

The Undergraduate Council is impressed by the effort and thought that has gone into this complex proposal. We have some questions and suggestions below, which we hope will come across not as critiques but as support for your efforts to foresee everything that needs to be figured out to make this program succeed.

Thank you for the thoughtful feedback and suggestions. We have responded in blue to each of the points of considerations raised below. Where necessary, we have updated the program proposal itself and have made notation in this document referring to the section of the proposal that has been updated.

Minor Suggestions/Comments/Questions:

Please note that limiting the degree type to BS (instead of BS and BA) will make it far more difficult for students to double major in BIOE and any majors that require a BA. Doing so would necessitate the completion of the requirements for a double degree (and not just both sets of major requirements). If you would like to allow a BA as well as a BS please let us know by updating the proposal.

ABET accredited bioengineering degrees are almost universally BS or BSE (Bachelor of Science in Engineering) degrees. Because this will be the first engineering degree offered at UO, we feel that conforming to this standard is important as we build the reputation and national recognition of the program. The University of Pennsylvania has an interesting program that offers both an ABET accredited BSE degree (intended for traditional engineering students) and a more flexible, non-ABET accredited bioengineering degree (intended for students who are interested in bioengineering as a strong foundation towards the pursuit of non-engineering careers such as medicine, business, and law). Following ABET accreditation of the BS degree, we are interested in exploring the possibility of adding a more flexible BA degree that will allow students to double major without needing to satisfy the requirements of a double degree. ABET accreditation eligibility begins once the program has at least one graduating cohort.

The 4-year Academic plan provided includes BI 211 in the spring term, please note that this class is only offered in the fall, winter, and summer. Please update the 4-year plan to account for this.

Thank you. BI 211 has been moved to fall term of year 2.

The 4-year Academic plan accounts for 177 total credits, please add a class in there so the total is 180 or above.

The original 4-year Academic plan contained a note in the "Milestones" tab in fall term of year 4 that specified students needed to take an extra 3 credits during year 4 to achieve 180 total credits. As this may have caused confusion, we have modified the 4-year Academic plan to explicitly list a 3-credit open course in the fall term of year 4 with a note in the milestones tab that this can be completed during any term of year 4.

The 4-year Academic plan lists WR 122, which focuses on written reasoning as a process of argument. We request that you replace this with WR 123, which focuses on written reasoning in the context of research. Both classes, along with WR 121, are acceptable to fulfill the UO writing requirement.

Thank you for the suggestion. We have updated the 4-year Academic plan to WR 123

Can students take MATH 246 and 247 (Calculus for the Biological Sciences I and II) instead of MATH 251 and 252? If so please let us know by updating the proposal.

It is important that students complete MATH 253, which lists MATH 252 as a prerequisite. Therefore, at this time, we feel MATH 246 and 247 should not be able to replace MATH 251 and 252.

Can students take Advanced General Chemistry and lab (CH 224H-226H and CH 237-239) instead of the regular general chemistry sequence and lab (CH 221-223 & CH 227-229)? If so please let us know by updating the proposal.

This is an excellent suggestion and we have modified the proposal to allow CH 224H-226H and CH 237-239 instead of the regular general chemistry sequence. This update has been made in the "Course of Study" section and we have made a note in the "milestones" tab on the 4-year Academic Template that the Advanced General Chemistry series can be taken instead.

Can students take Honors Biology (BI 281H) instead of BI 211? Note, BI 281H is only offered fall term and requires completion of the full gen chem sequence with a B- or better. Based on your 4-year academic plan this shouldn't be a problem. If BI 281H will be accepted please let us know by updating the proposal.

This is another excellent suggestion. We have updated the proposal in the "Course of Study" section as well as the 4-year Academic plan.

Please update the "Course of Study" section of the proposal to include the correct prerequisites for BI 211 and the General Chemistry sequence (as these recently changed): MATH 111 for CH 221 and MATH 112 for CH 222 and BI 211: CH 111 or CH 113 or CH 114 or CH 221 or CH 224H. Not a big deal but might as well be accurate.

The proposal has been updated to reflect the new prerequisites noted above.

Will any of the BIOE courses be requesting Core Ed status? If so, please let us know which ones.

No BIOE courses are requesting Core Ed status at this time.

Please update the proposal to remove the inconsistency regarding the prerequisites for BIOE 251: In the "Program Description" section MATH 251 is listed as a prerequisite and PHYS 251 is listed as a co-requisite. In the "Course of Study" section both are listed as prerequisites. The latter scenario will not work with the 4-year academic plan provided.

The "Course of Study" section has been updated to specify that PHYS 251 is a co-requisite for BIOE 251

Please update the "Course of Study" section to clarify the prerequisites for BIOE 252 and BIOE 253: Currently listed as BIOE 221 and 222 but should probably be 251 and 252.

Thank you for highlighting this typo. The prerequisites have been updated to BIOE 251 and BIOE 252.

Please adjust the BIOE elective section of the proposal to either 32 or 36 credits, whatever makes the most sense... or add some 2 credit options to the list so that the required number of credits is attainable. We have changed the electives to require 32 credits

We have changed the elective requirements to 32 credits.

Residency Requirements: Please specify if the total residency requirement will be 54 credits (34 + 20 for the BIOE core) or 34 credits (BIOE courses included within the 34)

We have tried to clarify the requirement by adding a statement that the BIOE courses that must be taken at UO may count towards the 34-credit requirement.

Please note that co-requisites cannot be enforced by our automated system. That doesn't mean you can't have them, but informed robust advising will be necessary to make sure students take the correct co-reqs together (since there is no automated way of doing this). Because of the structured nature of this program, it will likely need a highly trained advisor to make sure students can stay on track, navigate all co-requisites, create a plan for catching up if they fall behind, and create an alternative academic plan if they cannot keep up.

We appreciate the insight regarding co-requisites and the general need for skilled advising. While we will follow the CAS-wide integration with Tykeson advising, we also plan to allocate FTE to a dedicated undergraduate advisor to assist bioengineering students with the types of issues highlighted above.

Does the program plan to add research opportunities for students eventually? If so, will students be able to use research credit towards the BIOE major? If so how much credit and toward what requirement (elective section? If that still works with accreditation requirements) is there an expectation that new faculty in the Knight Campus will take on undergraduate students in their labs?

Knight Campus faculty affiliated with the Bioengineering Program will be expected to participate in the Knight Campus Undergraduate Scholars Program. All bioengineering affiliated faculty will also be encouraged to create additional research opportunities for motivated undergraduate students. We have created a placeholder in CourseLeaf for "BIOE 401 – Research" in order to offer students the possibility of earning credit as one of the many benefits of participating in undergraduate research. This course will run similar to other 401 courses in units such as Biology and Chemistry. The course will be valid for 1-4 credits. While we plan to make this course repeatable for university credit, a maximum of 4 credits will be allowed to count towards the BIOE elective requirement.

Should ABET choose to not recognize the 401 Research option as "engineering credits", a student who allocates 4 credits of 401 towards the bioengineering elective requirement may only acquire 67 engineering credits (35 bioengineering core + 28 bioengineering elective + 4 CIS - which ABET considers engineering). In order to ensure each student receives the mandated 67.5 engineering credits required by ABET, BIOE 253 will need to be updated to a 4-credit course. We will revise the BIOE 253 syllabus and update the course proposal including the student engagement inventory to ensure that BIOE 253 will qualify as a 4-credit course.

Does the program plan to offer Honors? Ok if not, it can always be added later, but if so please provide some info about how that will work.

The program does not plan to offer Honors at this time. As the program reaches steady-state and the full contingency of TTF are in place, it is likely that an Honors option will be added. This type of offering is highly aligned with the experiential curriculum design of the program.

More involved Suggestions/Comments/Questions:

Please communicate with the Registrar's office about how to functionalize the admissions process (as it relates to freshmen and as it relates to students entering the upper-division core classes). Sounds like a pre-major might be a good option (with exceptions made for students that are directly admitted as freshman), but there might be alternative ways to make sure that students take all the intended lower-division courses before they start the upper-division courses without having to list every single lower-division course as a prerequisite for every upper-division course. The College of Business has a process that attempts to do something similar, they might be a good model. Please let us know how this process will be functionalized.

In order to provide the best access to the Bioengineering Program for as many students as possible, we plan to delay the adoption of direct admissions for freshman until the program reaches a capacity-constrained state. At

program launch, we desire to implement a program admission model that emulates the current College of Business pre-major model (students apply for full major status after completing a specific set of prerequisite courses and have completed around 90 total credits). We feel confident this model will be possible to implement from a Registrar standpoint as it currently exists at the UO. We plan to initiate conversations with the Registrar's office in the near future regarding the details of applying this type of pre-major option, as well as to inquire about the feasibility of a direct admission process for freshman should the need arise.

We want to highlight that the freshman direct admission approach is not intended to be used as an exclusionary tool. Rather, it is meant to provide an assurance to freshman applicants that, should they decide to enroll at UO, they will be guaranteed a place in the Bioengineering Program and can earn a bioengineering degree as long as they remain academically qualified. This is likely to be of particular importance at UO, where alternative engineering programs are not available for a student to transition into if they are not accepted into the Bioengineering Program during the sophomore application window.

We have updated the program proposal in the "Other Program Characteristics" section with the above language.

According to UO policy, students cannot be required to take unregularized courses. Because of this, the process of regularization will need to be initiated for 4 or 5 more courses within the elective category (depending on if that category will require 32 or 36 credits). This will involve reserving a course number in CourseLeaf and providing a sample syllabus. Please communicate with Frances White (Chair of the UOCC) to get more specific information about the minimal requirements to accomplish this threshold.

We have initiated the regularization process for four additional courses within the elective category, including:

- 332 Biomedical Signals
- 333 Systems in Bioengineering
- 432 Biomedical imaging
- 442 Cell and Tissue Engineering

The "Course of Study" section has been updated to show regularized course numbers for these courses. There are now 32 credits worth of elective courses for which regularization has been initiated, which satisfies the (revised) 32 credit requirement for the elective category.

The proposal states "Each of the bioengineering courses that are designated as part of the core curriculum have a focus on experiential-, problem- and design- based learning, which is at the heart of the pedagogy for the new degree." Please let us know what resources will be made available to new faculty to ensure that they are supported in providing this high standard of pedagogy. Are there plans for collaboration with the Teaching Engagement Program, or will the program have its own pedagogy training and support? The unique nature of this program, wherein much of the faculty will be new to UO, presents an opportunity to implement a deliberate pedagogy training and support plan that can elevate BIOE to meet the high teaching standard outlined in this very well-articulated proposal.

The Teaching Engagement Program is a valuable resource and we anticipate that future collaboration with the TEP will enhance the pedagogical approach implemented by the Bioengineering Program. Additionally, a key aspect of the [Knight Campus Strategic Plan \(link\)](#) involves developing and supporting innovative education models that are experiential, applied, and entrepreneurial. Several short- and long-term targets for implementing these approaches have been identified and resources and workshops to support curriculum design will be available through the Knight Campus. Combined with the trainings available through TEP, these resources will support bioengineering instructors' efforts in delivering exceptional education.

What is the current undergraduate Knight Campus lab space capacity (specifically to teach the BIOE lab courses)? What are the projections for when this capacity will become inadequate to meet program needs? What are the plans for meeting additional capacity needs as the program grows?

Current Knight Campus facilities are detailed below. Initially, the Knight Campus Internship Program (KCIP) designated spaces will be the primary home for BIOE instructional and laboratory needs. These spaces are heavily utilized during the summer but are able to accommodate BIOE usage during fall, winter, and spring terms. As the program needs increase, facility usage will overflow into non-KCIP designated space. If the program is highly successful and it becomes clear that program needs will eventually exceed the available capacity of facilities, new educational and laboratory space will need to be built or the program will need to enforce capacity limits on new majors. Based upon the projected start date, smaller initial cohorts and the fact that bioengineering-specific labs are not taught in the first two years, the currently available lab space should satisfy needs through 2025.

Knight Campus Facilities that will be available from summer 2020:

- Seminar room – 2900 NSF
- Three KCIP 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

Please provide us with a bit more detail about how the program is projected to grow until it reaches a stable state, and what resources will be available. This can be done by providing a table similar to the one below. Advising resources could be included as a separate category or combined with Instructional or Administrative FTE, whatever makes sense. We understand that these are projections, subject to change. We do not need \$ amounts, just a sense of what the expectations and plans are.

We have filled out the recommend table with current projections of program growth. We have grouped the following roles under the label “Program administration (FTE)”: student recruiter, business manager, administrative assistant, lab manager, and teaching lab preparator. As noted, these are subject to change and do not include all possible scenarios.

	Year 1 2021-2022	Year 2 2022-2023	Year 3 2023-2024	Year 4 2024-2025	Year 5 2025-2026
Expected enrollment	15-25	40-50	50-75	75-100	100-125
Total students in the program	15-25	50-70	85-125	140-200	200-265
Which Program courses will be offered (BIOE)	112,113	112,113 251, 252,253	112, 113 251, 252, 253 321, 322 5 electives	112,113 251, 252,253 321,322 421,422,423 8 electives	112,113 251, 252,253 321,322 421,422,423 10 electives
Total # BIOE courses offered	2	5	12	18	20

Permanent faculty affiliated with program on campus	3	4	7	10	13
# Courses taught via bioengineering affiliated TTF	3	4	7	10	13
# Courses taught via NTTF Instruction	0	1	5	8	7
Student Program Manager/Advisor	0.25	1	1	1	1
<u>Program administration (FTE)</u>	2	3	4	5	5

*** Below is a list of duties that may need to be assigned to the director. Many of these should be considered when calculating an appropriate FTE commitment from CAS. We DO NOT need an accounting of who will do each of the below, this list is merely for your consideration.

- Advising coordination (with Tykeson, and other advising units)
- Advising beyond what Tykeson can provide (in proposal)
- Vetting students for the major (in proposal) (reading those rec letters and the like)
- Transfer evaluations
- Academic Exceptions and petition review
- Curriculum oversight, updates, and review
- Program assessment
- Tracking students, survey and maintaining contact (in proposal)
- Interfacing with member department and CAS and advocating specifically for undergraduates
- Shepherding students into research labs (if the major values this)
- Honors administration (If the program plans to do this, who will make the decisions, maintain consistency, and oversee honors)
- Document creation and updates
- Degree clearances
- Change of major processing and advisor assignment
- Commencement planning, and execution (this is a significant undertaking)
- Budget management
- Web site administration
- Keeping a program mailing list and disseminating info through it (Canvas can be used for this, BI uses a traditional listserve)
- Internship partnership development
- planning and executing special programming/events for majors
- Who covers S&S expenses (copies, phone, CAS stickers, commencement costs)

Statement of commitment from affiliated departments (MATH, CH, PHYS please, and ideally CIS and BI). Please provide the curricular plan and projected student numbers to each affiliated department to get a well-informed support statement that includes an agreement to the following:

- BIOE students will have the same registration priority and access to courses affiliated with the BIOE major as the unit's own majors.
- Affiliated Departments will expand offerings of BIOE affiliated courses if these courses cannot accommodate new and existing students.

Departments might need some time to consult with the Dean's office to verify Dean's support for additional resources in case their needs should increase as a result of this program.

We have contacted the heads of the units mentioned above, requesting the support statements above. In an effort to give UGC members as much time as possible to review and approve the updated proposal in advance of the UO Senate meeting and vote on Jan 08, 2020, we have returned this feedback to the council for their review pending response from the above units. Given the strong support from the President, Provost, and CAS, we have every expectation that we will receive positive responses in the coming weeks. As responses are received, we will forward the return statements to UGC.

Please also note the below message from Katy Lenn (who represents the Libraries on the Undergraduate Council) and let us know if this will augment the program proposal in any way:

We had a cancellation project last year and titles were canceled - we are still receiving issues until the current subscription runs out.

As a result:

- Annals of Biomedical Engineering - access will be lost as part of dropping the package - cost to subscribe - \$1,792
- Applied Magnetic Resonance - access will be lost - unknown cost to subscribe
- Archives Computational Methods in Engineering - access will be lost- unknown cost to subscribe
- Applied Biochemistry and Biotechnology - access will be lost - \$2,716 to subscribe
- Applied Bioinformatics - we don't currently have access to this journal- unknown cost to subscribe
- Applied Biological Chemistry - Open Access - have access
- Annals of Solid & Structural Mechanics - we don't currently have access to this journal- unknown cost to subscribe

So, soon we'll have ongoing immediate access to only one of the titles above.

Regarding the Morgan and Claypool titles. We have purchased electronic access to backfiles of those series, but do not have current subscriptions for any of them.

Regarding Science Direct – these are part of a package deal (so we receive some titles without having a current subscription). That package deal that may have to be unbundled which means we may lose the titles for which we do not have direct subscriptions to including:

- J Biomechanics – do have a current subscription
- Osteoarthritis and Cartilage – do not have a current subscription, access part of the package
- Biomaterials– do not have a current subscription, access part of the package
- the Spine Journal– do not have a current subscription, access part of the package
- J Bioscience and Bioengineering– do not have a current subscription, access part of the package
- Biophysical Journal – do have a current subscription

Also, my assumption, based on your note, was that books/monographs would not be needed.

I can try to obtain numbers for the journals you have listed and would be happy to talk with you some more and/or put you in touch with our Head of Collection Services.

We appreciate the financial and logistical challenges of maintaining adequate library support as several new university initiatives and programs are being implemented. We are also aware that the cost to maintain access to quality journals is increasing at a rapid rate and appreciate the efforts of the Libraries faculty and staff to provide the necessary support to all members of the university in the context of restrictive budgets. The unfortunate cancellations noted above may limit the available selection of readings that instructors can provide to their students. We remain confident that, between the remaining access at UO Libraries and the open-access archives at PubMed Central, suitable content will be available to administer high-quality undergraduate instruction. Journal access restriction is likely to have a greater impact on research faculty. Agreements are in place for UO bioengineering faculty to have affiliate status at OHSU and OSU, providing additional library access if needed. These agreements should help to mitigate this concern during recruitment and retention of high-caliber faculty.

There were a few changes suggested by departments that we have included in the revised program description:

CIS 210

In response to a discussion with Michal Young following our presentation to the UGC, we have updated the Course of Study to allow CIS 210 to be taken instead of CIS 122 and we have noted in the 4-year Academic Plan that qualified students are encouraged to take CIS 210.

MATH/DSCI 345

In response to a request from the Mathematics department head, we wish to modify the MATH 343 requirement to "MATH 343 or MATH/DSCI 345". MATH/DSCI 345 is a new course moving through approval committees and contains similar content to MATH 343 but is intended for students with programming experience. Although many bioengineering students will not complete CIS 211, which is a prerequisite to MATH/DSCI 345, students who choose to do so will benefit from the computational approaches in MATH/DSCI 345.