)

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

Müller, M. F.**,** Roche, K. R., & Dralle, D. N. (2021). Catchment processes can amplify the effect of increasing rainfall variability. *Environmental Research Letters*, *16*(8), 084032

Roche, K.R., Müller-Itten, M., Dralle, D., Bolster, D., & Müller, M.F.* (2020). "Climate change and the opportunity cost of conflict." *Proceedings of the National Academy of Sciences, 117* (4) 1935-1940.

Roche, K.R., Li, A., Bolster, D., Wagner, G., & Packman, A.I. (2019). "Effects of turbulent hyporheic mixing on reach-scale transport." *Water Resources Research*, *55.*

Kim, J., Roche, K.R., Bolster, D., & Doudrick, K.* (2019). "Transport of Food- and Catalytic-Grade Titanium Dioxide Nanoparticles in Controlled Field Streams with Varying Streambed and Biofilm Conditions." *Environmental Science: Nano, 6* (11), 3454-3466.

Roche, K.R., Shogren, A., Aubeneau, A.F., Tank, J.T., & Bolster, D. (2019). "Modeling benthic vs. hyporheic uptake in unshaded streams with varying substrates." *JGR-Biogeosciences*, *124(2)*, 367-383.

Roche, K.R., Blois, G., Best, J.L., Christensen, K.T., Aubeneau, A.F., & Packman, A.I. (2018). "Turbulence links momentum and solute exchange in coarse-grained streambeds." *Water Resources Research, 54*

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

Course Design Institute, Boise State University (2021, participant)

National Socio-Environmental Synthesis Center, SESYNC – "Social-Environmental Approaches to Watershed Management and Governance", SESYNC Headquarters (2020, participant)

EDUCATION

Degree	Discipline	Institution	Year
Ph.D.	Civil Engineering	The University of Texas at Arlington	2008
M.S.	Civil Engineering	National Institute of Technology Karnataka, India	2004
B.S.	Civil Engineering	Jawaharlal Nehru Technological University, Kakinada, India	2002

ACADEMIC EXPERIENCE

Boise State University
Associate Professor — July 2018 – Present, FT
Assistant Professor — Aug. 2013 – June 2018, FT
The University of Texas at Arlington
Faculty Associate-Research/Lecturer — Sep. 2010 – Aug. 2013, FT

NON-ACADEMIC EXPERIENCE

Parsons Brinckerhoff
Engineer-II — Jan. 2009 – Sep. 2010, FT
Sai Sudha Constructions, India
Field Engineer — Nov. 2004 – Jul. 2005, FT

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

P.E. in: State of Idaho – State of Texas

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- American Society of Civil Engineers (ASCE)

HONORS and AWARDS

- Accomplished Under 40 Honoree, Idaho Business Review. 2019
- ***Best Paper Award***: Pedarla, A., Puppala, A. J., Chittoori, B., Ganne, V.K., Nazarian, S. (2017). "Long-term Durability Studies on Chemically Treated Reclaimed Asphalt (RAP) Material as a Base Layer for Pavements", Journal of Transportation Research Board, No. 2657, 1-9.
- Nominated for ASCE Norman Medal for best paper: Chittoori, B. and Puppala A.J. (2011). "Quantitative estimation of clay mineralogy in fine grained soils", Journal of Geotechnical and Geoenvironmental Engineering, 137 (11), 997-1008.
- 'University Scholar' Award for Academic Excellence in Civil Engineering Department, The University of Texas at Arlington, USA. 2008

SERVICE ACTIVITIES

- Associate Chair Department of Civil Engineering, Boise State University (2019-present)
- Member, Faculty Senate Diversity Committee, Boise State University (2018 to 2021)
- Member, College of Engineering Safety Committee, Boise State University (2018-2018)
- Associate Editor, ASCE Journal of Materials in Civil Engineering (2014-Present)
- Handling Editor, Transportation Research Record (2018-Present)
- Chair, ASCE Geo-Institute's Committee on Sustainability in Geotechnical Engineering
- Member, ASCE Committee on Technical Advancement (2018-2021)
- Member: TRB (Transportation Research Board) Standing Committee on Low-Volume Roads (AFB30)
- Member: TRB (Transportation Research Board) Standing Committee on Geotechnical Instrumentation and Modeling (AFS20)

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

- *Gajurel, A., Chittoori, B., Sarathi, P. M., Sadegh, M. (2021) "Machine Learning Methods to Map Stabilizer Effectiveness based on Common Soil Properties", Transportation Geotechnics, 27, DOI: https://doi.org/10.1016/j.trgeo.2020.100506.
- *Robbins, T., and Chittoori, B. (2021) "A Practical Risk-Based, Probabilistic Framework for Unifying Sustainability and Resiliency Assessments of Civil Infrastructure" Proceedings of the Institution of Civil Engineers - Engineering Sustainability, 174(3), DOI: https://doi.org/10.1680/jensu.20.00010.
- *Rabbi, M. F., Boudreau, R. L., Chittoori, B. C., Sotirin, M., & Mishra, D. (2020). "Polyurethane Grout Injection as Remedial Measure to Reduce Differential Heave in Pavement Sections Constructed over Expansive Soils." Journal of Transportation Engineering, Part B: Pavements, 146(4), 04020068. DOI: https://doi.org/10.1061/JPEODX.0000221.
- *Islam, Md., T, Chittoori, B. C. S., Burbank, M. (2020). "Evaluating the Applicability of Biostimulated Calcium Carbonate Precipitation to Stabilize Clayey Soils", ASCE Journal of Materials, 32 (3), 11.

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

- Asghari, S., Chittoori, B. C. S., Burbank, M., Hudyma, N. (2021). "Studying the Relationship between Indigenous Microbial Communities, Urease Activity, and Calcite Precipitation in Artificial Mixes of Clay and Sand", IFCEE 2021, May 10th to 14th, Dallas, TX, GSP 325, 130-138.
- Chittoori, B. C. S., Pathak, A., Burbank, M., *Islam, M. T. (2020). "Application of Bio-Stimulated Calcite Precipitation to Stabilize Expansive Soils: Field Trials", GeoCongress 2020, Feb 25-28, Minneapolis, MN.
- *Gajurel, A, Chittoori, B. C. S., Mukherjee, P. (2019). "Estimating Optimal Additive Content for Soil Stabilization Using Machine Learning Methods", Gecongress 2019, Mar 24-27, Philadelphia, PA.
- Chittoori, B. C. S., *Rahman, T., Burbank, M. (2019). "Evaluating Shallow Mixing Protocols as Application Methods for Microbial Induced Calcite Precipitation Targeting Expansive Soil Treatment", Gecongress 2019, Mar 24-27, Philadelphia, PA.

NAME: SONDRA MILLER

EDUCATION

Degree	Discipline	Institution	Year
AS	Liberal Arts, General Studies	Monroe Community College	1988
AS	Engineering Science	Monroe Community College	1989
BS	Civil Engineering	SUNY - Buffalo	1996
MS	Environmental Engineering	SUNY - Buffalo	1999
PhD	Environmental Engineering	University of Iowa	2003

ACADEMIC EXPERIENCE

- Boise State University - Civil Engineering, Associate Professor. (2013 - present, FT).
- Boise State University - Civil Engineering, Assistant Professor. (2006 - 2013, FT).
- Boise State University - Civil Engineering, Adjunct Professor. (2005 - 2006, PT).
- University of Iowa - Civil and Environmental Engineering, Research and Teaching Assistant. (1998 - 2002, FT).
- SUNY, Buffalo - Civil, Structural and Environmental Engineering, Research and Teaching Assistant. (1996 - 1998, FT).

NON-ACADEMIC EXPERIENCE

- CENTRA Consulting, Inc. - Vice President and Chief Engineer. (2014 -2015, PT).
- Idaho Department of Environmental Quality - Associate Engineer. (2004 - 2006, FT).
- Hydroblend, Inc. - Plant Engineer. (2002 - 2004, FT).
- The Sear-Brown Group - Structural Designer. (1990 - 1995, FT).

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

PE in: State of Idaho – State of New York

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- American Society of Civil Engineers (ASCE)
- American Society for Engineering Education (ASEE)
- Idaho Society of Professional Engineers (ISPE)
- National Society of Professional Engineers (NSPE)

HONORS and AWARDS

- Boise State University Foundation Scholars Award for Service, 2012
- Boise State University Provost's Excellence in Advising Award, 2010

SERVICE ACTIVITIES

- President, Idaho Society of Professional Engineers (2020 - present)
- Undergraduate Coordinator, EngineeringPLUS (2020 - present)
- Undergraduate Coordinator, Department of Civil Engineering (2016 - present)
- Associate Dean, College of Engineering (2018 - 2021)
- Discipline Expert, National Council of Examiners for Engineering and Surveying (2018, 2019)

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

- McLaughlin, B.M, Chittoori, B.C.S., Hamilton, R.W., Hudyma, N.W., **Miller, S.M.**, and Sadegh, M. 2021. "Work In Progress: Halting Attrition in Civil Engineering Programs through Lower-Division Engagement Course Implementation", *2021 Conference and Exposition*, American Society of Engineering Education.
- Chittoori, B.C.S., Salzman, N., Hamilton, R.W., Mishra, D. and **Miller, S.M.** 2020. "Incorporating Sustainability and Resiliency Content into the Civil Engineering Undergraduate Curriculum", *2020 Conference and Exposition*, American Society for Engineering Education.
- Hollar, C.E. and **Miller, S.M.** 2020. "Work in Progress: Development of a General Education First-Year Design Course", *2020 Conference and Exposition*, American Society for Engineering Education.
- Olson, L., Moll, A.J., Bullock, D., **Miller, S.M.**, Jain, A., and Callahan, J. 2016. "Support Model for Transfer Students Utilizing the STEM Scholarship Program", *2016 Conference and Exposition*, American Society for Engineering Education.
- **Miller, S.M.**, Catlin, L., and Giacumo, L. 2016 "Successes and Lessons from a Multidisciplinary Capstone Project". *2016 ASEE Pacific Northwest Division Section Conference.*

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

- ISPE Annual Conference, November 2021
- ASEE Conference and Exposition, June 2020

NAME: NICHOLAS HUDYMA

EDUCATION

Degree	Discipline	Institution	Year
BS	Geological Engineering	Universityof Manitoba	1992
MS	Civil and Environmental Engineering	University of Nevada, Las Vegas	1994
PhD	Engineering	University of Nevada, Las Vegas	1999

ACADEMIC EXPERIENCE

- Boise State University – Civil Engineering, Professor. (2019 – present, FT).
- University of North Florida – School of Engineering, Assistant/Associate/Full Professor (2002 – 2019, FT).
- University of Nevada, Las Vegas – Civil and Environmental Engineering, Assistant Research Professor (2000 – 2002, FT).
- Bradley University – Civil Engineering and Construction, Assistant Professor (1999 – 2000, FT).

NON-ACADEMIC EXPERIENCE

- Group Alpha – Project Engineer. (1999 – 1999, FT).
- Construction, Testing, and Engineering (CTE), Nevada – Operations Manager. (1997 – 1998, FT).
- Converse Consultants – Project Manager. (1997 – 1997, FT).

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

PE in: State of Nevada

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- American Society of Civil Engineers (ASCE)
- International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE)
- American Rock Mechanics Association (ARMA)
- International Society for Rock Mechanics (ISRM)
- United States Council on Geotechnical Education and Research (USUCGER)

HONORS and AWARDS

- Northeast Florida Engineer of the Year, 2017
- Northeast Florida Professor of the Year, 2012
- Northeast Florida Professor of the Year, 2007
- University of North Florida Outstanding Undergraduate Teacher of the Year Award, 2006

SERVICE ACTIVITIES

- Chair, Civil Engineering Department (2019 – present)
- Chair, Technical Coordination Council of the Geo-Institute of ASCE (October 2019 – present)
- Technical Co-Chair, 2020 ASCE Geo-Institute Geo-Congress
- Secretary, Technical Coordination Council of the Geo-Institute of ASCE (October 2016 – October 2019)
- Team Leader, NSF Geotechnical Extreme Events Reconnaissance (Fall, 2017)
- Associate Editor for ASCE Journal of Materials in Civil Engineering (Geomaterials Section) (August 2017 – present)
- Co-Chair, 2014 ASCE Geo-Institute Geo-Congress

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

- Dally, W.R., Crowley, R., and **Hudyma, N.**, 2021. "Northeast Florida – A new hotspot for hurricane damage?" Proceedings of Geo-Extreme, Savannah, GA, November 7-10, 2021.
- Landon, M.E., **Hudyma, N.W.**, and Sharma, R.S., 2020. "Hurricane Irma: Consequences of intense rainfall and storm surge from a tropical storm in north and central Florida", International Journal of Geotechnical Case Histories, Volume 5, Issue 4, pp.26-46. https://doi.org/10.4417/IJGCH-05-04-02
- **Hudyma, N**. and Avar, B.B., 2020. "Characterization of failure loads and failure modes in schist from indirect tension tests", 54th US Rock Mechanics/Geomechanics Symposium. Manuscript 20-1439.
- **Hudyma, N.**, Kopp, B., Oglesby, J., and Vong, S., 2020. "Bench-scale investigation of remote detection of clay pockets in granular soils", Geo-Congress 2020: Modeling, Geomaterials, and Site Characterization, pp. 550-557. https://doi.org/10.1061/9780784482803.059
- Avar, B.B. and **Hudyma, N.W.**, 2019. "Earthquake surface rupture: A brief survey on interdisciplinary research and practice from geology to geotechnical engineering", Rock Mechanics and Rock Engineering, Volume 52, Issue 12, pp. 5259-5281. https://doi.org/10.1007/s00603-019-02006-0

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

- ASCE Geo-Institute's Geo-Extreme Conference, November 2021
- ASEE DELTA Department Leaders Institute, January 2021
- ASCE Geo-Institute's Geo-Congress, March 2020
- ARMA 52th US Rock Mechanics/Geomechanics Symposium, June 2018

NAME: Mojtaba Sadegh

EDUCATION

Degree	Discipline	Institution	Year
BS	Civil and Environmental Eng.	Ferdowsi University of Mashhad	2007
MS	Civil and Environmental Eng.	University of Tehran	2010
PhD	Civil and Environmental Eng.	University of California, Irvine	2015

ACADEMIC EXPERIENCE

Boise State University – Civil Engineering, Assistant Professor. (2017 – Present, FT).
University of California, Irvine – Postdoctoral Scholar. (2015-2016, FT)

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

- American Geophysical Union – Member
- American Society of Civil Engineers – Member

HONORS and AWARDS

- 2021 Golden Apple Award for the College of Engineering of Boise State University for Offering Inclusive Learning Experiences.
- 2020 Editors' Citation for Excellence in Refereeing for *Earth's Future*
- 2019 Editors' Citation for Excellence in Refereeing for *Earth's Future*
- 2017 Editor's Citation for Excellence in Refereeing for *Water Resources Research.*

SERVICE ACTIVITIES

- Associate Editor: Journal of Hydrologic Engineering, ASCE, 2019-present
- Associate Editor: Hydrological Science Journal, IAHS, 2020-present.
- Panel Reviewer: NASA, NSF, Canada Foundation for Innovation.

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

- Shojaeezadeh, S., Nikoo, M.R., Talebbeydokhti, N., **Sadegh, M.**, Adamowski, J., 2021, Process-constrained Statistical Modeling of Sediment Yield, ***Catena***, 209 (1), 105794.
- Noori, R., Maghrebi, M., Mirchi, A., Tang, Q., Bhattarai, R., **Sadegh, M.**, Noury, M., Torabi Haghighi, A., Kløve, B., Madani, K., 2021, Anthropogenic Depletion of Iran's Aquifers, ***Proceedings of the National Academy of Sciences of the USA***, 118 (25) e2024221118.
- Alizadeh, M.R., Abatzoglou, J.T., Luce, C.H., Adamowski, J., Farid, A., **Sadegh, M.,** 2021, Warming Enabled Upslope Advance in Western U.S. Forest Fires, ***Proceedings of the National Academy of Sciences of the USA***, 118 (22), e2009717118.

- Salman, R., Nikoo, M.R., Shojaeezadeh, S.A., Hatami B.B., P., **Sadegh, M.,** Adamowski, J.F., Alamdari, N., 2021, A novel Bayesian maximum entropy-based approach for optimal design of water quality monitoring networks in rivers, ***Journal of Hydrology,*** 603, 126822.
- ModaresiRad, A., Kreitler, J., **Sadegh, M.,** 2021, Augmented Normalized Difference Water Index for Improved Surface Water Monitoring, ***Environmental Modeling & Software,*** 140, 105030.
- Vanda, S., Nikoo, M.R., Taravatrooy, N., **Sadegh, M.,** Al-Wardy, M., Adamowski, J.F., 2021, An emergency multi-objective compromise framework for reservoir operation under suddenly injected pollution, ***Journal of Hydrology***, 598, 126242.
- Abatzoglou, J.T., Rupp, D., O'Neill, L., **Sadegh, M.,** 2021, Compound extremes drive the western Oregon wildfires of September 2020, ***Geophysical Research Letters***, 48, e2021GL092520.
- AghaKouchak, A., Mirchi, A., Madani, K., Di Baldassarre, G., Nazemi, Al., Alborzin, A., Anjileli, H., Azarderakhsh, M., Chiang, F., Hassanzadeh, E., Hunning, L.S., Mallakpour, I., Martinez, A., Mazdiyasni, O., Moftakhari, H., Norouzi, H., **Sadegh, M.**, Sadeqi, D., Van Loon, A.F., Wanders, N. 2021, Anthropogenic Drought: Definition, Challenges and Opportunities, ***Reviews of Geophysics***, 59, e2019RG000683.
- Hashempour Bakhtiari, P., Nikoo, M.R., Golkar, F., **Sadegh, M.**, Al-Wardy, M., Al-Rawas, G.A., 2021, Design of a high-coverage ground-based CO2 monitoring layout using a novel information theory-based optimization model, ***Environmental Monitoring and Assessment***, 193, 150.
- Srivastava, A.K., Grotjahn, R., Ullrich, P., **Sadegh, M.**, 2021, Pooling data improves multimodel IDF estimates over median-based IDF estimates: Analysis over Susquehanna and Florida. ***Journal of Hydrometeorology***, 22, 971–995.
- Gajurel, A., Chittoori, B., Mukherjee, P.S., **Sadegh, M.,** 2021, Machine Learning Methods to Map Stabilizer Effectiveness based on Common Soil Properties, ***Transportation Geotechnics***, 27, p.100506.
- Alizadeh, M.R., Adamowski, J., Nikoo, M.R., AghaKouchak, A., Dennison, P., **Sadegh, M.** 2020, A Century of Observations Reveal Increasing Likelihood of Continental-Scale Compound Dry-Hot Extremes, ***Science Advances***, 6, eaaz4571.
- Madadgar, S., **Sadegh, M.**, Chiang, F., Ragno, E., AghaKouchak, A. 2020, Quantifying Increased Fire Risk in California in Response to Different Levels of Warming and Drying, ***Stochastic Environmental Research and Risk Assessment***, 34(12), 2023-2031.
- Haghighat, M., Nikoo, M.R., Parvinnia, M., **Sadegh, M**., 2020, Multi-objective conflict resolution optimization model for reservoir's selective depth water withdrawal considering water quality, ***Environmental Science and Pollution Research,*** 28(3), 3035-3050.
- Khorshidi, M.S., Dennison, P.E., Nikoo, M.R., AghaKouchak, A., Luce, C.H., **Sadegh, M**., 2020, Increasing concurrence of wildfire drivers tripled megafire critical danger days in Southern California between 1982-2018, ***Environmental Research Letters,*** 15(10), p.104002.

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

- Wildfire and the Biosphere Innovation Lab, NSF-funded Virtual Workshop, May, 2021.
- Flexible Teaching for Student Success Tier 1 Institute, Center for Teaching and Learning, Boise State University, June-July 2020.
- Aligning Stakeholders and Structures to Enable Risk Taking (ASSERT) Cohort 4, January-May, 2020.

AYKUT SATICI

EDUCATION

Degree	Discipline	Institution	Year
B.S.	Mechatronics Engineering	Sabanci University	2008
M.S.	Mechatronics Engineering	Sabanci University	2010
M.S.	Mathematical Sciences	The University of Texas at Dallas	2013
Ph.D.	Electrical Engineering	The University of Texas at Dallas	2014

ACADEMIC EXPERIENCE

Boise State University – Mechanical and Biomedical Engineering, Assistant Professor. (2017 – present, FT)
Massachusetts Institute of Technology – Engineering and Computer Science, Postdoctoral Associate. (2016 – 2017, FT)
The University of Naples, Federico II, – Electrical Engineering and Information Technology, Postdoctoral Researcher. (2015 – 2016, FT)

NON-ACADEMIC EXPERIENCE

Not Applicable

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

Not Applicable

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

IEEE

HONORS and AWARDS

Not Applicable

SERVICE ACTIVITIES

Associate Editor for the International Conference on Robotics and Automation, (2020 – 2022)
Member of the American Control Conference Program Committee Member, (2023)
Led Robotics for Girl Scouts, (2019)
Supervisor for the Boise State Micron Robotics Challenger, (2020)

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

Aykut C. Satici, Fabio Ruggiero, et. al. "Robotic Dynamic Manipulation", Springer Nature Switzerland AG, 2022

Volkan Patoglu and **Aykut Cihan Satici**, "Optimal Design of Haptic Interfaces", Advances in Haptics, IN-TECH, 2010. (This book chapter has been downloaded over 5000 times from unique IP addresses.)

F. Ruggiero, **Aykut C. Satici**, et. al. "Perception of Deformable Objects and Nonprehensile Manipulation Control", ICINCO Springer, 2019

F. Ruggiero, **Aykut C. Satici**, et. al. "Nonprehensile manipulation of deformable objects: Achievements and Perspectives from the RoDyMan Project", vol. 25, nu. 3, pp.83,92 IEEE Robotics & Automation Magazine, 2018

Ryan Montrose, **Aykut C. Satici**, and John Gardner, "Centralized and Decentralized Optimal Control of Variable Speed Heat Pumps", Energies, MDPI, 2021

Wankun Sirichotiyakul, Volkan Patoglu, Aykut C. Satici, "Efficient Singularity-Free Workspace Approximations Using Sum-of-Squares Programming", Journal of Mechanisms and Robotics, 2020.

D. Serra, F. Ruggierro, **A. C. Satici**, et. al., "Time-Optimal Paths for a Robotic Batting Task", Informatics in Control, Automation and Robotics, Springer, 2018.

L. Buonocore, J. Cacace, A. Donaire, **A. C. Satici**, et. al., "Nonprehensile manipulation of defomable objects", Robotics and Automation Magazine (RAM), 2018.

Aykut Cihan Satici, Alejandro Donaire, Bruno Siciliano, ,"Intrinsic Dynamics and Total Energy Shaping Control of the Ballbot System", International Journal of Control, 2016.

Aykut C Satici, Mark W. Spong, "Global Swarming With Connectivity Via Lagrange-Poincaré Equations,", Automatica, Volume 71, 2016.

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

National Effective Teaching Institute, (2018)

DONALD PLUMLEE

EDUCATION

Degree	Discipline	Institution	Year
B.S.	Mechanical Engineering	Texas A&M University	1993
M.S.	Mechanical Engineering	Boise State University	2003
Ph.D.	Mechanical Engineering	University of Idaho	2007

ACADEMIC EXPERIENCE

Boise State University – College of Engineering, Associate Dean for Academic Affairs. (2021 – present, FT)
Boise State University – Mechanical and Biomedical Engineering, Associate Professor. (2014 – present, FT)
Boise State University – Mechanical and Biomedical Engineering, Department Chair. (2014 – 2020, FT)

NON-ACADEMIC EXPERIENCE

Not Applicable

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

Licensed Professional Engineer

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

Pi Tau Sigma
Tau Beta Pi
International Microelectronics and Packaging Society (IMAPS)
American Society of Engineering Education (ASEE)

HONORS and AWARDS

BSU Foundation Scholars Award for Teaching, (2014)

SERVICE ACTIVITIES

Boise State University "Top Ten Scholars" Selection Committee, (2011 – 2020)
Boise State University Academic Leadership Committee, (2014 – 2020)
Boise State University Decision Support: Project Implementation Working Group, (2019 – 2020)
Chair of the Civil Engineering Department Chair Search Committee, (2018 – 2019)
College of Engineering Executive Committee (EXCO), (2014 – 2020)
College of Engineering Assessment Committee (ABET), (2013 – 2020)

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

Black, D., Harper, R., Ward, P., Davlin, J., Bentancourt, O., **Plumlee, D.**, & Browning, J. (2020). "*A cathode support structure for use in a magnetron oscillator experiment*." INTERNATIONAL JOURNAL OF APPLIED CERAMIC TECHNOLOGY, *17*(5), 2393-2406.

Cornell, K. A., Benfield, K., Berntsen, T., Clingerman, J., Croteau, A., Goering, S., **D. Plumlee** & Oxford, J. T. (2020). "*A Cold Atmospheric Pressure Plasma Discharge Device Exerts Antimicrobial Effects*." INTERNATIONAL JOURNAL OF LATEST TRENDS IN ENGINEERING & TECHNOLOGY: IJLTET, *15*(3), 036.

McNeilly, S. A., Pakala, K., & **Plumlee, D.** (2020). "Revolutionizing Mechanical Engineering Undergraduate Curriculum," ASEE Virtual Annual Conference and Exposition.

Kramer, Kyle; Carlson, Jessica; McCarver, Joe; Ravenscroft, Cory; Croteau, Adam; White, Amanda; Kennedy, Zeke; Kandadai, Nirmala; Estrada, David; **Plumlee, Don**; and Browning, Jim, "Understanding the Effects of Plasma Parameters on Plasma-Jet Printed Material Films" (2019). *2019 Undergraduate Research and Scholarship Conference*. 88. https://scholarworks.boisestate.edu/under_conf_2019/88

Browning, J., Pearlman, M., **Plumlee, D.**, Akinwande, T., Worthington, M., & Cipolla, J. (2017, May). Development Of A Phase-Controlled Magnetron Experiment Using A Modulated Electron Source. In *2017 IEEE International Conference on Plasma Science (ICOPS)* (pp. 1-1). IEEE.

Browning, J., Saxena, V., **Plumlee, D.**, Akinwande, T., Worthington, M., & Hay, B. (2016, June). A phase-controlled magnetron using a modulated electron source," Plasma Science (ICOPS), 2016 Abstracts IEEE International Conference on, Banff, Alberta, Canada, June 2016.

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

PKAL STEM Leadership Institute
Intergraph EMS Modeling Course

TODD OTANICAR

EDUCATION

Degree	Discipline	Institution	Year
B.S.	Aerospace Engineering	University of Kansas	2002
M.S.	Mechanical Engineering	University of Cincinnati	2005
Ph.D.	Mechanical Engineering	Arizona State University	2009

ACADEMIC EXPERIENCE

Boise State University – Mechanical and Biomedical Engineering, Department Chair. (2021 – present, FT)
Boise State University – Mechanical and Biomedical Engineering, Associate Professor. (2019 – present, FT)
The University of Tulsa – Mechanical Engineering, Assistant Professor. (2016 – 2019, FT)

NON-ACADEMIC EXPERIENCE

Exaeris Water Innovations LLC – Chief Scientist, developed technical models, oversaw device design and testing. (2015 – 2022)

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

Licensed Professional Engineer

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Society of Thermal Fluids Engineers (ASTFE)

HONORS and AWARDS

American Society of Biomechanics Early Career Achievemetn Award, (2021)
Kids in Danger Best Friend Award, (2021)
Orthopaedic Research Society's Harris Award for Basic and Clinical Hip Research, (2020)
Arkansas Business Healthcare Hero: Innovation Hero Nominee, Little Rock, AR., (2020)
Phenomenal Woman Awardee, University of Arkansas for Medical Sciences, (2019)

SERVICE ACTIVITIES

Boise State University Academics and Research Subcommittee Sustainability Governance Council, (2020 – present)
Board Member of the Boise State University Idaho Chapter CleanTech Alliance, (2021 – present)
Idaho Strategic Energy Alliance Utility-Scale Storage Task Force, (2021 – present)

Mechanical and Biomedical Engineering Faculty Search Committee, (2019)
Mechanical and Biomedical Engineeirng ABET Committee, (2019 – 2021)
Chair of the University of Tulsa's Provost's Task Force on Research and Scholarship, (2018 – 2019)
Member of the University of Tulsa Graduate Council, (2017 – present)

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

Christen CE, Gomez-Hernandez J, **Otanicar TP**, "Bimodal Particle Distributions with Increased Thermal Conductivity for Solid Particles as Heat Transfer Media and Storage Materials," *International Journal of Heat and Mass Transfer*, 184, 2022.

Alagumalai A, Qin C, Vimal KEK, Solomin E, Yang L, Zhang P, **Otanicar T**, Lasaeian A, Chamka AJ, Rashidi MM, Wongwises S, Ahn HS, Lei Z, Saboori T, Mahian O, "Conceptual analysis framework development to understand barriers of nanofluid commercialization," *Nano Energy*, 92, 2022.

Espejo Sanchez A, Goel N, **Otanicar T**, "Novel Hybrid Solar Nanophotonic Distillation Membrane with Photovoltaic Module for Co-production of Electricity and Water," *Applied Energy*, 305, 2022.

Goel N, Fong TML, Shingledecker JP, Russel A, Keller MW, Shirazi SA, **Otanicar TP**, "Effect of temperature on abrasion erosion in particle based concentrating solar powerplants," *Solar Energy*, 224, 2021.

Goel N, O'Hern H, Orosz M, **Otanicar T**, "Annual simulation of photovoltaic retrofits within existing parabolic trough concentrating solar powerplants," *Solar Energy,* 211, 2020.
Wingert R, O'Hern H, Orosz M, Harikumar P, Roberts K, **Otanicar T**, "Spectral beam splitting retrofit for hybrid PV/T using existing parabolic trough power plants for enhanced power output," *Solar Energy*, 202, 2020.

Otanicar TP, Wingert R, Orosz M, McPheeters C, "Concentrating Photovoltaic Retrofit for Existing Parabolic Trough Solar Collectors: Design, Experiments, and Levelized Cost of Electricity," *Applied Energy*, 265, 2020.

Goel N, Taylor RA, **Otanicar T**, "A review of nanofluid-based direct absorption solar collectors: Design considerations and experiments with hybrid PV/Thermal and direct steam generation collectors," *Renewable Energy*, 145, 2020.

Otanicar T, Patel J, Sarica E, "Mechanical milling of thermoresponsive poly(N-isopropylacrylamide) hydrogel for particle-oriented oil-water separation," *Journal of Applied Polymer Science*, 137, 2020.

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

Flexible Teaching for Student Success Boise State University Center for Teaching and Learning, (2020)

MAHMOOD MAMIVAND

EDUCATION

Degree	Discipline	Institution	Year
BS	Aerospace Engineering	Amirkabir University	2004
MS	Mechanical Engineering	Tarbiat Modares University	2007
PhD	Mechanical Engineering	Mississippi State University	2014

ACADEMIC EXPERIENCE

Boise State University – Mechanical and Biomedical Engineering, Assistant Professor. (2017-Present, FT)
University of Wisconsin-Madison – Materials Science, Postdoctoral Researcher. (2014-2017, FT)

NON-ACADEMIC EXPERIENCE

Nargan Engineers and Constructors – Mechanical Engineer, Fixed Equipment Designer. (2009-2011, FT).

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS:

Not Applicable

CURRENT MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS

American Society of Mechanical Engineers (ASME)
The Minerals, Metals & Materials Society (TMS)

HONORS and AWARDS:

Not Applicable

SERVICE ACTIVITIES

Grant reviewer, National Science Foundation, (2021)
Grant Reviewer, Department of Energy, (2019,2021)
Guest Editor, Journal of Metals, (2020 – 2021)
Symposium Co-Organizer for ASME-IMECE, (2018 – 2019)
Symposium Co-Organizer for TMS, (2017, 2020)
Mechanical and Biomedical Engineering Search Committee, (2019, 2021)

Mechanical and Biomedical Engineering Academic Dishonesty Committee, (2018 – present)
Mechanical and Biomedical Engineering Graduate Committee, (2017 – present)
Micron School of Materials Science and Engineering Interdisciplinary Graduate Program, (2017 – present)
Mechanical and Biomedical Engineering Solid Mechanics Curriculum Alignment Team, (2018 – present)
Mechanical and Biomedical Engineering Computational Curriculum Alignment Team, (2018 – present)

PRINCIPAL PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

E. Moshkelgosha, **M. Mamivand** (2021). *"*Three-dimensional phase field modeling of fracture in shape memory ceramics*," International Journal of Mechanical Sciences*.

A. Lupercio, E. Moshkelgosha, R. Winters, C. Doyle, **M. Mamivand**, A. Nelson, *B. Jaques (2021). *"*Ball-on-ring test validation for equibiaxial flexural strength testing of engineered ceramics*," International Journal of Ceramic Engineering & Science*.

E. Moshkelgosha, **M. Mamivand** (2021). *"*Concurrent modeling of martensitic transformation and crack growth in polycrystalline shape memory ceramics*," Engineering Fracture Mechanics*.

S. Cui, **M. Mamivand**, D. Morgan (2020). *"*Simulation of Cu precipitation in Fe-Cu dilute alloys with cluster mobility*," Materials & Design*.

E. Moshkelgosha, **M. Mamivand** (2020). *"*Phase Field Modeling of Crack Propagation in Shape Memory Ceramics–Application to Zirconia*," Computational Materials Science*.

M. Mamivand, P. Wells, H. Ke, S. Shu, GR Odette, D. Morgan (2019). *"*CuMnNiSi precipitate evolution in irradiated reactor pressure vessel steels: Integrated Cluster Dynamics and experiments*," Acta Materialia*.

M. Asle Zaeem, N. Zhang, **M. Mamivand** (2019). "A Review of Computational Modeling Techniques in Study and Design of Shape Memory Ceramics*," Computational Material Science*.

M. Mamivand, Y. Yang, J. Busby, D. Morgan (2017). *"*Integrated Modeling of Second Phase Precipitation in Cold-Worked 316 Stainless Steels under Irradiation*," Acta Materialia*.

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

Proposal Workshop, National Science Foundation, (2019)
Aligning Stakeholders and Structures to Enable Research Transformation (ASSERT), Boise State University, (2020)

ZHANGXIAN DENG

EDUCATION

Degree	Discipline	Institution	Year
B.E.	Mechatronics Engineering	Zhejiang University	2010
Ph.D.	Mechanical Engineering	The Ohio State University	2015

ACADEMIC EXPERIENCE

Boise State University – Mechanical and Biomedical Engineering, Assistant Professor. (2018-Present, FT)

The Ohio State University – Mechanical Engineering, Postdoctoral Researcher. (2015-2018, FT)

NON-ACADEMIC EXPERIENCE

Not Applicable

CERTIFICATIONS and PROFESSIONAL REGISTRATIONS

Not Applicable

CURRENT MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

Institute of Electrical and Electronics Engineers (IEEE)

HONORS and AWARDS

Not Applicable

SERVICE ACTIVITIES

Mentor, NSF Research Experience for Undergraduates (REU), (2019, 2021)
Mechanical and Biomedical Engineering Graduate Committee, (2018 – 2020)
Mechanical and Biomedical Engineering Student Affairs Committee, (2021 – present)

PRINCIPLE PUBLICATIONS AND PRESENTATIONS OF LAST FIVE YEARS

K. Fujimoto, J. Watkins, T. Phero, D. Litteken, K. Tsai, T. Bingham, K. Ranganatha, B. Johnson, **Z. Deng**, B. Jaques, and D. Estrada. "Aerosol jet printed capacitive strain gauge for soft structural materials." *Npj Flexible Electronics*. 32. 2020

Z. Deng, J. J. Scheidler, V. M. Asnani, and M. J. Dapino. "Shunted magnetostrictive devices in vibration control." *Smart Materials and Structures*. 29(10): 105007. 2020

L. Weng, G. Xie, B. Zhang, W. Huang, B. Wang, and **Z. Deng**. "Magnetostrictive tactile sensor array for force and stiffness detection." *Journal of Magnetism and Magnetic Materials*. 513: 167068. 2020

L. Shu, J. Yang, B. Li, **Z. Deng**, and M. J. Dapino. "Impact force sensing with magnetostrictive Fe-Ga alloys." *Mechanical Systems and Signal Processin.* 106418. 2019

Z. Deng, I. Nas, and M. J. Dapino. "Torque analysis in coaxial magnetic gears considering nonlinear magnetic properties and spatial harmonics." *IEEE Transactions on Magnetics*. 55(2): 8200511. 2019

Z. Deng and M. J. Dapino. "Review of magnetostrictive materials for structural vibration control." *Smart Materials and Structures*. 27(11):113001. 2018

Z. Deng, M. B. Gingerich, T. Han, and M. J. Dapino. "Yttria-Stabilized Zirconia-Aluminum matrix composites via ultrasonic additive manufacturing." *Composite B: Engineering*. 151:215-221. 2018

Z. Deng, Q. Zhang, and M. J. Dapino. "Dynamic model for magnetostrictive systems with applications to damper design." *IEEE/ASME Transactions on Mechatronics*. 23(4):1823-1831. 2018

Z. Deng and M. J. Dapino. "Review of magnetostrictive vibration energy harvesters." *Smart Materials and Structures*. 26(10): 103001. 2017.

Z. Deng*. "Dynamic discrete energy-averaged model for magnetostrictive materials." *Journal of Magnetism and Magnetic Materials*. 441: 757-763. 2017.

Z. Deng and M. J. Dapino. "Magnetic flux biasing of magnetostrictive sensors." *Smart Materials and Structures*. 26(5): 055027. 2017.

Z. Deng*. "Explicit and efficient discrete energy-averaged model for Terfenol-D." *Journal of Applied Physics*. 122(4): 043901. 2017.

R. L. Harne, **Z. Deng**, and M. J. Dapino. "Adaptive magnetoelastic metamaterials: a new class of magnetorheological elastomers." *Journal of Intelligent Material Systems and Structures.* 1045389X17721037. 2017.

MOST RECENT PROFESSIONAL DEVELOPMENT ACTIVITIES

Summer 2019 Course Design Institute 1.0, (2019)
Mobile Learning Summer Institute, (2019)

LEWIS-CLARK STATE COLLEGE

SUBJECT

Master of Nursing, Nursing Leadership in Healthcare

REFERNCE

December 2020	The Board approved LC State's first graduate certificate program in Nursing Management and Leadership.

APPLICABLE STATUTE, RULE, OR POLICY

Idaho Code § 33-3101

Idaho State Board of Education Governing Policies & Procedures, Section III.G and III.Z., Planning and Delivery of Postsecondary Programs and Courses

BACKGROUND/DISCUSSION

Lewis-Clark State College requests approval to offer a new Master of Science Nursing (MSN) degree in Nursing Leadership in Healthcare. This program will offer two tracks:

1) Bachelor of Science Nursing (BSN) – MSN track (30 credits)
2) Registered Nurse (RN) – MSN track (11-17 bridge credits + 30 graduate level credits)

The fully online MSN program, Nursing Leadership in Healthcare, challenges the BSN-prepared Registered Nurse to develop the evidenced-based knowledge and skills to become a transformative nurse leader effective across a diverse range of healthcare and academic environments. The graduate will develop expertise to practice at an advanced level in financial and human capital management and quality improvement and safety management. Graduates will be equipped with strategies for managing policy and other issues encountered in healthcare and educator leadership roles.

The American Organization for Nursing Leadership (AONL) core concepts are woven throughout the program. Graduates are eligible for the AONL's Certified Nurse Manager and Leader (CNML) examination.

The RN to MSN track is designed for the nurse with an associate degree in nursing who wishes to pursue advanced education upon completion of select bridge courses.

IMPACT

The proposed MSN degree is in response to the need expressed by local and regional industry partners for more nurse leaders and managers to support the health care workforce. Nursing (RN) is listed among the top occupations in

terms of job growth through 2026 (Idaho Department of Labor; US Bureau of Labor Statistics). The pandemic reinforced the need for hospitals and health care agencies to develop new care delivery models. As the care providers closest to patients, nurses are integral to these discussions. Graduate level coursework in leadership, management, and business processes provides a strong foundation for nurse leaders who contribute to these health system changes.

Existing infrastructure, such as the learning management system, are in place to facilitate the online program. There are sufficient faculty resources to initiate the graduate program. Reallocation of current faculty teaching assignments will occur to provide for new course instruction. The MSN program will have a very modest impact on LC State Library resources. Given LC State's online presence and Coeur d'Alene Outreach Center, there is well-established access to the library's holdings through online database and journal access, and through the inter-library loan programs with partner institutions.

The program will need to purchase several online journals and other web-based commercial reference management software packages. Annual cost is estimated at less than $5,000. It is anticipated that faculty teaching in the MSN program will be shared with the BSN program. Over time, a teaching load equivalent to two FTE may be needed for delivery of MSN curriculum. The program will also utilize adjuncts with necessary credentials and content knowledge. In FY22, the Governor authorized the addition of $400,000 in ongoing funds to LC for nursing programs. Funds will be used to support doctoral-prepared nursing faculty to teach in the master's and BSN programs. Funds may also be used to support travel to supervise students in their practicum experiences. Total financial impact is $52,595 - $122,143 over a four-year period.

The program is proposed as the first full graduate program offered by LC State. Board approval would allow LC State to offer a degree that was developed to meet healthcare industry needs.

ATTACHMENTS

Attachment 1 – Master of Nursing, Nursing Leadership in Healthcare Proposal

BOARD STAFF COMMENTS AND RECOMMENDATIONS

The proposed program will be LC State's first master's degree offering and is intended to fill a need for more nurse leaders and managers expressed by local and regional industry partners such as Kootenai Health and St. Joseph Regional Medical Center. These healthcare partners collaborated with LC State faculty to develop the curriculum. Beginning Fall 2024, the program will be offered fully online with one credit required as a face-to-face immersion course. The program will include a 500-hour practicum experience and will prepare graduates to complete American Organization for Nursing Leadership Certified Nurse Manager

and Leader examination. The RN to MSN track is designed for the nurse with an associate degree in nursing who wishes to pursue advanced education upon completion of select bridge courses. Graduates who have earned the graduate certificate in Nursing Management and Leadership will be able to seamlessly transition to the full degree.

LC State projects five initial enrollments in its first year, reaching 25 by year five and graduating 10 by year four. The program will require a minimum enrollment of 15 per cohort by year three to maintain sustainability. LC State is committed to offering the program for a minimum of five years to assess enrollment trends.

The proposed master's program is consistent with LC State's Service Region Program Responsibilities and their current institution plan for Delivery of Academic Programs in Region II. Currently, Idaho State University has statewide program responsibility to offer a Master of Science in Nursing and shares statewide program responsibility with Boise State University for Region III. LC State provides that there are no master's degrees focused on nursing leadership currently being offered by Idaho universities. The chart below represents the status of master's nursing program offerings.

Instit.	Program	CIP Code	Degree	Location	Responsibility	Method of Delivery
BSU	Nursing **(suspended)**	51.3801	MN/MSN	Boise	Regional	Online
BSU	Adult-Gerontology Nurse Practitioner – Acute Care option **(scheduled for discontinuation)**	53.3818	MN	Boise	Regional	Online
BSU	Adult-Gerontology Nurse Practitioner-Primary Care option **(scheduled for discontinuation)**	53.3818	MN	Boise	Regional	Online
ISU	Nursing: Education Option	51.3801	MS Option	Online	Regional	Online

The proposal completed the program review process and was presented to the Council on Academic Affairs and Programs on December 7, 2023; and to the Instruction, Research, and Student Affairs on February 15, 2024.

Board staff recommends approval.

BOARD ACTION

I move to approve the request by Lewis-Clark State College to offer a Master of Nursing, Nursing Leadership in Healthcare as presented in Attachment 1.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

Institutional Tracking No. _____

Idaho State Board of Education

FULL PROPOSAL FORM

Academic Degree and Certificate Program

Date of Proposal Submission:	August 25, 2023			
Institution Submitting Proposal:	Lewis-Clark State College			
Name of College, School, or Division:	Professional Studies/ Graduate School			
Name of Department(s) or Area(s):	Nursing & Health Sciences			
Official Name of the Program:	Master of Science in Nursing Leadership in Healthcare			
Implementation Date:	Fall 2024			
Degree Information:	Degree Level: Graduate	Degree Type: Master of Science in Nursing (MSN)		
CIP code (consult IR /Registrar):	51.3802			
Method of Delivery: Indicate percentage of face-to-face, hybrid, distance delivery, etc.	Online with 1 credit required face-to-face immersion			
Geographical Delivery:	Location(s)	Online	Region(s)	Online
Indicate (X) if the program is/has: (Consistent with Board Policy V.R.)	☐ Self-Support fee	☐ Professional Fee	☐ Online Program Fee	
Indicate (X) if the program is: (Consistent with Board Policy III.Z.)	☐ Regional Program Responsibility	☐ Statewide Program Responsibility		

Proposed Action

- [X] **New program offering**
  - [ ] Undergraduate program
  - [X] Graduate program
  - [ ] Undergraduate certificate (30 credits or more)
  - [ ] Graduate certificate (30 credits or more)
- [ ] **New branch campus or change in location**
- [ ] **Modification of Existing Academic Programs**
  - [ ] Converting one program option to a stand-alone program
  - [ ] Consolidating two or more undergraduate programs into one
  - [ ] Consolidating two or more graduate programs into one
  - [ ] Splitting an existing program into two or more programs
  - [ ] Program expansion outside an institution's Designated Service Region as defined in Board Policy III.Z.
  - [ ] Adding certificate or degrees to existing programs

Judith M Maddy II	08/25/2023		08/25/2023
College Dean	Date	Vice President for Research (as applicable)	Date
		Patty Sanchez	12/5/2023
Graduate Dean/other (as applicable)	Date	Academic Affairs Program Manager, OSBE	Date
Julie Crea	09/01/2023		12/06/2023
FVP/Chief Fiscal Officer	Date	Chief Financial Officer, OSBE	Date
	09/05/23	TJ Bliss	12/5/2023
Provost/VP for Instruction	Date	Chief Academic Officer, OSBE	Date

09/07/2023

President	Date	SBOE/Executive Director or Designee Approval	Date

Before completing this form, refer to Board Policy Section III.G., Postsecondary Program Approval and Discontinuance. This proposal form must be completed for the creation of each new program. All questions must be answered.

Rationale for Creation or Modification of the Program

1. **Describe the request and give an overview of the changes that will result.** What type of substantive change are you requesting? Will this program be related or tied to other programs on campus? Identify any existing program that this program will replace. If this is an Associate degree, please describe transferability.

   The proposed Master of Science in Nursing (MSN) program will be the first full master's degree at Lewis-Clark State College, and will join two existing graduate certificates (one is in Nursing Management & Leadership). The new MSN program will include comprehensive coursework in leadership, management, and business processes that provides a strong foundation for nurse leaders. The new MSN program, adhering to the American Association of Colleges of Nursing (AACN) Essentials document, will include a 500 hour practicum experience and will prepare graduates to complete a national certification examination. Graduates who have earned the graduate certificate in Nursing Management & Leadership will be able to seamlessly transition to the full degree.

2. **Need for the Program**. Describe evidence of the student, regional, and statewide needs that will be addressed by this proposal to include student clientele to be served and address the ways in which the proposed program will meet those needs.

   a. **Workforce and economic need:** Provide verification of state workforce needs that will be met by this program. Include job titles and cite the data source. Describe how the proposed program will stimulate the state economy by advancing the field, providing research results, etc.

      Nursing (RN) is listed among the top occupations in terms of job growth through 2026 (Idaho Department of Labor; US Bureau of Labor Statistics). According to the Bureau of Labor Statistics *Employment Projections* 2016-2026, Registered Nursing (RN) is listed among the top occupations in terms of job growth through 2026. The RN workforce is expected to grow from 2.9 million in 2016 to 3.4 million in 2026, an increase of 438,100 or 15%. Still, the Bureau projects an additional 203,700 new RNs are needed each year through 2026, to fill new positions and to replace retiring nurses. The pandemic reinforced the need for hospitals and health care agencies to develop new care delivery models, and as the care providers closest to patients, nurses are integral to these discussions. Graduate level coursework in leadership, management, and business processes provides a strong foundation for nurse leaders who contribute to these health system changes. Currently, there are no master's degrees focused on nursing leadership offered at Idaho public colleges/ universities. LC State proposes this degree as its first full graduate program to fulfill a need expressed by local and regional industry partners for more nurse leaders and managers. These healthcare partners collaborated with LC State faculty to develop the curriculum. An increasing need for nurses and nurse leaders, coupled with industry support, reinforces the program's future viability and sustainability.

      Lewis-Clark State College (LC State) began discussions about offering graduate degrees and certificates nearly a decade ago, with emphasis on degrees that build on our highly

regarded programs in the health sciences and related fields. Students, graduates, and regional industry partners have expressed interest in graduate level offerings. As one example, Kootenai Health, a large health system in northern Idaho, continues to have increased need for nurses to serve as leaders and managers within its organization. Another healthcare partner, St. Joseph Regional Medical Center has identified this same need.

As initial steps, the college developed both an undergraduate and a graduate certificate in Nursing Management and Leadership. While this is helpful in the short term, Kootenai Health System and other industry partners want and need nurses prepared with a full master's degree.

Further, over the past two years, the LC State's BSN program Advisory Board discussed the need for a leadership focused master's degree in nursing and expressed support for the college and division to move in this direction. At the most recent Advisory Board meeting (April 2023), the general degree plan, curriculum, and learning outcomes were presented. Members unanimously supported the college and division moving toward offering the graduate degree and pledged support in curricular development and clinical placement opportunities.

The 2022 Idaho Nursing Workforce Report conducted by the Idaho Nursing Workforce Center does not provide detail on nurses prepared at the master's level, beyond those in advanced practice or certified nurse practitioner roles. However, interesting aspects of the report that compel approval of this master's degree include:

- Among CNOs, most have been in their position for less than 2 years, and the situation is worse for those in the long-term care setting.
- One of the reasons nurses migrate out of Idaho is to pursue graduate education. RNs have also left Region II for the Treasure Valley, perhaps in pursuit of an advanced degree leading to progression on the career ladder.
- RN self-reported data reveal 9.87% of Idaho nurses with a non-APRN master's degree.
- Of nurses licensed in Idaho and holding a clinical nurse specialist certification, 92% were educated outside of Idaho.
- Data from 2019 indicates 18 graduates of Idaho non-NP master's programs; however, only two (2) graduated from an Idaho public institution. Data from 2020 and 2021 show 21 and 23 graduates, respectively, all from a private Idaho university. In 2022, 4 graduated from a public Idaho university and 26 from a private institution.
- Idaho Department of Labor reports that Idaho's population will continue to grow, requiring growth in the nursing sector. Additionally, healthcare systems are looking to change models of care delivery, requiring more master's level nurses to serve as agents of change.

b. Student demand. What is the most likely source of students who will be expected to enroll (full-time, part-time, outreach, etc.). Provide evidence of student demand/ interest from inside and outside of the institution.

LC State is a destination for transfer students from Idaho's community colleges, each of which has an associate degree program in nursing. To serve the needs of LC State BSN graduates, associate degree in nursing community college graduates, and industry partners, college administration approached the Idaho State Board of Education (SBOE) in 2018 with a request to support a change in Idaho statute to allow LC State to offer graduate-level education. In the 2020 session, a northern Idaho state representative introduced this

change, which was approved by both legislative chambers and the Governor, clearing the way for LC State to bring forward to the Idaho State Board of Education and the Northwest Commission on Colleges and Universities (NWCCU) requests for approval of master's level certificates and degrees. In addition to seeking legislative and Idaho State Board of Education approval, the addition of graduate programs at LC State has been discussed with all internal constituent groups (faculty, staff and students), and addressed at the institutional All-Campus and town hall-type events. Faculty Senate voted in December of 2020 to support forward movement of graduate level programming.

The student clientele to be served with this initial graduate program includes Registered Nurse (RN) employees of industry partners and LC State BSN graduates. As noted above, there is strong interest from health care partners for master's level education in the area of nursing management and leadership. This initial graduate program will address this need by offering a fully online curriculum, targeting the working nurse who wishes to advance up the career ladder. It is anticipated that, to gain advanced knowledge and to distinguish themselves to future employers, current Bachelor of Science in Nursing students will enroll in the graduate program immediately upon graduation. Additionally, the online RN to MSN option will provide an accelerated option for associate degree prepared nurses seeking a leadership position within their organization.

c. **Societal Need**: Describe additional societal benefits and cultural benefits of the program.
The AACN advocates for a well-educated nursing workforce to help assure quality patient care. Further, positive outcomes are 'linked to nurses prepared at the baccalaureate and graduate degree levels" (AACN, 2019, para. 1).

3. Program Prioritization

Is the proposed new program a result of program prioritization?

Yes_____ No XX

If yes, how does the proposed program fit within the recommended actions of the most recent program prioritization findings.

4. Credit for Prior Learning

Indicate from the various crosswalks where credit for prior learning will be available. If no PLA has been identified for this program, enter 'Not Applicable'.

Not applicable.

5. Affordability Opportunities

Describe any program-specific steps taken to maximize affordability, such as: textbook options (e.g., Open Educational Resources), online delivery methods, reduced fees, compressed course scheduling, etc. This question applies to certificates, undergraduate, graduate programs alike.

The online delivery mode and part-time/ full-time options, allow nurses across the state, region, and beyond, to access high quality education with limited travel costs and at a pace that allows for continued employment. Whenever possible, low-cost textbooks will be utilized, and many of the supplemental course materials are anticipated to be open-access. Some courses will be delivered in a compressed format, using the two 8-week blocks in each of fall and spring semester, and the 8-week block in summer session.

Enrollments and Graduates

6. **Existing similar programs at Idaho Public Institutions.** Using the chart below, provide enrollments and numbers of graduates for similar existing programs at your institution and other Idaho public institutions for the past four years.

Idaho State and Boise State universities offer master's and doctoral degrees in nursing. However, neither offers a master's in the nursing leadership and management areas as is proposed by LC State.

Instit	Program Name	Fall Headcount Enrollment in Program				Number of Graduates From Program (Summer, Fall, Spring)			
		FY__	FY__	FY__	FY__ (most recent)	FY__	FY__	FY__	FY__ (most recent)
N/A									

7. **Justification for Duplication** (if applicable). If the proposed program is similar to another program offered by an Idaho public higher education institution, provide a rationale as to why any resulting duplication is a net benefit to the state and its citizens. Describe why it is not feasible for existing programs at other institutions to fulfill the need for the proposed program.

Not applicable.

8. **Projections for proposed program:** Using the chart below, provide projected enrollments and number of graduates for the proposed program:

Proposed Program: Projected Enrollments and Graduates First Five Years											
Program Name: MSN Nursing Leadership in Healthcare											
Projected Fall Term Headcount Enrollment in Program						**Projected Annual Number of Graduates From Program**					
FY25 (first year)	FY26	FY27	FY28	FY29		FY25 (first year)	FY26	FY27	FY28	FY29	
5	10	15	20	25		0	0	5	10	15	

9. **Describe the methodology for determining enrollment and graduation projections.** Refer to information provided in Question #2 "Need for the Program" above. What is the capacity for the program? Describe your recruitment efforts? How did you determine the projected numbers above?

   Through inquiry and informal survey of current nursing program graduates and employer partners. Discussion with BSN program Advisory Board members to determine conservative projected program enrollments.

10. **Minimum Enrollments and Graduates.**
    a. What are the minimums that the program will need to meet in order to be continued, and what is the logical basis for those minimums?

       Based on projection of 2 FTE to support graduate program instruction, anticipate minimum enrollment of 15 per cohort by year 3.

    b. If those minimums are not met, what is the sunset clause by which the program will be considered for discontinuance?

       Administration is committed to offering the program for a minimum of 5 years to assess enrollment trends and opportunities.

11. **Assurance of Quality.** Describe how the institution will ensure the quality of the program. Describe the institutional process of program review. Where appropriate, describe applicable specialized accreditation and explain why you do or do not plan to seek accreditation.

    LC State has a well-established program assessment process that occurs every 3 years, on a rotating basis. The Nursing & Health Sciences Division conducts an assessment and develops a Unit Action Report (UAR) annually. The assessment process begins with program faculty creating program learning outcomes and setting benchmarks for each. Programs gather relevant data, compare data to established benchmarks, and analyze the overall results. The results inform changes to learning outcomes, benchmarks, and measurement tools. Findings also serve as the basis for the work plan, which specific programmatic changes resulting from data analysis. Throughout the next year, programs implement work plan actions. Upon approval, specific benchmarks and direct / indirect measurement tools for each program learning outcome will be established.

    Additional metrics such as completion and placement rates and employer satisfaction, will provide important data on the quality of graduates and the usefulness of the program in assisting nurses to advance on the career ladder. Graduate satisfaction will be assessed through an end of program survey and in an exit interview. Graduates will be prepared to take a national certification exam. Exam pass rates will provide insight into program effectiveness. To close the feedback loop, data will be reviewed and used, at least annually, to refine or modify course outcomes/ expectations, assignments, content of courses, and internship experiences.

    The existing BSN program is fully accredited by the Commission on College Nursing Education (CCNE), and we will seek accreditation for this proposed MSN program following one year of program delivery.

12. **In accordance with Board Policy III.G., an external peer review is required for any new doctoral program.** Attach the peer review report as **Appendix A**.

    Not applicable.

13. Teacher Education/Certification Programs All Educator Preparation programs that lead to certification require review and recommendation from the Professional Standards Commission (PSC) and approval from the State Board of Education.

Will this program lead to certification?

Yes_____ No_____

If yes, on what date was the Program Approval for Certification Request submitted to the Professional Standards Commission?

14. Three-Year Plan: If this is a new proposed program, is it on your institution's approved 3-year plan?

Yes **X** No _____

If yes, proceed to question 15. If no:

a. Which of the following statements address the reason for adding this program outside of the regular three-year planning process.

Indicate (X) by each applicable statement:

	Program is important for meeting your institution's regional or statewide program responsibilities.
	The program is in response to a specific industry need or workforce opportunity.
	The program is reliant on external funding (grants, donations) with a deadline for acceptance of funding.
	There is a contractual obligation or partnership opportunity related to this program.
	The program is in response to accreditation requirements or recommendations.
	The program is in response to recent changes to teacher certification/endorsement requirements.

b. Provide an explanation for all statements you selected.

Educational Offerings: Curriculum, Intended Learning Outcomes, and Assessment Plan

15. Curriculum. Provide descriptive information of the educational offering.

a. Summary of requirements. Provide a summary of program requirements using the following table.

Credit hours in required courses offered by the department (s) offering the program.	30 credits
Credit hours in required courses offered by other departments:	0 credits
Credit hours in institutional general education curriculum	0 credits
Credit hours in free electives	0 credits
Total credit hours required for degree program:	30 credits

b. Curriculum. Provide the curriculum for the program, including credits to completion, courses by title and assigned academic credit granted.

Program description:

The fully online MSN program in Nursing Leadership in Healthcare challenges the BSN-prepared registered nurse to develop the evidenced-based knowledge and skills to become a transformative nurse leader, effective across a diverse range of healthcare and academic environments. The graduate will develop expertise to practice at an advanced level in the areas of financial and human capital management and quality improvement and safety management. Graduates will be equipped with strategies for managing policy and other issues encountered in healthcare and educator leadership roles. The American Organization for Nursing Leadership (AONL) core concepts are woven throughout the program. Graduates will be prepared for the AONL's Certified Nurse Manager and Leader (CNML) examination. The RN to MSN track is designed for the nurse with an associate degree in nursing who wishes to pursue advanced education upon completion of select bridge courses.

Required coursework:

NU 507 Leadership in Healthcare Immersion (1 credit)
BUS 512 Human Resource Management in Healthcare (3 credits)
BUS 560 Leadership (3 credits)
NU 533 Health Information and Patient Care Technologies (3 credits)
NU 547 Evidence-Based Practice for Nursing Leadership (3 credits)
NU 568 Quality Improvement & Safety Management (3 credits)
NU 569 Principles of Business and Finance in Healthcare (3 credits)
NU 580 Population Health in a Global Society (3 credits)
NU 594 Nursing Leadership in Healthcare Practicum (minimum 8 credits)

c. Additional requirements. Describe additional requirements such as comprehensive examination, senior thesis or other capstone experience, practicum, or internship, some of which may carry credit hours included in the list above.

The program includes a one (1) credit face-to-face immersion course which introduces students to the college, the division, support services (student support, library, etc.), and required program components. It includes 20 lab hours focused on development of a plan for the culminating practicum. A total of eight (8) credits (480 hours in final practicum; 20 in immersion course) of practicum work is a required component of the MSN program.

16. Learning Outcomes: Expected Student Learning Outcomes and Connection to Curriculum.

a. Intended Learning Outcomes. List the Intended Learning Outcomes for the proposed program, using learner-centered statements that indicate what students will know, understand, and be able to do, and value or appreciate as a result of completing the program.

Upon completion of the Nursing Leadership in Healthcare MSN program, the graduate will:

1. Demonstrate administrative and/or practice leadership in a population health context.
2. Synthesize and disseminate evidence-based administrative and/ or practice leadership knowledge to improve health outcomes.
3. Be prepared to serve in leadership roles in clinical nursing, nursing education, or management.
4. Articulate methods, tools, performance measures, and standards related to quality, as well as apply quality and safety principles within an organization.

5. Collaborate across disciplines and with patients, families, and care teams to improve patient outcomes and enhance the healthcare experience.
6. Apply leadership communication skills, including health information management to lead and manage a team within a complex healthcare environment at individual and aggregate levels.
7. Demonstrate professionalism in all program activities reflective of nursing's value, and an attitude of personal growth and commitment to career-long learning.
8. Be prepared to successfully complete the American Organization for Nursing Leadership's Certified Nurse Manager and Leader or similar examination.

17. Assessment plans.

a. Assessment Process. Describe the assessment plan for student learning outcomes that will be used to evaluate student achievement and how the results will be used to improve the program.

LC State has a well-established program assessment process that occurs every 3 years, on a rotating basis. The Nursing & Health Sciences Division conducts an assessment and develops a Unit Action Report (UAR) annually. The assessment process begins with program faculty creating program learning outcomes and setting benchmarks for each. Programs gather relevant data, compare data to established benchmarks, and analyze the overall results. The results inform changes to learning outcomes, benchmarks, and measurement tools. Findings also serve as the basis for the work plan, which specific programmatic changes resulting from data analysis. Throughout the next year, programs implement work plan actions. Upon approval, specific benchmarks and direct / indirect measurement tools for each program learning outcome will be established.

Additional metrics such as completion and placement rates and employer satisfaction, will provide important data on the quality of graduates and the usefulness of the program in assisting nurses to advance on the career ladder. Graduate satisfaction will be assessed through an end of program survey and in an exit interview. Graduates will be prepared to take a national certification exam. Exam pass rates will provide insight into program effectiveness. To close the feedback loop, data will be reviewed and used, at least annually, to refine or modify course outcomes/ expectations, assignments, content of courses, and internship experiences.

Resources Required for Implementation – fiscal impact and budget.

Organizational arrangements required within the institution to accommodate the change including administrative, staff, and faculty hires, facilities, student services, library; etc.

18. Physical Facilities and Equipment: Describe the provision for physical facilities and equipment.

a. Existing resources. Describe equipment, space, laboratory instruments, computer(s), or other physical equipment presently available to support the successful implementation of the program.

Due to the online nature of the program, existing infrastructure, such as the learning management system, is in place.

b. Impact of new program. What will be the impact on existing programs of increased use of physical resources by the proposed program? How will the increased use be accommodated?

Not applicable.

c. Needed resources. List equipment, space, laboratory instruments, etc., that must be obtained to support the proposed program. Enter the costs of those physical resources into the budget sheet.

Not applicable.

19. Library and Information Resources: Describe adequacy and availability of library and information resources.

a. Existing resources and impact of new program. Evaluate library resources, including personnel and space. Are they adequate for the operation of the present program? Will there be an impact on existing programs of increased library usage caused by the proposed program? For off-campus programs, clearly indicate how the library resources are to be provided.

There are sufficient personnel in place to support addition of this program. The MSN program will have a very modest impact on LC State Library resources. Given LC State's online presence and Coeur 'd'Alene Outreach Center, there is well established access to the Library's holdings through online database and journal access, and through the inter-library loan program in place with partner institutions.

b. Needed resources. What new library resources will be required to ensure successful implementation of the program? Enter the costs of those library resources into the budget sheet.

A modest increase in Library resources is required to support the MSN program. Additional resources include purchase of several online journals, and potentially a web-based commercial reference management software package. The annual cost of these resources is anticipated to be less than $5,000.

20. Faculty/Personnel resources

a. Needed resources. Give an overview of the personnel resources that will be needed to implement the program. How many additional sections of existing courses will be needed? Referring to the list of new courses to be created, what instructional capacity will be needed to offer the necessary number of sections?

It is anticipated that faculty teaching in the MSN program will be shared with the BSN program, based on nursing specialty. Therefore, as many as 5-6 faculty members could carry a combined MSN / BSN teaching assignment. There is sufficient faculty resource to initiate the graduate program. Reallocation of current faculty teaching assignment will occur to provide for new course instruction. Over time, assuming full program capacity with multiple ongoing cohorts, it is anticipated that a teaching load equivalent to two (2) FTE may be needed for delivery of the MSN curriculum. In addition to reallocation of current faculty teaching assignment, adjunct instructors with necessary credentials and specialty content knowledge will be utilized.

b. Existing resources. Describe the existing instructional, support, and administrative resources that can be brought to bear to support the successful implementation of the program.

From a resource perspective, in FY22, Governor Little authorized the addition of $400,000 in ongoing funds to LC State nursing program budgets. These funds supported structural expansion of the BSN nursing simulation laboratories during the pandemic. Additionally, the funds are being used to support nursing faculty prepared at the doctoral level to teach in the master's and BSN programs. Funds may also be used to support faculty travel to supervise students in their practicum experiences.

c. Impact on existing programs. What will be the impact on existing programs of increased use of existing personnel resources by the proposed program? How will quality and productivity of existing programs be maintained?

As noted above, it is anticipated that MSN faculty will also teach in the BSN program. This model keeps nurse educators working within their area of specialization, and makes the transition for students from the BSN to the MSN program more seamless.

d. Needed resources. List the new personnel that must be hired to support the proposed program. Enter the costs of those personnel resources into the budget sheet.

Not applicable at this time.

21. Revenue Sources

a) **Reallocation of funds:** If funding is to come from the reallocation of existing state appropriated funds, please indicate the sources of the reallocation. What impact will the reallocation of funds in support of the program have on other programs?

With initial implementation of the program, it is anticipated that doctoral-prepared faculty currently teaching in the BSN program will teach some of the graduate courses. Additionally, qualified adjunct instructors will be utilized for specialized course content instruction. Initial implementation of the program will result in minimal impact on the existing nursing program.

b) **New appropriation**. If an above Maintenance of Current Operations (MCO) appropriation is required to fund the program, indicate when the institution plans to include the program in the legislative budget request.

Not applicable.

c) **Non-ongoing sources**:

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

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

Not applicable.

d) **Student Fees**:

i. If the proposed program is intended to levy any institutional local fees, explain how doing so meets the requirements of Board Policy V.R., 3.b.

Graduate program application fee = $50

ii. Provide estimated cost to students and total revenue for self-support programs and for professional fees and other fees anticipated to be requested under Board Policy V.R., if applicable.

Graduate tuition at LC State is $496 per credit (AY 2023-2024).
30 cr x $496 = $14,880.

22. Using the excel **budget template** provided by the Office of the State Board of Education, provide the following information:

- Indicate all resources needed including the planned FTE enrollment, projected revenues, and estimated expenditures for the first **four** fiscal years of the program.
- Include reallocation of existing personnel and resources and anticipated or requested new resources.
- Second and third year estimates should be in constant dollars.
- Amounts should reconcile subsequent pages where budget explanations are provided.
- If the program is contract related, explain the fiscal sources and the year-to-year commitment from the contracting agency(ies) or party(ies).
- Provide an explanation of the fiscal impact of any proposed discontinuance to include impacts to faculty (i.e., salary savings, re-assignments).

Program Resource Requirements.

- Indicate all resources needed including the planned FTE enrollment, projected revenues, and estimated expenditures for the first **four** fiscal years of
- Include reallocation of existing personnel and resources and anticipated or requested new resources.
- Second and third year estimates should be in constant dollars.
- Amounts should reconcile subsequent pages where budget explanations are provided.
- If the program is contract related, explain the fiscal sources and the year-to-year commitment from the contracting agency(ies) or party(ies).
- Provide an explanation of the fiscal impact of any proposed discontinuance to include impacts to faculty (i.e., salary savings, re-assignments).

I. PLANNED STUDENT ENROLLMENT

	FY 25		FY 26		FY 27		FY 28	
	FTE	Headcount	FTE	Headcount	FTE	Headcount	FTE	Headcount
A. New enrollments		5		10		10		15
B. Shifting enrollments	0	0		5		15		20
Total Enrollment	0	5	0	15	0	25	0	35

II. REVENUE

	FY 25		FY 26		FY 27		FY 28	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
1. New Appropriated Funding Request	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2. Institution Funds	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
3. Federal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
4. New Tuition Revenues from Increased Enrollments	$28,908.75		$86,726.25		$124,530.00		$162,333.75	
5. Student Fees	$3,331.25		$9,993.75		$14,350.00		$18,706.25	
6. Other (i.e., Gifts)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Revenue	$32,240	$0	$96,720	$0	$138,880	$0	$181,040	$0

Ongoing is defined as ongoing operating budget for the program which will become part of the base.
One-time is defined as one-time funding in a fiscal year and not part of the base.

III. EXPENDITURES

	FY 25		FY 26		FY 27		FY 28	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
A. Personnel Costs								
1. FTE	0.3		0.3		0.5		0.5	
2. Faculty	$25,000.00		$25,000.00		$37,500.00		$37,500.00	
3. Adjunct Faculty	17,500		57,000		72,000		72,000	
4. Graduate/Undergrad Assistants								
5. Research Personnel								
6. Directors/Administrators								
7. Administrative Support Personnel								
8. Fringe Benefits	5,095		5,095		7,643		7,643	
9. Other:								
Total Personnel and Costs	$47,595	$0	$87,095	$0	$117,143	$0	$117,143	$0

	FY		FY		FY		FY	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
B. Operating Expenditures								
1. Travel								
2. Professional Services								
3. Other Services								
4. Communications								
5. Materials and Supplies								
6. Rentals								
7. Materials & Goods for Manufacture & Resale								
8. Miscellaneous								
Total Operating Expenditures	$0	$0	$0	$0	$0	$0	$0	$0

	FY 25		FY 26		FY 27		FY 28	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
C. Capital Outlay								
1. Library Resources	$5,000.00		5,000		$5,000.00		$5,000.00	
2. Equipment								
Total Capital Outlay	$5,000	$0	$5,000	$0	$5,000	$0	$5,000	$0

	FY		FY		FY		FY	
	On-going	One-time	On-going	One-time	On-going	One-time	On-going	One-time
D. Capital Facilities Construction or Major Renovation								
E. Other Costs								
Utilites								
Maintenance & Repairs								
Other								
Total Other Costs	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL EXPENDITURES:	$52,595	$0	$92,095	$0	$122,143	$0	$122,143	$0
Net Income (Deficit)	-$20,355	$0	$4,625	$0	$16,737	$0	$58,897	$0

Budget Notes (specify row and add explanation where needed; e.g., "I.A.,B. FTE is calculated using…"):

I.A.B.	
III.A.1.	.3 FTE - current faculty to be reassigned - not new faculty line; same faculty assignment to be increased to .5 FTE year 3