

----- Forwarded message -----

From: **Patrick Phillips** <[pphil@uoregon.edu](mailto:pphil@uoregon.edu)>

Date: Sat, Mar 30, 2019 at 1:46 PM

Subject: Conflict check for new bioengineering courses

To: <[dtyler@uoregon.edu](mailto:dtyler@uoregon.edu)>, <[jhaack@uoregon.edu](mailto:jhaack@uoregon.edu)>

Cc: Nathan Jacobs <[ntjacobs@gmail.com](mailto:ntjacobs@gmail.com)>

Dear Dave and Julie,

As you know, we are in the process of creating a new undergraduate bioengineering degree in order to capitalize on the teaching capacity of new Knight Campus faculty and to expand our undergraduate offerings into engineering space. I believe that this move will be a big boon to all of the sciences at the UO because it will help bolster our standing a strong science campus with potential (very strong) students. This has long been an issue for us, despite the fact that we have the top science departments in the state. It is our hope and expectation that the Bioengineering Program will recruit new students to campus, leading to a net increase in the total number and quality of students in the sciences on campus, rather than being competitive with existing degrees.

We have initiated the degree approval process, the first step of which is to have a suite of pre-approved courses that can serve as the basis for the new degree. The degree will at least initially sit within CAS under a new Program in Bioengineering, and so the course approval process is moving through the CAS curriculum committee, which is terrific for making sure that everything fits within university guidelines and synergies appropriately with our current offerings.

As part of this process, the CASCC requires assurances from other departments that the proposed courses do not significantly overlap with existing offerings within other departments. We also want to make sure that none of these offerings will be seen to generate a negative impact on your department as a whole. All 300- and 400-level courses will be closed to non-Bioengineering majors, which should minimize impact to and/or overlap with existing programs.

Because of the overall scope of bioengineering, I'm including the materials for all of the initial set of proposed courses. In addition, I have also attached a brief program overview so that you can see the context of the courses.

You should of course feel free to comment on any of the offerings, but we would appreciate a specific response that the Department of Biology does not anticipate any conflict from our offering "Biomaterials".

I recognize that this is huge imposition at the very start of the term, but we are hoping to have the CASCC approve the courses this term so that we can move onto the more daunting task of getting the degree approved. Given the nature of the offerings, I'm hoping that this can actually be a fairly quick decision on your part. To this end, it would be great if we could hear back from you by the end of the day on Wednesday, April 3.

I am naturally happy to answer any questions that you might have. Thanks so much for your help with this.

Patrick

P.S. We continue to have conversations about how to best support applied and translational work at the UO, and so I am always quick to bring up everyone's desire to see an applied chemistry degree come into being. There are various potential paths forward here, but it seems that we will probably need to see how the dust settles on the CAS organization discussion, although it seems that maintaining the status quo is the most likely outcome at this point.

### Course Titles and Descriptions

#### BIOE 111 – Introduction to Bioengineering

This course introduces students to bioengineering, exploring the types of issues bioengineers encounter through design challenges and problem-based learning. Various sub-specialties and career-pathways in bioengineering are explored. Additional topics include degree requirements, academic plans, and undergraduate research opportunities.

#### BIOE 112 – Careers in Bioengineering

This course provides an overview of career opportunities available to bioengineering students. The course instructor and guest lecturers will present numerous career pathways in bioengineering including industrial, clinical, legal, and academic fields.

#### BIOE 113 – Research in Bioengineering

This course introduces students to the scientific process utilizing an interactive combination of instructor and guest lectures paired with collaborative small group problem solving sessions. Students will also gain exposure to research fields within and related to bioengineering. Guest lecturers will present their current research in fields such as biomechanics, imaging, bioinformatics and cellular engineering while instructor-led lectures and team problem solving sessions will focus on investigating, deconstructing, and designing real-world scientific research projects. The quarter will culminate with students creating their own research proposal in a bioengineering field of their choice.

#### BIOE 251 – Fundamentals of Bioengineering I

This is the first in a three-course series that introduces students to foundational principles in bioengineering. Topics include units, dimensional analysis, energy balances, conservation of mass, energy, and momentum, and introductory biomechanics.

#### BIOE 252 – Fundamentals of Bioengineering II

This is the second in a three-course series that introduces students to foundational principles in bioengineering. Topics include linear circuits, Fourier transforms, fluid pressure, the Bernoulli Equation, conservation principles in fluid control volumes, and laminar fluid flow.

#### BIOE 253 – Fundamentals of Bioengineering III

This is the third in a three-course series that introduces students to foundational principles in bioengineering. In this course, students will apply the engineering concepts acquired in the first two Fundamentals of Bioengineering courses to solve complex, real-world bioengineering problems. The course will be built around three units, with each unit focused on a different bioengineering problem which students will complete in small groups.

### BIOE 331 – Biomaterials

This course examines the utilization of polymers, ceramics, and metals in bioengineering and biomedical applications, with a focus on material properties and physiological interactions. The course will cover concepts related to basic material fabrication, synthesis, and characterization. Additionally, the link between structural properties and material function will be investigated, including how modifications to specific properties may lead to various functional advantages. Throughout the course, emphasis will be placed on the physiological response to these biomaterials when interacting with or implanted in the body.

### BIOE 341 – Quantitative Physiology

A quantitative, engineering approach is used to explore the structure and function of healthy and diseased physiological systems, including musculoskeletal, nervous, endocrine, cardiovascular, respiratory and renal. Emphasis is placed on mechanics, transport processes, energy balances and electrical signaling. Where applicable, mathematical models are used to quantify system processes and/or to create simplified simulations of key system constituents.

### BIOE 342 – Quantitative Cellular and Molecular Biology

This course investigates cellular and molecular biology from an engineering perspective, with particular emphasis on bioengineering design and applications. Cellular structure, function, and processes are quantitatively assessed using fundamental principles such as entropy, diffusion, and continuum mechanics. Mathematical models of cellular and molecular functions are derived and implemented to construct computational simulations.

### BIOE 454 – Biotransport

Biological processes rely on the transport of mass, momentum, and energy. Bioengineering applications from imaging to drug delivery harness these mechanisms for social and scientific gain. This course investigates the underlying physical phenomena that drive these processes, including chemical gradients, electrical potentials, and fluid flow. Continuum methods are used to develop and apply models to solve bioengineering problems involving transport.

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Patrick C. Phillips, Ph.D.

Philip H. Knight Chair

Professor of Biology

Special Advisor to the President

<https://www.uoregon.edu/~pphil>

[pphil@uoregon.edu](mailto:pphil@uoregon.edu) | 541-346-0916

----- Forwarded message -----

From: **Patrick Phillips** <[pphil@uoregon.edu](mailto:pphil@uoregon.edu)>

Date: Sat, Mar 30, 2019 at 2:29 PM

Subject: Re: Conflict check for new bioengineering courses

To: <[dtyler@uoregon.edu](mailto:dtyler@uoregon.edu)>, <[jhaack@uoregon.edu](mailto:jhaack@uoregon.edu)>

Cc: Nathan Jacobs <[ntjacobs@gmail.com](mailto:ntjacobs@gmail.com)>

Oops. I put "Department of Biology does not anticipate" when I obviously intended "Department of Chemistry does not anticipate". Sorry about that.

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Patrick C. Phillips, Ph.D.  
Philip H. Knight Chair  
Professor of Biology  
Special Advisor to the President  
<https://www.uoregon.edu/~pphil>  
[pphil@uoregon.edu](mailto:pphil@uoregon.edu) | 541-346-0916

----- Forwarded message -----

From: **Julie Haack** <[jhaack@uoregon.edu](mailto:jhaack@uoregon.edu)>

Date: Fri, Apr 5, 2019 at 10:36 AM

Subject: Re: Conflict check for new bioengineering courses

To: Patrick Phillips <[pphil@uoregon.edu](mailto:pphil@uoregon.edu)>, David Tyler <[dtyler@uoregon.edu](mailto:dtyler@uoregon.edu)>

Cc: Nathan Jacobs <[ntjacobs@gmail.com](mailto:ntjacobs@gmail.com)>

Dear Patrick,

David Tyler and I had a chance to meet this morning and review the program proposal for the undergraduate bioengineering degree. Based on the proposal we received, we do not see any significant overlap with existing course offerings in the Department of Chemistry & Biochemistry. In addition, we do not anticipate that the proposed bioengineering courses and bioengineering major will negatively impact our department as a whole. We are excited about this new program and welcome the addition of new students, faculty and opportunities to our campus.

Thanks,

Julie

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Julie A. Haack, PhD  
Assistant Department Head and Senior Instructor II  
Department of Chemistry and Biochemistry  
1253 University of Oregon  
Eugene, Oregon 97403

Email: [jhaack@uoregon.edu](mailto:jhaack@uoregon.edu)

Phone: (541) 346-4604

Website: <http://chemistry.uoregon.edu/profile/jhaack/>

Connecting design and innovation to the science of sustainability.

On 3/30/19, 1:46 PM, "Patrick Phillips" <[pphil@uoregon.edu](mailto:pphil@uoregon.edu)> wrote:

Dear Dave and Julie,

As you know, we are in the process of creating a new undergraduate bioengineering degree in order to capitalize on the teaching capacity of new Knight Campus faculty and to expand our undergraduate offerings into engineering space. I believe that this move will be a big boon to all of the sciences at the UO because it will help bolster our standing a strong science campus with potential (very strong) students. This has long been an issue for us, despite the fact that we have the top science departments in the state. It is our hope and expectation that the Bioengineering Program will recruit new students to campus, leading to a net increase in the total number and quality of students in the sciences on

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I am naturally happy to answer any questions that you might have. Thanks so much for your help with this.

Patrick

P.S. We continue to have conversations about how to best support applied and translational work at the UO, and so I am always quick to bring up everyone's desire to see an applied chemistry degree come into being. There are various potential paths forward here, but it seems that we will probably need to see how the dust settles on the CAS organization discussion, although it seems that maintaining the status quo is the most likely outcome at this point.

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**Subject:** RE: Access to Chemistry courses for students in proposed Bioengineering program

**Date:** Tuesday, December 17, 2019 at 3:32:33 PM Pacific Standard Time

**From:** David Tyler

**To:** Jim Hutchison

Dear Jim,

Thanks for the email inquiring about providing access for bioengineering students to the following courses:

CH 221+227 or 224H+237

CH 222+228 or 225H+238

CH 223+229 or 226H+239

CH 331

I am writing to confirm that bioengineering students would have access to these lecture and lab courses. In particular, 1) because the bioengineering degree is a key priority for the institution and has the full support of the president and the provost, and 2) because CAS has always taken every possible step to make sure that required courses have capacity for students on campus, I have the full expectation that the University and CAS will be able to provide financial support for the following concepts:

- Bioengineering students will have the same registration priority and access to the courses listed in your email as Chemistry and Biochemistry majors.
- If needed, the Chemistry and Biochemistry Department will expand offerings of the courses to accommodate new and existing students.

Best Wishes,

David

David Tyler

Department Head

Department of Chemistry and Biochemistry

1253 University of Oregon

Eugene, OR 97403

(541) 346-4649

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## Nathan Jacobs

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**From:** Bruce Bowerman  
**Sent:** Tuesday, December 17, 2019 11:02 AM  
**To:** Jim Hutchison  
**Cc:** Nathan Jacobs  
**Subject:** Re: Access to Biology courses for students in proposed Bioengineering program

hi Jim,

I would be comfortable saying that BI 211 will be unrestricted and should be able to adjust to capacity demands due to the new BIOE major. This same assurance for BI 281H, which is deliberately maintained at a smaller class size, should be contingent on CAS providing additional resources to expand course offerings if this becomes necessary. Does this sound reasonable?

Bruce

On Dec 13, 2019, at 9:36 AM, Jim Hutchison <[hutch@uoregon.edu](mailto:hutch@uoregon.edu)> wrote:

Dear Bruce,

As you know, we are in the process of creating a new undergraduate degree in Bioengineering. As part of the program approval process, we have been asked to reach out to several departments to confirm that new students recruited to the program would have access to the courses required as part of the new degree. Please respond to this email or let me know if you have any questions. We've provide text below that provides the context for this request.

This program offers a unique opportunity to capitalize on the philanthropic and statewide investments in the Knight Campus and to expand UO's undergraduate offerings into the engineering space for the first time. It is our hope and expectation that the Bioengineering Program will recruit new students to campus, leading to a net increase in the total number and quality of students in the sciences on campus.

As part of the degree requirements, bioengineering students will be required to complete either BI 211 or 281H.

As I mentioned above, we are going through program reviews and have been asked by the Undergraduate Council to reach out to you to confirm that bioengineering students would have access to these courses. In particular, we would appreciate a response that includes the following statements:

- Bioengineering students will have the same registration priority and access to the above courses as Biology majors.
- If needed, the Biology Department will expand offerings of the above courses to accommodate new and existing students.

To provide scope to the expected demand, we plan to launch in fall of 2021 with an anticipated cohort of 25 students. This is expected to grow by approximately 25 students each year until a maximum

cohort of ~150 students is reached. For purposes of planning and to understand the context of the program, we have attached a 4-year Academic Plan to this email.

Please respond to us at your earliest convenience. There is some urgency to this request, because the Undergraduate Council would like to vote on this proposal by Dec 18.

I am happy to respond to any questions you may have and I am available to discuss any possible issues.

Best,

Jim

Jim Hutchison  
Lokey-Harrington Chair in Chemistry  
Senior Associate Vice President, Knight Campus for Accelerating Scientific Impact  
University of Oregon

<4-year Academic Plan.docx>

## Nathan Jacobs

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**From:** Daniel Dugger  
**Sent:** Tuesday, December 17, 2019 10:00 AM  
**To:** Nathan Jacobs  
**Cc:** Jim Hutchison  
**Subject:** Re: Access to Math courses for students in proposed Bioengineering program

Dear Nathan,

Speaking for the Math Department, I have reviewed your proposal for an undergraduate degree in Bioengineering. We fully support this proposal and think it will be a welcome addition to the UO undergraduate curriculum. There will be a few hurdles for us in terms of accommodating the number of new students this might generate, but nothing that strikes me as a red flag. The Math Department is used to seeing ebbs and flows of student demand due to other programs' changing needs, and we have never had serious problems adapting to those. In particular, I can attest that

- 1) Bioengineering students will have the same registration priority and access to the required Math courses as Math majors, and
- 2) If needed, the Math Department will expand offerings of the courses mentioned in your proposal to accommodate new and existing students.

Sincerely,

Dan Dugger  
Professor and Head  
Department of Mathematics

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**From:** Nathan Jacobs <njacobs2@uoregon.edu>  
**Sent:** Monday, December 16, 2019 5:25 PM  
**To:** Daniel Dugger <ddugger@uoregon.edu>  
**Cc:** Jim Hutchison <hutch@uoregon.edu>  
**Subject:** Re: Access to Math courses for students in proposed Bioengineering program

Dear Dan,

Thank you very much for your prompt response. I appreciate the recommendation that students with appropriate CIS background be able to choose MATH/DSCI 345 in place of MATH 343. We have updated our proposal accordingly. To clarify your question about bioengineering enrollment, we are preparing to have up to 100-125 students enter the program each year. I have included a table in this email to help illustrate the potential number of bioengineering students in each MATH class by year through the 2025/26 AY. I understand that this represents a significant number of new students across a range of MATH courses. We are in active conversations with UO leadership to solidify support for units, including MATH, that will play a key role in providing the math and science foundation necessary to ensure a successful bioengineering program at the UO. Thank you again for your consideration on this matter.

Best,

Nathan

Estimated bioengineering students in MATH courses by AY

	2021-22	2022-23	2023-24	2024-25	2025-26
MATH 251, 252, 253	15-25	40-50	50-75	75-100	100-125
MATH 256, 343 or MATH/DSCI 345		10-20	30-40	35-55	55-75

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**From:** Daniel Dugger <ddugger@uoregon.edu>

**Date:** Saturday, December 14, 2019 at 9:13 AM

**To:** Nathan Jacobs <njacobs2@uoregon.edu>

**Cc:** Jim Hutchison <hutch@uoregon.edu>

**Subject:** Re: Access to Math courses for students in proposed Bioengineering program

Dear Nathan,

I have two questions before I go ahead and sign off on this.

1) There are two possible interpretations of what you mean by "cohort", so I want to find out which you actually meant. Is the eventual goal to have 150 students in the program at one time (spread across 4 years), or is the goal to have 150 students \*entering\* the program at one time (so 150 students in each \*year\* of the program)? I'm assuming you meant the former, but the consequences of the latter interpretation are serious enough that I want to be sure.

2) As part of the new Data Science program, MATH and CIS will be offering a new course called MATH/DSCI 345

which is basically "MATH 343 for people with programming experience". That course is moving through the approval committees this year and should be live next year. I have attached a syllabus. I propose that you change

"MATH 343" in your proposal to "MATH 343 or MATH/DSCI 345". The 345 course will be better for many bioengineering students (though it will require more of a CIS prereq than you want to require of everyone in your program),

and allowing students to take either option will increase our ability to meet demand. Does this sound reasonable?

Dan

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**From:** Nathan Jacobs <njacobs2@uoregon.edu>

**Sent:** Friday, December 13, 2019 9:42 AM

**To:** Daniel Dugger <ddugger@uoregon.edu>

**Cc:** Jim Hutchison <hutch@uoregon.edu>

**Subject:** Access to Math courses for students in proposed Bioengineering program

Dear Dan,

I don't believe we have had the chance to meet yet. I am the curriculum development director for the Knight Campus for Accelerating Scientific Impact. As you know, the Knight Campus is in the process of creating a new undergraduate degree in Bioengineering. As part of the program approval process, we have been asked to reach out to several departments to confirm that new students recruited to the program would have access to the courses required as part of the new degree. Please respond to this email or let me know if you have any questions. We've provided text below that provides the context for this request.

This program offers a unique opportunity to capitalize on the philanthropic and statewide investments in the Knight Campus and to expand UO's undergraduate offerings into the engineering space for the first time. It is our hope and expectation that the Bioengineering Program will recruit new students to campus, leading to a net increase in the total number and quality of students in the sciences on campus.

As is typical in engineering, this program is highly quantitative and strong skills in mathematics are essential for student success. As part of the curriculum, bioengineering students will be required to complete the following five Math courses:

- MATH 251
- MATH 252
- MATH 253
- MATH 256
- MATH 343

As I mentioned above, we are going through program reviews and have been asked by the Undergraduate Council to reach out to you to confirm that bioengineering students would have access to these courses. In particular, we would appreciate a response that includes the following statements:

- Bioengineering students will have the same registration priority and access to the above courses as Math majors.
- If needed, the Math Department will expand offerings of the above courses to accommodate new and existing students.

To provide scope to the expected demand, we plan to launch in fall of 2021 with an anticipated cohort of 25 students. This is expected to grow by approximately 25 students each year until a maximum cohort of ~150 students is reached. For purposes of planning and to understand the context of the program, we have attached a 4-year Academic Plan to this email.

Please respond to us at your earliest convenience. There is some urgency to this request, because the Undergraduate Council would like to vote on this proposal by Dec 18.

I am happy to respond to any questions you may have and I am available to discuss any possible issues.

Thank you,

Nathan Jacobs

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**From:** Richard Taylor <rpt@uoregon.edu>

**Date:** Monday, December 16, 2019 at 2:34 PM

**To:** Jim Hutchison <hutch@uoregon.edu>

**Subject:** Re: Access to Physics courses for students in proposed Bioengineering program

Hi Jim

The below proposal has my full support. At some point, you might want to consider adding in the lab component of this course also (Physics 290).

As we discussed on Friday, Physics would be delighted to see the numbers increase to 150 students. At that Stage we would need to talk to the Dean regarding extra GE lines etc. However, for the current addition of 25 students, we can accommodate this in our current framework

Best wishes Richard

On Dec 13, 2019, at 9:33 AM, Jim Hutchison <[hutch@uoregon.edu](mailto:hutch@uoregon.edu)> wrote:

Dear Richard,

As you know, we are in the process of creating a new undergraduate degree in Bioengineering. As part of the program approval process, we have been asked to reach out to several departments to confirm that new students recruited to the program would have access to the courses required as part of the new degree. Please respond to this email or let me know if you have any questions. We've provide text below that provides the context for this request.

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The bioengineering curriculum relies on students developing a solid framework of general science principles, including a strong physics background. As part of the degree requirements, bioengineering students will be required to complete the Foundations of Physics series: PHYS 251, 252, 253. The associated laboratory courses will not be required.

As I mentioned above, we are going through program reviews and have been asked by the Undergraduate Council to reach out to you to confirm that bioengineering students would have access to these courses. In particular, we would appreciate a response that includes the following statements:

- Bioengineering students will have the same registration priority and access to the above courses as Physics majors.
- If needed, the Physics Department will expand offerings of the above courses to accommodate new and existing students.

To provide scope to the expected demand, we plan to launch in fall of 2021 with an anticipated cohort of 25 students. This is expected to grow by approximately 25 students each year until a maximum cohort of ~150 students is reached. For purposes of planning and to understand the context of the program, we have attached a 4-year Academic Plan to this email.

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Best,

Jim

Jim Hutchison  
Lokey-Harrington Chair in Chemistry  
Senior Associate Vice President, Knight Campus for Accelerating Scientific Impact  
University of Oregon

<4-year Academic Plan.docx>

**From:** Nathan Jacobs <njacobs2@uoregon.edu>

**Sent:** Monday, November 18, 2019 3:57 PM

**To:** Katy Lenn <klenn@uoregon.edu>

**Cc:** Jana Prikryl <jprikryl@uoregon.edu>; Mike Hahn <mhahn@uoregon.edu>; Jim Hutchison <hutch@uoregon.edu>

**Subject:** RE: BS undergraduate degree in bioengineering

Hi Katy,

Thank you for reaching out. I appreciate your concern and the opportunity to discuss the impact on the Libraries that a new program in bioengineering may have. Although bioengineering is, in a sense, completely new to UO, it leverages many of the preexisting strengths of the university. A few especially important examples include biology, chemistry and biochemistry, physics, human physiology, computer science, mathematics, and materials science. In my opinion, the Libraries' support of these programs has placed UO in a strong position to support bioengineering as well. The university already provides access to a majority of what I believe are the most important collections and databases for bioengineering (I have compiled a list of these below).

I have also tried to determine if any standards exist with regards to library resources/support for bioengineering programs. I was unable to find any formal guidelines; however, I found a few universities that did specifically list their bioengineering-related resources. Again, UO already subscribes to a competitive number of these.

I would be happy to meet in person or by phone to discuss this issue further if you think it would be beneficial. Please don't hesitate to let me know if you have any further concerns.

Thank you,

Nathan

#### **UO Libraries Bioengineering-Related Resources:**

##### **Medline**

##### **Web of Science**

##### **IEEE Xplore**

**ScienceDirect** - A few especially relevant journals from this service are:

- J Biomechanics
- Osteoarthritis and Cartilage
- Biomaterials
- the Spine Journal
- J Bioscience and Bioengineering
- Biophysical Journal

**Springer Biomedical and Life Sciences** - A few relevant journals from this service are:



- Annals of Biomedical Engineering
- Applied Magnetic Resonance
- Archives Computational Methods in Engineering
- Applied Biochemistry and Biotechnology
- Applied Bioinformatics
- Applied Biological Chemistry
- Annals Solid & Structural Mechanics

**Morgan and Claypool -**

- Synthesis lectures on Biomedical Engineering
- Synthesis Digital Library of Engineering and Computer Science
- Colloquium Digital Library of Life Sciences
- Synthesis Lectures on Tissue Engineering

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**From:** Katy Lenn <klenn@uoregon.edu>  
**Sent:** Friday, November 15, 2019 4:53 PM  
**To:** Mike Hahn <mhahn@uoregon.edu>; Nathan Jacobs <njacobs2@uoregon.edu>  
**Cc:** Jana Prikryl <jprikryl@uoregon.edu>  
**Subject:** BS undergraduate degree in bioengineering

Hello Mike and Nathan,

I am a member of the Undergraduate Council. I was impressed with your proposal for a new BS undergraduate degree in bioengineering.

One of the areas I am concerned with is the Libraries ability to support the instructional and research needs of both faculty and students in this new area. I believe this will be a new collecting area for the Libraries and I am wondering what materials you will need and how the purchase of these materials will be funded. I don't need an immediate response but I am sending this along to you now as I know it will come up at the Undergraduate Council meeting next week.

Thank you,

Katy Lenn  
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