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General Information

Give a brief (1-2 paragraphs) overview of the proposed credential, including its disciplinary foundations and connections, its focus and learning objectives for students, and the specific degree (e.g. bachelors, masters, doctorate) and/or credentials (e.g. major, certificate, minor, concentrations) to be offered. This should be based largely on your descriptions in the following sections, but it should be shorter than their combined length. Moreover, it should use language that is capable of communicating your ideas to audiences increasingly distant from your academic field as your proposal moves through the review process.

This proposal seeks to establish a single (dual-branded) joint graduate program in bioengineering between Oregon State University and the University of Oregon. This proposal seeks to extend OSU's existing degree program to include the UO as a full partner. The joint graduate program will afford many benefits relative to establishing independent programs on each campus. These benefits include:

1. Enhancing student education by tapping broader and deeper faculty expertise in the collaborative development and delivery of educational content,
2. Advancing education and accelerating research progress by sharing complementary educational and research facilities,
3. Improving student employment opportunities through a broader network of external relationships,
4. Building enhanced research collaborations between the two campuses that result from frequent, substantive faculty and student interactions, and
5. Elevating the joint program's national brand, rankings and recruiting success by tapping a larger critical mass of faculty mentors and expertise.

Brief description of the existing and anticipated programs

OSU established a new graduate program in Bioengineering in June of 2016 after undergoing a full curricular approval of the proposed new program including the HECC, and with an external review in February of 2016. The first cohort of students was recruited into the program for matriculation in fall 2017. The graduate program currently has over 40 participating faculty, mostly from the College of Engineering, but also from the Colleges of Science, Pharmacy, Public Health and Human Sciences, and Veterinary Medicine. These faculty provide students with the resources and expertise to conduct advanced studies in core areas that include biomaterials, biomedical devices and instrumentation, human performance engineering, medical imaging, and systems and computational biology.

Recently the UO established the Knight Campus for Accelerating Scientific Impact. To date, five new faculty have been hired with research interests that align with bioengineering, and 20 faculty with interest in this area from disciplines such as Biology, Chemistry, Physics, and Molecular Biology have been recruited as Associate Members of the campus. There are plans to hire at least 10 more Knight Campus faculty members in the next few years. Core areas in bioengineering will include regenerative medicine, biomechanics, neuroengineering, biosensors, biomaterials complemented by new innovation and entrepreneurship programs and training.

We propose to expand the existing OSU Bioengineering graduate program to give students at both campuses access to faculty, coursework, and resources at both OSU and UO. Although OSU will retain the MEng degree, the initial focus for the UO campus will be the PhD degree, and students will be expected to commit to this program of study when selecting a UO research advisor. An MS degree will be available in passing to UO students who complete the relevant requirements during their tenure. The UO will not participate in the MEng component of the graduate program.

The result of this proposal will be a single (dual-branded) joint OSU/UO Bioengineering graduate program. The universities will recruit the students jointly, share in the training of each cohort through a common curriculum, and provide cutting-edge graduate thesis research opportunities at both campuses. The value

proposition of this expansion into a joint Bioengineering graduate program is bringing to bear the strengths and complementary core areas of the two institutions. By blending OSU's existing strengths in engineering and bioprocesses with the Knight Campus focus on impact, innovation, and entrepreneurship, a unique and unrivaled research and training experience will be created for students.

On the national landscape, several highly ranked programs utilize a similar approach to combining outstanding faculty and resources to enhance research and graduate training impact in this still evolving discipline. Exemplars include the Georgia Tech & Emory University joint PhD Program in Biomedical Engineering, the University of North Carolina at Chapel Hill and North Carolina State University Joint Graduate Program in Bioengineering, and the UCSF-UC Berkeley Joint PhD Program in Bioengineering. Each of these programs demonstrate multiple synergies that occur via strategic partnerships, particularly when institutions with different, but complementary, foci combine.

The proposed OSU/UO Bioengineering graduate program will mirror several best practices already implemented across existing joint programs. All students will have complete access to courses, research opportunities, libraries, and other facilities at both OSU and UO. Students will be able to pursue research opportunities, including research lab rotations and interinstitutional research collaborations, with faculty at both campuses, and, upon selecting a permanent lab, assemble a thesis committee with appropriate faculty from both campuses.

In order to ensure student success and effectively administer the program, students will select a "Home Campus" as they matriculate into the program, based on the expected alignment of their research interests. The Home Campus will serve as their administrative home and manage all aspects of the student experience that must be tied to a location (e.g., tuition and fees, health services, other student services and transcripting). All students will have the opportunity, if needed, to change their home campus upon selection of their primary research advisor, typically during or at the end of the first academic year. In the unusual situation that a student needs to change home campus later in their graduate studies, they may request a change through a petition to the Chair of the program's executive committee, or a person(s) designated by the executive committee to review such petitions. Once a student has advanced to candidacy, a change of home campus petition will only be reviewed for extenuating circumstances outside the student's control. An MOU detailing the partnership agreement between OSU and UO, including the above-mentioned interinstitutional access of courses and facilities for students on both campuses, is currently being finalized.

The proposed joint program will provide a state-of-the-art training and research environment that prepares graduates to excel in research and development roles in private, government and academic sectors through a combination of technical, innovation, entrepreneurial and professional training. Students will be able to draw on the combined strengths of the two institutions to tackle the complex, interdisciplinary research challenges in bioengineering and accelerate their progress toward successful careers. Further, participation in a joint program will provide students with real-world experience in multi-site collaboration that will be a hallmark of both academic and private sector research for decades to come. Training in innovation, entrepreneurship, communication and teamwork, threaded throughout the students' coursework and research experience, will attract outstanding students to the program.

Primary Proposer: Jim Hutchison

Is there a co-proposer for this proposal?

Name	Home Unit
Nathan Jacobs	Knight Campus
Robert Guldberg	Knight Campus

Home department: Bioengineering

College: Knight Campus

Additional Department Affiliations: No

Level: Graduate

Program Type: Degree

Degree Type: Doctorate of Philosophy (Ph.D.) and Master of Science (M.S.) in passing

Primary Location: OSU – Corvallis main campus, UO – Eugene main campus

Additional Location(s):

Program Delivery Format: Traditional classroom/lab

Does the program represent a collaboration of two or more university academic units? No

Proposed Identification

Full Title: OSU/UO graduate program in bioengineering

What's your desired effective date? 2020-2021

Relationship to Institutional Mission and Statewide Goals

How is the program connected with the UO's mission, signature strengths and strategic priorities?

The proposed joint OSU/UO graduate program in bioengineering will support the mission and goals of UO and OSU through education, research and service by providing graduates with interdisciplinary training in bioengineering. The joint program will support a number of aspects of the strategic plans of both institutions, including creation of new and transformative courses and programs enabled by a unique partnership of regional research institutions that can serve as a model for future expansion of both this program and others in the future.

How will the proposal contribute to meeting UO and statewide goals for student access and diversity, quality learning, research, knowledge creation and innovation, and economic and cultural support of Oregon and its communities?

Equity and inclusion are core components of the Knight Campus Strategic Plan. The graduate bioengineering program will embrace a culture of inclusivity to harness the power of diverse ideas and people. Specific efforts to accomplish this will include targeted recruitment and retention efforts, accessible physical space design, and supportive policies and procedures. The program will actively recruit from underrepresented communities; pursue partnerships with Minority, Women, and Small Business Enterprises; and work with our Inclusion, Diversity and Outreach faculty committee to continuously assess and recommend ways to further improve our diversity initiatives. The program will also partner with the Knight Campus Internship Program (KCIP) to recruit diverse student cohorts. In 2019, KCIP's entering cohort of 90 students included over 50% women and underrepresented minorities.

The bioengineering program has been developed within the framework of the Knight Campus goal to transform student education through discovery-driven learning. This focus is woven throughout the core curriculum, in which students will engage in real-world design and research problems in the life sciences and explore ethical implications of bioengineering practices and decisions.

How will the proposal meet regional or statewide needs and enhance the state's capacity to:
- **improve educational attainment in the region;**
- **respond effectively to social, economic and environmental challenges and opportunities; and**
- **address civic and cultural demands of citizenship?**

The Oregon Bioscience Association recently released a report highlighting the importance of the Bioscience Industry to the Oregon economy. Oregon has over 800 life science companies that, together with academic and research institutions, employ over 19,000 workers that earn nearly $2 billion in wages, directly contributing over $6 billion to Oregon's economy in 2017. Furthermore, these jobs are high paying and diverse. The average annual wage of $70,451 was well over Oregon's average of $50,483 and women and minorities accounted for 47% and 22% of employment, respectively.

The bioscience industry has grown steadily from 2002 to 2017, adding 4,800 jobs, an increase of 77%.[1] The joint OSU/UO graduate program in bioengineering will create highly trained graduates that these companies will need to sustain the growth of the bioscience industry in Oregon. In addition to job creation, the industry was responsible for bringing nearly $289 million in NIH funding to Oregon institutions in 2015 alone.

The proposed program will create an organizational infrastructure to facilitate development of a community of students and faculty across bioengineering and other life sciences units on the OSU and UO campuses. It will be complementary to existing graduate programs focusing on health sciences, molecular/cellular biology, chemistry, human physiology, pharmacy and other bioscience-based fields, and is expected to synergistically

[1] See: https://www.oregonbio.org/wp-content/uploads/2019/07/Oregon-Bio-Final-FULL-Report-2019-1.pdf

bolster these programs through enhanced interdisciplinary collaboration. In addition, we expect that creation of the joint OSU/UO graduate program in bioengineering will lead to growth of bioscience-based industries in Oregon through development of new technologies and strengthening of the bioengineering workforce.

Program Description

Is there a core set of required courses? Yes

What is the core set of required courses and what is the rationale for giving these courses this prominent role? What are the central concepts and/or skills you expect students to take from the core?

All bioengineering graduate students (regardless of MS, PhD) are required to take the following courses:

BIOE 511 (OSU) or	**Cellular and Molecular Bioengineering** (3 credits)
BIOE 611 (UO)	Biomedical applications and engineering approaches to study and manipulate cells.
BIOE 512 (OSU) or	**Modeling of Physiological Systems** (4 credits)
BIOE 612 (UO)	Integration of engineering principles and human physiology in the following areas: mechanics of the musculoskeletal system; transport phenomena in the pulmonary, cardiovascular, renal and gastrointestinal systems; bioelectricity in the nervous system.
BIOE 513 (OSU) or	**Drug and Medical Device Regulation in Technology Development** (2 Credits)
BIOE 613 (UO)	Advanced study of regulation of pharmaceutical products and medical devices by the Food and Drug Administration, including requirements for drug and device approval, current good manufacturing practices, current good laboratory practices, quality control and assurance, and compliance.
BIOE 614 (UO)	**Innovation and Entrepreneurship** (3 credits) Introduces and develops the vocabulary, technical knowledge and leadership skills necessary to successfully translate research discoveries into successful ventures. Students will identify challenges and trends that signal promising opportunities. They will practice market research skills, including the collection and analysis of primary and secondary market data. They will learn and apply the fundamentals of competitive strategy, including intellectual property protection. They will develop business and financial models, including exploration of different sources of funding.
BIOE 507 (OSU)	**Bioengineering Seminar** (1 credit) Current topics in bioengineering research, including ethics and issues related to commercialization of biomedical technologies.
BIOE 617 (UO)	**Bioengineering Seminar** (1 credit) Current topics in bioengineering research, including ethics and issues related to commercialization of biomedical technologies.
CBEE 507 (OSU)	**Seminar: Professional Development** (1 credit)
or BIOE 618 (UO)	

What is the relationship between upper-division courses and the lower-division curriculum? For example, are fundamental principles introduced in the lower division and then applied to increasingly complex problems at the upper-division? This vertical architecture is common in the sciences but is by no means universal. In the humanities, a more horizontal structure is often appropriate. For example, students might

read and analyze literature at each level (100-400) but do so with increasing sophistication and the capacity to draw on a widening array of literary forms and ideas.

Not Applicable

Are there specific course-to-course prerequisites that help students extend or link ideas or are the intellectual connections among courses in your major more general?

There are no specific course-to-course prerequisites in the core set of courses for the graduate bioengineering program.

Are there tracks or concentrations within the credential? If so, do these start from a common core or are they differentiated from the beginning?

Although students are likely to tailor their curricular focus around their thesis/dissertation research, no official tracks or concentrations will be offered at this time.

Course of Study

Describe the course of study – proposed curriculum, including course numbers, titles, and credit hours.

Ph.D. students must complete a total of 108 graduate credits, including 36 credits of dissertation (BIOE 603) and at least 27 additional credits of non-generic courses.

M.S. students must complete a total of 45 graduate credits, including 12 thesis credits (BIOE 503), and at least 27 additional credits of non-generic courses.

Note: Generic courses are courses that can be repeated for credit, and typically have a zero as the second number, e.g., BIOE 507. Thesis and dissertation credits (BIOE 503 and BIOE 603) do not count as generic credits. For all BIOE graduate degrees, at least half of the non-generic courses must be graduate stand-alone courses. The remaining courses can be the 500 component of 400/500 slash courses.

RECOMMENDED PREREQUISITE COURSEWORK
Students with an undergraduate degree in a non-engineering discipline are strongly encouraged to take the following courses prior to enrolling in the BIOE core:

- Math through Differential Equations
- One year of Physics

REQUIRED COURSEWORK (BIOE Core)

All bioengineering graduate students (regardless of MS, PhD) are required to take the following courses:

BIOE 511 (OSU) or 611 (UO)	Cellular and Molecular Bioengineering	3 credits
BIOE 512 (OSU) or 612 (UO)	Modeling of Physiological Systems	4 credits
BIOE 513 (OSU) or 613 (UO)	Drug and Medical Device Regulation in Technology Development	3 credits
BIOE 614 (UO)	Innovation and Entrepreneurship	3 credits

Students must also take at least one quarter of research seminar at each campus.

BIOE 507 (OSU) (1)	Seminar: Bioengineering Research
BIOE 617 (UO) (1)	Seminar: Bioengineering Research

Students must take one quarter of professional development seminar at their home campus. This course will provide an orientation to successfully complete their graduate studies.

CBEE 507 (OSU)	Seminar: Professional Development	1 credit
BIOE 618 (UO)	Seminar: Professional Development	1 credit

A typical incoming student would enroll in the following courses in their first fall quarter (total of 12 credits): BIOE 511 or 611 (3 credits), BIOE 512 or 612 (4 credits), BIOE 614 Innovation and Entrepreneurship (3 credits), CBEE 507 or BIOE 618 Seminar: Professional Development (1 credit), BIOE 507 Seminar: Research - OSU (1 credit) and BIOE 617 Seminar: Research - UO (1 credit).

ELECTIVE COURSE SELECTION

Elective courses may be taken at either UO or OSU. Elective courses can be chosen from any graduate course offered at either campus, provided bioengineering students meet prerequisite and any additional requirements listed by outside units. Courses from non-BIOE units must be selected in consultation with the student's faculty advisor. Consideration should be given to the student's research area, background, and achieving a balance between breadth and depth. Typically, students choose a range of courses in each of the following categories: bioengineering, biomedical sciences, mathematics and statistics, and engineering fundamentals. Some representative courses in each of these categories are provided below. This list is non-exhaustive and is provided solely to represent the types of courses available to bioengineering graduate students at UO and OSU and does not include all possible elective courses.

Bioengineering:

Course Number	Course Title	Credits
UO Campus		
BIOE 631	Advanced Biomaterials	4
BIOE 632	Biomedical Imaging and Photonics	4
BIOE 670	Biosensors	4
HPHY 513	Muscle Structure, Function, and Plasticity	4
HPHY 534	Movement Disorders	4
HPHY 684	Kinematics of Human Movement	4
OSU Campus		
BIOE 540	Bioconjugation	3
BIOE 545	Surface analysis	3
BIOE 557	Bioreactors	3
BIOE 562	Bioseparations	3
ECE 599	Bioelectronic Systems and Devices 3	3
CS 546	Networks in Computational Biology	3
CS 519	Algorithms for Computational Molecular Biology	3
CS 584	Human Factors Programming Languages	4
IE 545	Human Factors Engineering	4
IE 546	Human Factors Engineering II	4
ROB 567	Human-Robot Interaction	4
ROB 562	Human Control Systems	4
KIN 523	Biomechanics of Motor Activities	3
KIN 525	Biomechanics of Musculoskeletal Injury	3
CE 554	Driving Simulation	3
H 594	Applied Ergonomics	3

H 599	Advanced Ergonomics	3
ME 513	Bio-Inspired Design	4
NSE 583	Radiation Biology	3
VMB 631	Mathematical Modeling of Biological Systems	3

Biomedical Sciences:

Course Number	Course Title	Credits
UO Campus		
CH 561	Biochemistry	4
CH 562	Biochemistry	4
CH 563	Biochemistry	4
CH 564	RNA Biochemistry	4
CH 565	Physical Biochemistry	4
CH 566	Structural Biochemistry	4
BI 523	Human Molecular Genetics	4
BI 524	Advanced Molecular Genetics	4
BI 526	Genetics of Cancer	4
BI 527	Molecular Genetics of Human Disease	4
BI 528	Developmental Genetics	4
BI 563	Cellular Neuroscience	4
BI 566	Developmental Neurobiology	4
OSU Campus		
VMB 521	Animal Models	3
VMB 524	Bioanalytical Chemistry	3
VMB 670	Introduction to Systems Biology	2
VMB 671	Molecular Tools	3
VMB 673	Comparative Immunology	3
VMB 674	Vaccines and New Therapies	3
BB 585	Applied Bioinformatics	3
MCB 525	Techniques in Molecular and Cellular Biology	4
MCB 554	Genome Structure, Organization and Maintenance	4
MCB 555	Genome Expression and Regulation	4
MCB 576	Introduction to Computing in the Life Sciences	3
PHAR 525	Foundations of Drug Action I	3

PHAR 574	Nanomedicine	3

Mathematics and Statistics:

Course Number	Course Title	Credits
UO Campus		
MATH 521M	Partial Differential Equations: Fourier Analysis I	4
MATH 522	Partial Differential Equations: Fourier Analysis II	4
MATH 561	Introduction to Mathematical Models of Statistics I	4
PHYS 581	Design of Experiments	4
OSU Campus		
ST 515	Design and Analysis of Planned Experiments	3
ST 592	Statistical Methods for Genomics Research	3
MTH 528	Stochastic Elements in Mathematical Biology	3
ME 526	Numerical Methods for Engineering Analysis	3

Engineering Fundamentals:

Course Number	Course Title	Credits
UO Campus		
PHYS 611	Theoretical Mechanics	4
PHYS 612	Theoretical Mechanics	2
PHYS 613	Statistical Physics	2
PHYS 614	Statistical Physics	4
OSU Campus		
ECE 564	Digital Signal Processing	4
ME 546	Convection Heat Transfer	3
ME 565	Incompressible Fluid Mechanics	3
CHE 520	Mass Transfer	4
CHE 537	Chemical Engineering Thermodynamics	4

Humanities:

Course Number	Course Title	Credits
UO Campus		
WR 510	Advanced Science Writing	4
PHIL 645	Environmental Philosophy (when topic is ethics of bioengineering)	2

Expected Learning Outcomes for Students and Means of Assessment

Ph.D. Outcomes	MS Outcomes
Outcome 1: Scholarship The student will be able to identify and conduct original research resulting in a significant contribution to knowledge in the fields spanned by Bioengineering and to effectively communicate this work to a technically literate audience. This will be assessed using the Ph.D. Qualifier Examination, Ph.D. Thesis and Final Oral Examination ("Defense").	**Outcome 1: Scholarship** The student will be able to conduct original research and assemble a creative new body of work in the fields spanned by Bioengineering and to effectively communicate this work to a technically literate audience. This will be assessed using the M.S. Thesis and Final Oral Examination.
Outcome 2: Mastery of Subject Material The student will be able to think critically, creatively and to address technical problems in the fields spanned by Bioengineering. The student will be able to plan and conduct research and entrepreneurial activities that leads to translation of research discoveries to solutions that meet societal needs. This will be assessed through satisfactory completion of the graduate program of study, as well as course summaries written by the instructors.	**Outcome 2: Mastery of Subject Material** The student will be able to think critically, creatively and to address technical problems in the fields spanned by Bioengineering. The student will be able to describe strategies used to translate research discoveries to solutions that meet societal needs. This will be assessed through satisfactory completion of the graduate program of study, as well as course summaries written by the instructors.
Outcome 3: Ethical Conduct Students will be educated in ethical and responsible conduct in research and professional activities. This will be assessed through satisfactory completion of the graduate seminar (BIOE 507), as well as ethical completion of the Ph.D. Qualifier Examination and the Ph.D. Thesis and Final Oral Examination.	**Outcome 3: Ethical Conduct** Students will be educated in ethical and responsible conduct in research and professional activities. This will be assessed through satisfactory completion of the graduate seminar (BIOE 507), as well as ethical completion of the M.S. Thesis and Final Oral Examination.

If needed, explain particular items in the grid:

Not Applicable

If needed, describe your curriculum map in narrative form, as an alternate to the grid:

Not Applicable

What is the nature and level of research and/or scholarly work expected of program faculty which will be indicators of success in those areas?

The OSU graduate program currently has over 40 participating faculty, mostly from the College of Engineering, but also from the Colleges of Science, Pharmacy, Public Health and Human Sciences, and Veterinary Medicine. These faculty provide students with the resources and expertise to conduct advanced studies in core areas that include biomaterials, biomedical devices and instrumentation, human performance engineering, medical imaging, and systems and computational biology.

Recently the UO established the Knight Campus for Accelerating Scientific Impact. To date, five new faculty have been hired with research interests that align with bioengineering, and 20 faculty with interest in this area from disciplines such as Biology, Chemistry, Physics, and Molecular Biology have been recruited as Associate Members of the campus. There are plans to hire at least 10 more Knight Campus faculty members in the next few years. Core areas in bioengineering will include regenerative medicine, biomechanics, neuroengineering, biosensors, biomaterials complemented by new innovation and entrepreneurship programs and training.

The majority of faculty to be included in the program have extramurally funded research and produce high quality scholarship (see Appendix 1). The number and quality of peer-reviewed scholarship and the availability of research funding will be the primary indicators of success. Performance parameters will include:

- Scholarly publication
- Participation in professional meetings, conferences and workshops
- External funding for research
- Number and magnitude of proposals written
- Participation in professional societies, committees, boards, and commissions
- Commercial development including disclosures, patents and start-up companies

These indicators are evaluated each year in the faculty member's annual review.

Explain the methods by which the learning outcomes will be assessed and used to improve curriculum and instruction.

Please see the mapping guides on the following pages for activities that will be used to assess the learning outcomes for the PhD and MS degrees.

Mapping Guide for the Ph.D. Degree – ***Bioengineering***

The main activities are listed for each outcome. Other activities may also support the outcomes, but data will only be collected for those listed below. The data collected will be reviewed annually and used for continuous improvement of the curriculum and instructional practices.

Activities ↓	***Learning Outcomes and Evidence:*** *Graduate students in the Ph.D. program will demonstrate*		
	Outcome 1: Scholarship	Outcome 2: Mastery of Subject Field	Outcome 3: Ethical Conduct
	Identify and conduct original research, scholarship or creative endeavors; communicate with peers	The student will be able to think critically, creatively and to address technical problems in field	Conduct professional activities in an ethical and responsible manner
1. Completion of Coursework		Completion of Program of Study; Course Summaries for Core Courses in BIOE grad program	
2. Seminar Series			Completion of Program of Study showing participation in BIOE 507 seminar
3. Ph.D. Qualifier Exam	Filled individual examiner's rubrics and committee summary rubric	Filled individual examiner's rubrics and committee summary rubric	Filled individual examiner's rubrics and committee summary rubric
4. Ph.D. Thesis and Final Oral Exam	Filled individual examiner's rubrics and committee summary rubric		Filled individual examiner's rubrics and committee summary rubric

Mapping Guide for the M.S. Degree – ***Bioengineering***

The main activities are listed for each outcome. Other activities may also support the outcomes, but data will only be collected for those listed below. The data collected will be reviewed annually and used for continuous improvement of the curriculum and instructional practices.

Activities ↓	***Learning Outcomes and Evidence:*** *Graduate students in the M.S. program will demonstrate*		
	Outcome 1: Scholarship	Outcome 2: Mastery of Subject Field	Outcome 3: Ethical Conduct
	Identify and conduct original research, scholarship or creative endeavors; communicate with peers	The student will be able to think critically, creatively and to address technical problems in field	Conduct professional activities in an ethical and responsible manner
1. Completion of Coursework		Completion of Program of Study; Course Summaries for Core Courses in BIOE grad program	
2. Seminar Series			Completion of Program of Study showing participation in BIOE 507 seminar
3. M.S. Thesis and Final Oral Exam	Filled individual examiner's rubrics and committee summary rubric		Filled individual examiner's rubrics and committee summary rubric

Accreditation

Is or will the program be accredited?

No

Why not?

ABET does not accredit PhD programs. Additionally, until 2016, ABET would not allow institutions to earn accreditation for both an undergraduate and graduate program. This rule has recently changed, but, to date, most universities continue to only accredit their undergraduate bioengineering program. The UO BS in Bioengineering program anticipates seeking ABET accreditation upon eligibility in 2026.

If accreditation is a goal, identify the steps being taken to achieve accreditation:

Not Applicable

If the program does not or cannot meet those standards, the proposal should identify the areas in which it is deficient and indicate steps needed to qualify the program for accreditation and date by which it would be expected to fully accredited.

Not Applicable.

Need for this Credential

What are the expected degrees/certificates over the next five years?

Year 1	Year 2	Year 3	Year 4	Year 5
0	0	0	3	5

What are possible career paths for students who earn this credential? Estimate the prospects for success of graduates in terms of employment, graduate work, licensure, or other professional attainments, as appropriate.

Most students who earn a graduate degree in bioengineering pursue academic research or work for biomedical/bioscience companies in research or research and development related roles. Prospects for success are high for graduates in the joint OSU/UO graduate program, due to the growing bioscience industry in Oregon, the focus on innovation and entrepreneurship at UO and OSU, and the expanded networking capacity created through the combined faculty at both campuses.

Other Similar Programs

Are there similar or related programs currently offered at the University of Oregon?

No

Attach your communications showing due diligence in consulting with other UO departments or areas

We have reached out to the Departments of Chemistry and Biochemistry, Human Physiology, and Biology. Responses will be forwarded to the Graduate Council when they are received.

Describe the steps that have been taken to ensure that the proposed program(s) does not overlap other existing UO program(s) or compete for the same population of students. [Provide documentation that relevant departments or areas have been informed of the proposal and have voiced no objections.]

Not Applicable

Program Integration and Collaboration

Are there closely-related programs in other Oregon public or private universities?

Yes

List similar programs and indicate how the proposal complements them. Identify the potential for new collaboration.

The current proposal is for the University of Oregon to join the existing graduate program in bioengineering at OSU. Other than the existing OSU program, the most closely related program in the state of Oregon is the Biomedical Engineering (BME) graduate program (MS and PhD) at the Oregon Health & Science University (OHSU). The OSU program was developed with the collaboration and full support of OHSU and was designed to be complementary to the BME program at OHSU rather than competitive. Creating a joint UO/OSU graduate program in bioengineering is expected to further enhance the synergies between the UO, OSU, and OHSU programs. The research activities at OHSU are focused squarely on engineering for unmet clinical needs while the bioengineering research threads at UO and OSU encompass a wider range of bioscience-based technologies beyond the focus of clinical need. OHSU representatives, including the BME Department Chair, have expressed support for the joint UO/OSU Bioengineering graduate program. It is anticipated that the proposed joint program and the BME program at OHSU will collaborate extensively in research, education and graduate student recruiting. This past year all three universities partnered in recruiting students into the existing BIOE and BME programs in the state.

If applicable, explain why collaborating with institutions with existing similar programs would not take place.

As mentioned above, we have discussed our plans to create a joint OSU/UO graduate program in bioengineering with several OHSU representatives. Our proposed program will be complementary to the existing BME program at OHSU, and we anticipate that creation of a formal OSU/UO program will enhance collaborative opportunities between all three institutions. We plan to continue to explore opportunities for collaboration with OHSU during and after the launch of the OSU/UO joint graduate program.

Describe the potential for impact on other institution's programs.

The proposed joint graduate program is expected to contribute to statewide efforts to increase Oregon's capabilities in applied life sciences. The program has been developed with a focus on areas of bioengineering that are complimentary to existing programs, rather than competitive, and is therefore not expected to negatively impact other institution's programs. The main area of potential impact is competition for graduate student applicants with the OHSU BME program. However, as described in the external review of the OSU graduate program, there are significantly more applicants to BIOE/BME graduate programs in the Northwest than available positions. An indicator of this was the University of Washington, which received over 600 applications per year and has the capacity to accept 20-25. The creation of a joint OSU/UO graduate program in bioengineering is expected to lead to a further increase in the total number of BIOE/BME graduate students in the state rather than to create competition for graduate applicants at any other institution.

Document your due diligence in consulting with other Oregon institutions.

Please see attached PDF of a proposal to the Oregon Provost's Council.

If the program's location is shared with another similar Oregon public university program, provide externally validated evidence of need.

As mentioned above, the external review of the OSU graduate program in bioengineering indicates that there are many more applicants to graduate BIOE/BME programs in the Northwest than available positions. The current program at OSU has helped satisfy some of the existing demand. Creating a joint OSU/UO program will further increase the existing capacity for graduate students in the state and help accommodate the large demand for placement in graduate programs in this field. Additionally, as described in the "Need" section, the Oregon Bioscience Association has reported on the importance of the bioscience industry to Oregon's economy and highlighted the strong growth in jobs within the sector. This joint program will help prepare well-qualified graduates and strengthen the bioengineering workforce in the state.

Resources

List any additional faculty who will have a role in this this program as a result of the change(s), indicating those who will have leadership and/or coordinating roles. For each individual, indicate status with respect to tenure track (TT or NTT), rank, and full-time or part-time.

Faculty Name	Faculty Classification and Rank	FTE	Role
Bob Guldberg	TT-Full	full-time	Faculty
Tim Gardner	TT - Associate	full-time	Faculty
Keat Ghee Ong	TT - Full	full-time	Faculty
Marian Hettiaratchi	TT- Assistant	full-time	Faculty
Calin Plesa	TT - Assistant	full-time	Faculty
Nathan Jacobs	NTT Protem	0.75	Coordinator
Future Hires	TT-various	full-time	Faculty

Describe how students will be advised in the new program.

The program plans to hire a student recruiter that is also tasked with ensuring student success and alumni engagement. This person will assist students in navigating program logistics and requirements, providing strong advising during the first year of the program when students have not, yet, selected a research advisor. MS and PhD students will receive additional, detailed advising regarding selection of coursework and research through their thesis committees.

Additional Staffing and Needs/Resources

What other additional staff are needed to support this program?

Minimal additional staffing is needed to support the program. As mentioned above, a position will be created that provides student recruitment and advising support. This role will also provide tracking of graduates in order to maintain a repository of post-graduation metrics. Knight Campus bioengineering faculty, already part of current approved hiring plans, will provide course instruction and thesis advising to MS and PhD students.

Are special facilities, equipment, or other resources required because of the change (e.g., unusual library resources, digital media support, etc.

No additional facilities are needed to support this program. The main educational facilities that will be needed to support the program are active learning classrooms. The graduate program will utilize spaces designated for the Knight Campus Internship Program (KCIP). These spaces are heavily utilized during the summer but are able to accommodate BIOE usage during fall, winter, and spring terms. Because the course sizes are expected to remain small (entering cohorts of 8-20 students), these spaces should be sufficient for the foreseeable future. Details of Knight Campus facilities that will be available to the bioengineering program are outlined below.

Knight Campus facilities that will be available from summer 2020:

- Seminar room – 2900 NSF
- Three KCIP designated classrooms: 965NSF each
- Three additional classrooms (not designated to KCIP): 965 NSF each
- Three instructional laboratories = 4,000 NSF
- Three instructional lab support spaces = 1200 NSF
- Research core facilities for rapid prototyping, 3-D printing, biological imaging and microelectronics fabrication.

Attach your communication(s) showing due diligence in consulting with UO Libraries and any other resource area effected by the new program.

Faculty and students associated with the graduate program will have joint appointment/enrollment with OSU and therefore have complete access to OSU Libraries. Please see the attached OSU Library Evaluation that demonstrates adequate collections and services to support the program. Although the OSU Library Evaluation was completed in 2015, journal access was re-evaluated in February, 2020, for each of the 141 "Core Journals in Bioengineering" listed in Appendix A of the evaluation. As of 2015, OSU Libraries provided current access to 97 of the 141 Core Journals, delayed access to 13 titles, and historical access to 6. Since the initial review, access to 10 additional Core Journals has been added, most in the first two quartiles for impact factor in their respective subject areas (JCR quartile). Subscriptions have been terminated for 8 journals from the list, however, several of these were in the third or fourth JCR quartile, and 4 of the 8 were historical access only. Total access is now 103 of 141 Core Journals, with delayed access to 13 titles and historical access to 4. The complete list of added and removed titles is provided below, including JCR quartile:

Added:

- Journal of the mechanical behavior of biomedical materials – Q1
- Laryngoscope – Q1
- Integrative Biology – Q2
- Journal of Electromyography and Kinesiology – Q2
- Journal of Surgical Research – Q2
- Journal of Thoracic and Cardiovascular Surgery – Q2
- Safety Science – Q2
- Skin Pharmacology and Physiology – Q3
- Biofutur – Q4
- Cellular and Molecular Bioengineering – Q4

Removed

- Circulation journal: Official Journal of the Japanese Circulation Society -Q2
- Journal of Biomedical Materials Research Part A (previously held historical access 1967-1996) - Q2
- Scientific World - Q2
- Journal of Applied Polymer Science (previously held historical access 1959-2000) - Q3

- Journal of Biomedical Materials Research Part B Applied Biomaterials (previously held historical access 1967-1996) - Q3
- Wireless Personal Communications - Q3
- Surface and Interface Analysis (previously held historical access 1985-1992) - Q4
- EMJ Engineering Management Journal – no JCR score listed

Financial Sustainability

What financial resources are needed to support this proposal? Identify the resources currently available as part of existing UO programs or reallocations within existing budgets. Are additional resources needed?

The current proposal requires minimal financial resources beyond investments that are already committed as part of the Knight Campus initiative. Support for the recruitment and advising position will be provided by the Knight Campus. Other administrative support for the program will also be provided by the Knight Campus. Most of this infrastructure has already been established in support of the Knight Campus Internships Program. There is potential to combine the responsibilities of these roles with similar roles that will be part of the recently approved undergraduate bioengineering program.

Provide a plan that shows how long-term financial viability of the program is to be achieved, addressing anticipated sources of funds, the ability to recruit and retain faculty, and plans for assuring adequate library support over the long term. (This is a header, no text needed)

Business Plan Description

The bioengineering program provides a unique mechanism to leverage the significant philanthropic and statewide investments in the Knight Campus and across the UO. The program will harness existing Knight Campus investments in bioengineering faculty who can contribute to the required instructional needs. The expected teaching load of the current and planned bioengineering-related faculty are sufficient to cover the core and elective course offerings of the bioengineering graduate program with no additional instructional costs.

Additionally, the program will utilize Knight Campus facilities to provide instructional space and support.

Describe your plans for development and maintenance of unique resources (buildings, laboratories, technology) necessary to offer a quality program.

No unique resources are needed beyond those already planned as part of the Knight Campus initiative.

What is the targeted student/faculty ratio? (student FTE divided by faculty FTE)

The program expects to maintain 13 faculty FTE for approximately 65-100 students, roughly a 5-8s/1 ratio.

What are the resources to be devoted to student recruitment?

As outlined above, FTE will be dedicated to a student recruitment and success position. The bioengineering program will also partner with the Knight Campus Internship Program and in-state partners (OSU and OHSU) to coordinate student recruitment efforts. Additionally, faculty attendance and presentations at large bioengineering-related conferences will provide outreach and recruitment opportunities.

Attach supporting documentation for financial sustainability.

Not Applicable

If grant funds are required to launch the program, what does the institution propose to do with the program upon termination of the grant?

Not Applicable

Other Program Characteristics

Must courses be taken for a letter grade and/or passed with a minimum grade to count toward the proposed major? If so, please list the courses and the requirements of each. Although there is variation in detail, UO majors typically require that most of the courses be taken for a letter grade (not "pass/no pass") and that the grade be C- or better.

All courses taken to satisfy the degree requirements must be taken for a letter grade and passed with a grade of C- or better.

Graduate students must maintain at least a 3.00 grade point average (GPA) in graduate courses taken in the degree program. Grades of D+ or less for graduate courses are not accepted for graduate credit but are computed in the GPA.

How much course overlap will be allowed to count toward both the major and some other credential a student might be earning (a minor, certificate, or another major)? If there are specific credentials with overlap limits, please list those and the limits.

There are no course overlap restrictions.

Does your proposal call for new courses, or conversion of experimental courses into permanent courses? If so, please list courses in the text box below and indicate when they will be submitted to UOCC for approval:

The proposal calls for the development of six new courses for the core curriculum and three elective courses. These courses are listed below. New course proposals have been initiated in the CourseLeaf system and curricular review with the Knight Campus Curriculum Committee (KCCC) is in process. We expect that the course proposals will be approved by the KCCC and submitted for UOCC review by the start of the upcoming spring term. Ideally, the majority of these courses will be approved and available for students starting in Fall 2020. Additionally, the OSU campus offers a full suite of core and elective BIOE courses that UO students are able to take for credit.

BIOE 611 Cellular and Molecular Bioengineering

BIOE 612 Modeling of Physiological Systems

BIOE 613 Drug and Medical Device Regulation in Technology Development

BIOE 614 Innovation in Bioengineering

KC 618 Seminar: Professional Development

BIOE 617 Seminar: Research

BIOE 631 Advanced Biomaterials

BIOE 632 Biomedical Imaging and Photonics

BIOE 670 Biosensors

Will admission to the program be limited?

There will not be cap on the number of students in the program, however, admission will primarily be driven by the needs and availability of faculty research mentors.

Maximum enrollment: Not Applicable

Will students be required to apply for entry to this program?

Yes

What are the conditions for admission?

Students must have completed a bachelor's degree prior to starting the program.

Additional Requirements (Will Appear in Catalog)

Please describe admission procedures (Will Appear in Catalog)

Residency Requirements (Will Appear in Catalog)