



Bioengineering PhD Program Handbook 2021-2022



Oregon State
University



UNIVERSITY OF
OREGON

University of Oregon (UO)/Oregon State University (OSU) Joint PhD Program

Program Overview

The UO/OSU Joint PhD program provides an unrivaled research and training environment that will prepare you to excel in private, government and academic sectors through a combination of technical, innovation, entrepreneurial and professional training. You will draw on the combined strengths of both institutions to tackle the complex, interdisciplinary research challenges in bioengineering and accelerate your progress toward successful careers. Further, you will gain 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 is threaded throughout your coursework and research experience to accelerate your progress toward your degree and career.

The joint graduate program offers you many benefits relative to programs sited on a single campus. These benefits include:

1. Enhanced education by tapping broader and deeper faculty expertise in the collaborative development and delivery of educational content;
2. Enhanced research collaborations between the two campuses that result from frequent, substantive faculty and student interactions;
3. Elevation of the Program's national brand, rankings and industry reputation by tapping a larger critical mass of faculty mentors and expertise;
4. Accelerated education and research progress by sharing complementary educational and research facilities; and
5. Expanded employment opportunities through a broader network of external relationships.

You will have complete access to courses, research opportunities, libraries, and other facilities at both OSU and UO, and upon selecting a permanent lab, you can assemble a thesis committee with appropriate faculty from both campuses. Upon graduation, you will receive a diploma issued by both institutions.

Home Campus

Your primary research home, and the place where you receive your student services, is your "home campus". You are initially admitted to a home campus based upon your research interests and the alignment of those interests with the faculty at that campus. The home campus provides an administrative home to students and manages all student experiences that must be tied to a location (e.g., health and student services, Graduate School forms and procedures, recreation center access, and athletic programs). Regardless of home campus, students will have the same core coursework, program requirements, and thesis milestones; however, there may be minor differences in the approach to these milestones between

campuses. All students in the Joint Program will have complete access to courses, research opportunities, research facilities, and libraries at both OSU and UO.

Your home campus should match the administrative home of your primary research advisor's laboratory. Students can petition to change their home campus should there be a need to change their primary advisor. A home campus change is expected to be utilized infrequently, typically as a result of an unanticipated change in advisor or laboratory location.

Program requirements

This section defines the requirements for all students within the joint program. Although the core requirements are the same, some of the details of implementation are governed by the academic policies of the home campus. Additional details regarding these policies are provided in the appendices provided for each of the home campuses. Note that students serving as teaching assistants will have some additional responsibilities related to their teaching appointment.

A. Enrollment:

You must maintain full-time enrollment at your home campus. Please consult the appendices for additional guidance.

It is possible for students to take a leave of absence to pursue internships or other opportunities outside the university for a limited duration. We recommend that students first meet with their thesis committee and establish a plan for reengaging with their degree program upon return from leave. Please consult the appendices for additional guidance for your home campus.

B. Required coursework:

Students are required to complete a combination of bioengineering core courses, a professional development series, and electives. Students are required to maintain an average 3.0 GPA.

Bioengineering Core:

BIOE 511 (OSU): Cellular and Molecular Bioengineering (3 Cr) -or- BIOE 611* (UO): Tissue Engineering (3 Cr)

BIOE 512 (OSU) or BIOE 612* (UO): Modeling of Physiological Systems (4 Cr)

BIOE 513 (OSU): Drug and Medical Device Regulation (3 Cr)

BIOE 614* (UO): Technology Ventures: From Concept to Commercialization (3 Cr)

*UO courses are in the process of regularization and approval and will be delivered as BIOE 610 for academic year 2021-2022. Please contact Nathan Jacobs at njacobs2@uoregon.edu with any questions.

Professional Development:

You are required to complete professional development training that includes career planning, communication training and a course on the ethical conduct of research. Please see the appendix for details on the requirements at each home campus.

Electives:

You are required to complete elective coursework in bioengineering or related fields. Courses can include any graduate-level course across UO or OSU. We recommend that you consult with your research advisor and committee about selection of elective courses. Please see the appendix for details on the approval process for elective courses on each home campus.

C. Other joint program requirements

On the way to your PhD, you will achieve a series of milestones related to your research training and thesis work. As a joint program, each of the components in this set of requirements is the same on both campuses; however, slight differences exist in the method of execution between campuses. Please see the appendices for details on your home campus procedures.

- Establish thesis committee by end of spring term of first year
- Initial thesis committee meeting – before the end of fall term of second year
- Advancement exam – typically last half of spring term of second year
- Annual review meetings with thesis committee – each year after advancement
- Dissertation submission and thesis defense

Appendix A: Procedures for UO Home Campus Students

Approved by the UO BIOE faculty on May 19, 2021

Enrollment

Students must maintain full-time enrollment. Full-time enrollment is 12 credits, however Knight Campus students are encouraged to register for 16 credits per term.

- Credits each term will be a combination of required courses, electives, research credits (prior to advancing to candidacy) and dissertation credits (after advancement to candidacy). Students should first register for any courses they wish to enroll in, then register for however many research/dissertation credits are needed to total 16 credits.
- While completing required coursework, students will typically register for two bioengineering core or elective courses per term. After completing required coursework/advancing to candidacy, enrollment may consist entirely of dissertation credits or a combination of course and dissertation credits, as determined by the student and their advisor.
- Students do not formally enroll during the summer, nevertheless they are expected to participate in full-time research over summer terms consistent with their GE appointment, unless specific arrangements have been made with research advisor and thesis committee.
- Students wishing to take a leave of absence to pursue internships or other opportunities outside the university for a limited duration must first meet with their thesis committee and establish a plan for reengaging with their degree program upon return from leave.

Course advising and electives

- Students are required to complete at least 10 credits of electives and four professional development credits. Courses can include any graduate-level course across UO or OSU, however, courses taken outside of the BIOE subject code must be approved by curriculum advising team in consultation with your research advisor.

Professional development series

Knight Campus graduate training programs prioritize the acquisition of strong professional skills and proactive career exploration as complements to advanced research training. The overarching goal of this training program is to jump start, accelerate and support your research productivity and career preparation.

You are required to complete 4 credits of professional development, including:

- Participation in Impact Week, Poster Workshop and participation in Oregon Bioengineering Symposium during first and second year (1 Cr)
- Ethical Considerations in Research and Innovation (1 Cr)

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- Writing for Impact (1 Cr)
- Grant writing and fellowship application workshop (1 Cr)

Establishing your Thesis Advisory Committee.

Knight Campus PhD students will assemble their thesis advisory committees during the spring term of their first year. The composition of the committee shall include:

- The primary research advisor (the student's PI);
- An additional BIOE faculty member from the UO;
- A BIOE faculty member from OSU;
- If the student is co-advised, the co-advisor shall be on the committee, otherwise a committee member having some relevant content expertise may be selected from the graduate faculty at-large at OSU or UO. (Note: This position may be filled by someone from outside the UO, but must meet certain criteria. Please consult with the Knight Campus Academic Business Coordinator (Khaila Carlstrom) if this is of interest.); and
- A UO faculty member from outside BIOE. The role of the "Outside Member" is to provide outside advocacy for the student, and they may come from any discipline.

You should work with your advisor to identify potential committee members. The next step is to contact each candidate to determine if they are willing to serve on the committee. You should ask one of the members (a UO faculty member, excluding advisors and the outside member) to serve as chair of the committee. Once all members have agreed, communicate the proposed committee composition to the Knight Campus Academic Business Coordinator (Khaila Carlstrom).

Initial thesis committee meeting (*Fourth-Term Review*)

During the fourth term of residence (usually the Fall term of the second year), you are required to meet with your thesis advisory committee. The purpose of this meeting is to assess your early progress toward the Ph.D. degree. During the meeting, your progress towards completion of course requirements will be discussed and your committee will review your ideas and progress towards a thesis. The fourth-term review has two parts:

1. Report: Submit 5-10-page report that includes an introduction to your thesis project, a summary of early progress and your initial ideas and plans for the thesis. This report is due to your committee one week before the scheduled review.
2. Talk: You should also prepare a 15-20-minute talk introducing the project and describing progress to date and proposed work. This talk will be a framework for the discussion at the review.

This review is not a pass/fail situation, but should be viewed as an opportunity for you to get better acquainted with your thesis committee and to discuss research ideas and goals with them.

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Prior to the meeting, update your Individual Development Plan (IDP) and discuss it with your advisor. You will also want to check in with your committee chair to discuss the format of the meeting.

All members of the committee should be invited to the meeting, but the outside member is not required to attend. Immediately following the review, you will be given an oral evaluation of your performance to date. In addition, a brief report summarizing the meeting and the committee's assessment of your progress will be forwarded for placement in your student file. A copy of the report will be sent to you. The program will notify you when it is time to schedule the meeting.

Advancement to candidacy exam

Students typically undergo this examination during the sixth (6) regular term of their graduate career (excluding summers). The purpose of the advancement to candidacy exam is to assess your academic preparation and ability to successfully carry out research at the doctoral level. These criteria are evaluated in the context of your presentation of a research report/thesis proposal. You should be able to place your research in the context of the field, report significant research progress and present an understanding of the future direction of the research that will ultimately constitute the basis of your thesis.

To advance to candidacy, a student must:

1. Have completed all of his/her required, elective and professional development coursework with at least a 3.0 GPA,
2. Prepare a research report and initial thesis proposal (details below), and
3. Orally defend the research report in an Advancement to Candidacy Exam.

The research report should place your research in context, detail your research accomplishments while working in the mentor's research group, and define future directions and possible extensions of this research area as it pertains to your proposed thesis. The purpose is to assess both your depth of knowledge in the field and research progress. Since students are expected to have worked closely with their advisor on the research work accomplished and future directions of the work, students are encouraged to discuss the content of the research report with their mentor and other faculty. Manuscripts submitted or in preparation can be submitted in lieu of a formal research report if authorized in advance by the committee. A brief document (2-3 pages) outlining future directions should be included with the manuscript(s) if this option is taken.

Prior to the meeting, update your IDP and discuss it with your advisor. You will also want to check in with your committee chair to discuss the format of the meeting.

The Advancement to Candidacy oral defense will test your ability to think on your feet when confronted with probing questions and to demonstrate specific, as well as the foundational knowledge that is important to your field of study. In both the written and oral presentations, you should stress the question(s) to be examined and indicate clearly how a successful completion of the proposed research would answer the questions posed. Students are advised to prepare a 20-minute talk that complements the written report. Numerous questions from

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the committee will lengthen the presentation beyond the twenty minutes prepared time. Generally, 1.5 hours are required for a discussion of your report and future plans.

All members of the committee must attend the advancement exam. The student's advisor will not participate in voting on the outcome of the exam. There are three possible outcomes of the advancement to candidacy exam. Students can pass unconditionally; they can be asked to rewrite selected part(s) of the report or to fulfill certain other obligations; or they can fail. Immediately following the exam, students will be given an oral evaluation of the outcome. In addition, a brief summary of the meeting and the committee's assessment of the student's performance will be forwarded to the program for placement in your file. You will receive a copy of the report. In the event that you are required to rewrite and/or redefend portions of the exam, written and verbal guidance will be provided about what could help you in a reexamination. A student in this situation should work closely with the committee chair to determine the best course of action.

Ongoing committee engagement and subsequent annual reviews of academic progress

You are encouraged to reach out to your committee chair and other members of your committee outside formal committee meetings to seek their advice on mentoring and/or to tap their scientific expertise.

Each year following advancement to candidacy, you are required to meet with your thesis advisory committee during Winter term. For third year students, the annual review may coincide with the 3rd-year departmental research seminar. The program will notify you when it is time to schedule the review. You should contact all members of your committee and try to accommodate their schedules in arranging a meeting. It is not necessary for all members to attend each year, but a minimal group consisting of the student's thesis advisor, the committee chair, and one other member must be present. Prior to the meeting, update your IDP and discuss it with your advisor. You will also want to check in with your committee chair to discuss the format of the meeting.

1. Report: You are expected to write a brief report, usually 5-10 pages, summarizing research progress and plans for the coming year. You should also provide a list of other academic activities since the last Annual Review, such as courses taken for a grade, seminars presented and scientific meetings attended, at the beginning of the report. Finally, please describe your plans for completion of your thesis.
2. Talk: You should be prepared to give a short talk (15-20 minutes) on your work, including a brief introduction, suitable for any committee members who are not specialists in the immediate area of research. You should also provide your committee with a brief update on your IDP, including steps you are taking to prepare for the next stages of your career.

Immediately following the review, you will be given an oral evaluation of their progress. In addition, a brief summary of the meeting and the committee's assessment of your progress will be forwarded to the program for placement in the student's file. A copy of the report will be sent to you. Completion of annual reviews is required to maintain a student's academic

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standing. Failure to complete the reviews in a timely fashion means that the student is not making satisfactory progress and may not be eligible for financial support as a GE.

Thesis defense

As you near the completion of your thesis work and have reached an agreement with your committee on a projected defense date, it is time to finish writing your thesis and plan your thesis defense. All the procedural details for submitting your thesis and holding your defense can be found on the Graduate School website:

<https://gradschool.uoregon.edu/academics/policies/doctoral/oral-defense-procedures>

The public defense of your thesis must take place on campus at a date that you set in consultation with your committee chair and approved by the Graduate School. Tentative approval of the dissertation by the committee is required prior to the formal defense. This approval should be based on evaluation of copies of the final manuscript, which the candidate provides for the dissertation committee **at least 3 weeks before** the formal defense.

You should check the graduate school website to ensure that you meet all the relevant deadlines. Some of the key deadlines include:

- To graduate in a given term, the oral defense must take place by **Friday of week 9** of that term.
- The deadline to apply for oral defense is **3 weeks before** the defense date.
- The signed Certificate of Completion must be submitted to the Graduate School **within 2 weeks** after the defense, or by the published deadline, whichever is earlier.
- The final, committee-approved dissertation must be [uploaded](#), along with the Thesis/Dissertation Approval Form, by **Monday of week 11** of the term of graduation.

Key Milestones and Progress

First year

- Participate in Impact Week and new student advising
- Meet with course advising team and submit plan of study (during Impact Week)
- Start research
- Meet with Impact Team for quarterly follow-up on IDP and plan of study
- Take Professional development series
- Establish thesis committee by end of spring term

Second year

- Initial thesis committee meeting –fall term, no later than 10/31
- Complete course requirements – spring term (must maintain 3.0 GPA or better)

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- Advancement exam – typically last half of spring term
 - Research report and proposal
 - Oral defense of reports

Third year and beyond

- Annual review meetings with thesis committee – winter term each year
- Present at department or Knight Campus seminar – at least once during year 3

Thesis defense

Appendix B: Procedures for OSU Home Campus Students

GENERAL INFORMATION

The administrative home for OSU home campus students is the School of Chemical Biological and Environmental Engineering (CBEE). Students are encouraged to contact the CBEE graduate program coordinator Amy Thomson (amy.k.thomson@oregonstate.edu) if they have any questions.

All Bioengineering PhD students must achieve a series of milestones that include coursework, a research project with guidance from the thesis committee, a preliminary oral examination, and a written dissertation and final examination. Details about each of these requirements are provided below.

For other regulations relevant to OSU graduate students, see the OSU Graduate School Catalog (<https://catalog.oregonstate.edu/college-departments/graduate-school/#policiestext>).

COURSEWORK REQUIREMENTS

RECOMMENDED PREREQUISITE COURSEWORK

The following is recommended prerequisite coursework to prepare you to be successful in the Bioengineering Graduate Program.

Students with a B.S. degree in a non-engineering field are strongly encouraged to take the following courses prior to enrolling in the BIOE core courses:

- Math through Differential Equations
- One year of Physics
- A course on computer programming (e.g., Matlab)

REQUIRED COURSEWORK

In total, PhD students must complete at least 108 graduate credits. Of these, at least 36 must be thesis credits (BIOE 603). No more than 15 credits of blanket-numbered courses, other than thesis, may be counted toward the 108 credit minimum (blanket courses are courses with a zero as the second number, e.g., CBEE 507). A minimum of one year of residence, continuously, at OSU (i.e., three consecutive quarters as a full time student) is required. In addition, students must take the BIOE core, professional development courses, research seminar and electives, as detailed below.

BIOE Core Courses:

All BIOE graduate students are required to take the following BIOE core courses:

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BIOE 511 (OSU): Cellular and Molecular Bioengineering (3 Cr) -or- BIOE 611* (UO): Tissue Engineering (3 Cr)

BIOE 512 (OSU) or BIOE 612* (UO): Modeling of Physiological Systems (4 Cr)

BIOE 513 (offered remotely via OSU): Drug and Medical Device Regulation (3 Cr)

BIOE 614 (offered remotely via UO): Technology Ventures: From Concept to Commercialization (3 Cr)

Professional Development:

All newly enrolled students are required to take the full professional development series, CBEE 507 Professional Development, during their first year (3 total credits). The professional development series is intended to develop your understanding of the profession, to introduce the research activities that take place in the School, and to develop professional skills including literature searching and citations, communication skills, ethics, and navigating graduate school.

Research Seminar:

Research seminars give students the opportunity for broad exposure to new research in bioengineering. In year two and beyond, all enrolled students holding a GRA/GTA position are required to register for CBEE 507 Seminar: Presentation, all terms(F/W/Sp). In addition, students are encouraged to attend the Oregon Bioengineering Symposium each fall.

Elective Course Selection:

At least 14 credits of elective courses are required. Electives must be non-blanket courses. At least seven of the elective credits must be from graduate stand-alone courses. The remaining credits can be the 500 component of 400/500 slash courses.

Elective courses should be selected in consultation with your faculty advisor. Consideration should be given to your research area, your background, and achieving a balance between breadth and depth. Typically, students choose a range of courses in each of the following categories: engineering fundamentals, mathematics and statistics, biomedical science, and bioengineering. Some representative OSU courses in each of these categories are provided below. (This is a non-exhaustive list.) Joint program students can also take elective courses at the UO.

Bioengineering:

<i>Course number</i>	<i>Course title</i>	<i>Credit hours</i>
BIOE 545	Surface analysis	3
BIOE 557	Bioreactors	3
BIOE 562	Bioseparations	3
ECE 599	Bioelectronic Systems and Devices	3
ECE 599	Biosensors and Medical Devices	3
CS 546	Networks in Computational Biology	3
IE 545	Human Factors Engineering	4
ROB 567	Human-Robot Interaction	4
ROB 562	Human Control Systems	4

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KIN 525	Biomechanics of Musculoskeletal Injury	3
H 594	Applied Ergonomics	3
ME 513	Bio-Inspired Design	4
NSE 583	Radiation Biology	3

Biomedical Sciences:

<i>Course number</i>	<i>Course title</i>	<i>Credit hours</i>
VMB 521	Animal Models	3
VMB 652	Cancer Systems Biology	3
VMB 670	Introduction to Systems Biology	2
VMB 671	Molecular Tools	3
VMB 672	Molecular Approach to Cancer	1
VMB 673	Comparative Immunology	3
VMB 674	Vaccines and New Therapies	3
BB 585	Applied Bioinformatics	3
BB 586	Advanced Molecular Genetics	3
BB 590	Biochem 1: Structure & Function	3
BB 591	Biochem 2: Metabolism	3
BB 592	Biochem 3: Genetic Biochem	3
PHAR 525	Foundations of Drug Action I	3
PHAR 537	Bioorganic Chemistry	3
PHAR 547	Antibiotics and Infectious Disease	3
PHAR 548	Drug Actions in Immunology	3
PHAR 563	Cancer and Chemoprevention	2
PHAR 572	Applied Biopharmaceutics & Pharma	3
PHAR 574	Nanomedicine	3
PHAR 591	Pharmacology I	5
PHAR 594	Advances in Manipulating the Human Genome	3

Mathematics and Statistics:

<i>Course number</i>	<i>Course title</i>	<i>Credit hours</i>
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
VMB 631	Mathematical Modeling of Biological Systems	3

Engineering Fundamentals:

<i>Course number</i>	<i>Course title</i>	<i>Credit hours</i>
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

Program of Study:

A program of study form must be approved during a meeting with the student's committee and filed with the graduate school. The program of study defines the student's path to completion

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of coursework, and, once approved, it becomes the obligation of the student to complete the requirements as formulated. Doctoral students are required to submit the program of study form by the fifth term, but students are encouraged to complete the program of study early so they can get input from their committee. Changes in the program may be made by submitting a [Petition for Change of Program form](#) available in the Graduate School.

Transfer Credit:

Eligible graduate coursework completed previously can be transferred for credit towards the doctoral degree with the consent of the student's doctoral committee. Completion of the [Transfer Credit Request Form](#) is required if these credits were obtained outside of OSU.

ADVISOR SELECTION

Students entering the program on a teaching assistantship in the School of CBEE typically do research rotations and should select a research advisor during their first term at OSU. With assistance from CBEE, students will identify and contact faculty members to set up a meeting to discuss research opportunities. In addition to meeting with faculty, it can also be helpful to meet with graduate students, attend lab meetings and visit the lab. At the end of the term, students will submit an Advisor Selection Form listing their top three choices for preferred advisors. The selection process will be finalized by the start of the next term. The student must sign a "letter of intent" to work with the specific advisor. This agreement is binding except in extraordinary circumstances. If a student believes a change of advisor is warranted they are encouraged to talk with the Graduate Program Coordinator.

DOCTORAL COMMITTEE

The principal authority over a student's program resides with the student's Doctoral Committee. This committee is responsible for assuring that University and School requirements are satisfied, monitoring student progress, assigning and approving courses of study, approving dissertation topics and paths-forward, and administering preliminary and final oral examinations. The committee is typically formed during spring term of the first year.

The committee consists of at least 5 members:

- the student's research advisor;
- an additional BIOE faculty member from OSU;
- A BIOE faculty member from UO;
- the student's minor professor, or if no minor is selected, committee member may be from graduate faculty at-large at OSU or UO; and
- one Graduate Council Representative (GCR). The role of the GCR is to provide outside advocacy for the student, and they may come from any discipline outside of BIOE.

The committee is originally formed, with approval from the research advisor, at the student's invitation. The Graduate Council Representative is selected from a list generated by the [online GCR list generation tool](#). The GCR is a permanent member of the committee and *must* attend all

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committee meetings, including the preliminary program of study committee meeting, the preliminary oral examination, and the final examination (dissertation defense).

PRELIMINARY ORAL EXAMINATION

The purpose of the preliminary oral examination is for the student to demonstrate their (i) ability to formulate a research plan, (ii) ability to communicate clearly, and (iii) understanding of the bioengineering content. Students must successfully complete the examination to advance to candidacy in the PhD program. The preliminary oral examination is taken near the completion of all course work on the Program of Study, typically around spring quarter of the second year.

To schedule the preliminary oral examination, students must contact the members of the committee to arrange the date, time, and place, then schedule the examination with the Graduate School not less than two weeks before the examination using the [Exam Scheduling Form](#). Students must be formally enrolled (for a minimum of 3 credits) during the term in which the examination takes place.

For the preliminary oral examination, students must write a research proposal on a topic provided by their advisor, orally defend the research proposal, and answer questions from their committee on the proposal topic, as well as topics from the student's coursework. The written proposal should be submitted to the committee at least one week prior to the oral examination. The default format for the written document is that of the [NIH F31 proposal](#) (i.e., 1 page for specific aims and 6 pages for research strategy). Deviations from this format, that support the student's professional development (e.g., the student is writing a proposal for another grant mechanism that has slightly different formatting requirements), are allowed if agreed upon by the advisor and student.

The topic of the research proposal typically matches the student's anticipated PhD research, and provides an opportunity to propose extension of the research into new areas. Students are welcome to discuss the contents of the proposal with their faculty advisor, committee and peers, but the written document should be prepared independently by the student. The faculty advisor should formally provide the proposal topic to the student and thesis committee three weeks before the written document is due to the committee. However, students are encouraged to discuss potential proposal topics with their advisor earlier.

ANNUAL COMMITTEE MEETINGS

After completing the preliminary oral exam and advancing to candidacy, students should schedule annual committee meetings to present their research progress and plans for completing their doctoral research. The purpose of these meetings is to allow the committee to provide feedback to the student on their plan of research.

EXPECTATIONS FOR RESEARCH DISSEMINATION

Dissemination of research findings is vital to the success of our graduates and the reputation of our graduate program. Research can be disseminated in various ways, including presentations at scientific conferences, peer-reviewed publications and patents. It is generally on the basis of these presentations and publications that the quality and impact of one's research endeavors is assessed and potential for future success evaluated. Stated another way, simply completing a Ph.D. dissertation is generally not sufficient for attainment of the career goals of students and faculty.

In general, students give at least three presentations and publish about three manuscripts on the basis of their Ph.D. dissertation research. Students will have ample opportunity to present their work and hone their scientific communication skills. In particular, students are encouraged to give at least one oral presentation during CBEE seminar, and to present a poster at the CBEE open house, which takes place each fall. In addition, students are encouraged to present their work at the Oregon Bioengineering Symposium, which is a one-day conference that takes place each fall. Specific expectations for research dissemination, including guidelines and timelines, are matters to be arranged between students and their faculty advisors.

DOCTORAL DISSERTATION & FINAL ORAL EXAMINATION

All Ph.D. candidates must submit a thesis embodying the results of research and presenting evidence of originality and ability in independent investigation. The thesis must constitute a valid contribution to knowledge in the field of study and must be based on the candidate's own investigation, including one or more of the following elements:

- Contribution to theory,
- Development of a new method or technology,
- Generation of new scientific data that clearly advances the science, and
- Development and/or novel implementation of a numerical model.

The thesis must reflect a mastery of the literature of the subject and be written in scientific format. Thesis guidelines are available at <http://gradschool.oregonstate.edu/success/thesis-guide>. We recommend that students use a "manuscript-based" thesis format, in which multiple published or draft publications are bundled into a single thesis document.

The results from studies conducted using human subjects without obtaining Institutional Review Board approval shall not be used to satisfy doctoral dissertation requirements. For more information, please send an email to irb@oregonstate.edu or visit the IRB website at <http://oregonstate.edu/research/irb/>.

After completion of or while concurrently registered for all work required by the program, the student must pass a final oral examination. The final oral examination **must be scheduled in the Graduate School not less than two weeks prior** to the date of the examination. The final oral examination should be scheduled for at least two hours. The Graduate Program

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Coordinator must also be notified for announcement in the School of CBEE no less than two weeks prior to the examination date.

The initial portion of the final oral examination is open to all interested persons. After the open portion of the exam, the examining committee excludes all other persons and continues with the examination of the candidate's knowledge of his or her field. The committee then votes on whether or not the student should pass. If more than one negative vote is recorded by the examining committee, the candidate has failed the examination. **Only one re-examination is permitted.**

The final oral examination must be taken within five years after the preliminary oral examination. If more than five years elapse, the candidate is required to take another preliminary oral examination.

When scheduling their final oral examinations, doctoral students are **required to submit** the pretext pages of their dissertations to the Graduate School **at least two weeks prior to the final oral examination**. Pretext pages include the abstract, copyright (optional), title page, approval page, acknowledgment page, contribution of authors, table of contents, list of figures, tables, appendices, dedication (optional), and preface (optional). It is expected that students will distribute examination copies of their dissertation to all committee members, including the Graduate Council representative, at least two weeks prior to the student's final oral examination.

Within six weeks after the final oral examination or before the first day of the following term, whichever comes first, students must upload one PDF copy of the thesis, without signatures, electronically to ScholarsArchive and submit the signed ETD submission approval form with a copy of the title page to the Graduate School. Signatures on the ETD submission approval form can be electronic, signed, scanned and emailed or faxed. If final submission occurs after the initial six-week period, the student may be subject to re-examination. Please refer to the Graduate School's website for complete details.

Within **six weeks** of the final oral examination, one printed copy your thesis must be submitted to the School of CBEE main office for binding and archiving in the CBEE thesis library.

TIMELINE AND CHECKLIST

On the following page is a brief list of the steps required to obtain the PhD degree. You should also become familiar with the specific and detailed information contained in the Graduate School Catalog as well as School requirements.

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Procedures for PhD Students			
Check Box	Item #	Step	Timing
	1	Identify a Major Professor (research advisor)	By the end of the 1st term
	2	Select a committee with the help of your advisor	By the end of your first academic year
	3	Generate Grad Council Rep (GCR) list ; and contact those people until you find someone willing to serve as your GCR	
	4	Schedule doctoral program meeting with all committee members and reserve a room	
	5	Doctoral program meeting: Print Doctoral program meeting checklist and take to the meeting	
	6	File Doctoral Program of Study	
	7	Schedule the Preliminary Oral Examination with your committee and reserve a room	AT LEAST 2 weeks prior to preliminary oral examination
	8	Review Preliminary Oral Examination Scoring guide	
	9	Complete and Submit Exam Scheduling Form	
	10	Complete preliminary oral examination	Spring Term, Second Year
	12	Hold regular meetings with your Committee to keep them updated on your progress	Throughout your degree progression (at least once a year)
	13	Read the Thesis Guide on the Grad School's website	Prior to starting your dissertation
	14	Compare Doctoral Program of Study form and transcripts for consistency	1 term before your intended graduation term
	15	File Petition to Change Program form if needed.	
	16	File a Diploma Application	15 weeks prior to final oral examination
	17	Complete final draft of your dissertation and submit it to your major professor for review and approval	By the start of your last term
	18	Schedule the final oral examination with your committee and reserve a room	AT LEAST 2 weeks prior to final oral examination
	19	Submit final oral examination announcement to Graduate Program Coordinator for circulation	
	20	Review final oral examination scoring guide	
	21	Complete Exam Scheduling Form	
	22	Submit dissertation pretext pages to the Graduate School	

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23	Submit a final draft dissertation to all committee members (with advisor's approval)	
24	Confirm final oral examination appointment with the Grad School (make sure it's on their calendar!)	1 week after submitting exam scheduling form
25	Remind (e-mail) Committee of the final oral examination	2 days prior to final oral examination
26	Complete final oral examination	NO EARLIER THAN 1 term after passing preliminary oral examination
27	Submit final copies (See Submission Instructions)	Within 6 weeks of the exam or by the first day of the next term, whichever is first; <i>if you miss the deadline, you will be required to register for an additional 3 credits, no exceptions!</i>
28	Print copy of dissertation for School binding; submit to CBEE Office Coordinator.	
29	Graduate School Survey will be emailed to you. If you complete it a gift will be mailed to you.	A month after graduation

NOTES ABOUT THE CHECKSHEET

- Although it is not included in the checklist, dissemination of research findings is essential and is expected to occur throughout your time in the PhD program. The timing of research presentations and manuscript preparation will depend on your research progress and should be discussed with your faculty advisor.
- Give yourself and your committee members a lot of time to plan for the defense date. Sometimes committee members will be on sabbatical leave during the term in which you plan to defend. You should check with your committee members about such leaves far in advance to better plan, especially if you need to change a committee member for any reason. Note that your GCR must attend all meetings and examinations during your degree program.
- The Diploma Application must be filed no later than week two of the term in which you defend. However, completion of the form a term or two early is OK. If you need to change your end term after you file a Diploma Application, simply fill out the application again.
- When you confirm your defense exam date with the Graduate School, you are making sure your exam is on their calendar. If they are not aware of your defense date, even if you filled out all the paperwork, you will not be allowed to defend and will have to reschedule.

Appendix B: OSU Home Campus Procedures

CURRICULUM CHART FOR BIOENGINEERING PHD STUDENTS

						Total Credits
Year 1	Fall	CBEE 507 Grad Seminar Prof. Dev. 1 cr	BIOE 511 Cell & Molecular BioE 3 cr	BIOE 512 Modeling of Phys Systems 4 cr	Grad Minor or Elective 3-4 cr	12
	Winter	CBEE 507 Grad Seminar Prof. Dev. 1 cr	BIOE 513 Drug & Med Device Regs in Tech Dev 3 cr	Grad Minor or Elective 3-4 cr	BIOE 603 PhD Thesis Variable 1-12 cr	12
	Spring	CBEE 507 Grad Seminar Prof. Dev. 1 cr	BIOE 614 Tech Ventures: Concept to Commercialization 3 cr	Grad Minor or Elective 3-4 cr	BIOE 603 PhD Thesis Variable 1-12 cr	12
Year 2	Fall	CBEE 507 Grad Seminar Presentation 1 cr	Grad Minor or Elective 3-4 cr	BIOE 603 PhD Thesis Variable 1-12 cr		12
	Winter	CBEE 507 Grad Seminar Presentation 1 cr	Grad Minor or Elective 3-4 cr	BIOE 603 PhD Thesis Variable 1-12 cr		12
	Spring	CBEE 507 Grad Seminar Presentation 1 cr	BIOE 603 PhD Thesis Variable 1-12 cr			12
Year 3-5	Fall	CBEE 507 Grad Seminar Presentation 1 cr	BIOE 603 PhD Thesis Variable 1-12 cr			12
	Winter	CBEE 507 Grad Seminar Presentation 1 cr	BIOE 603 PhD Thesis Variable 1-12 cr			12
	Spring	CBEE 507 Grad Seminar Presentation 1 cr	BIOE 603 PhD Thesis Variable 1-12 cr			12

BIOE core (13 cr): BIOE 511, BIOE 512, BIOE 513, BIOE 614. BIOE 614 is offered remotely through UO.

Professional development (3 cr): CBEE 507, Seminar Professional Development is required for 3 terms (F/W/Sp).

Research seminar: Students are requested to enroll in CBEE 507, Seminar Presentations, each term after the 1st year.

Ph.D. Thesis (36 cr): variable credits, thesis credits can go over 36 units total to meet GTA/GRA requirements

Graduate Elective (14+ cr): Any graduate-level course, typically 4-5 courses. These are the most flexible credits. A graduate minor typically requires 15 credits of courses from the minor field. Students should consult with their research advisor about elective courses.

108 Total Credits required

Note: the completion timeline can vary and depends on how long it takes for successful completion of the PhD research project and dissertation.

Appendix B: OSU Home Campus Procedures

**Scoring Guide (Rubric) for Graduate Learning Outcome Assessment
PhD PRELIMINARY or FINAL ORAL EXAM in BIOENGINEERING**

Type of Examination (please select one): **PRELIMINARY ORAL EXAM** **FINAL ORAL EXAM**

Candidate Name: _____ Date: _____

Title of Examination Document: _____

Name and Signature of the Examining Committee Member: _____

Criteria	Does Not Pass Exam	Passes Exam	
	Unsatisfactory	Satisfactory	Exemplary
1a. Research Hypothesis and Objectives	Research problem not clearly stated, or statement not carefully considered and hypothesis driven; Research plan to investigate solution to the defined problem is not fully considered; measurable technical outcomes not described	Research problem clearly stated and hypotheses behind research activities identified; Research plan to investigate solution to the defined problem adequately considered; measurable technical outcomes described	Research problem fully considered and hypotheses behind all research questions clearly enunciated with broader impacts in the field identified; Research plan to investigate solution to the defined problem fully considered; measurable technical outcomes described and significance of likely measurements discussed
1b. Literature Review	Disorganized and too brief to adequately explore the topic; widely known technical references clearly missing or not germane to the topic at hand	Logically crafted and adequately explores the topic; some references known to experts in the field may be missing,	Fully explores the topic and illustrates the state of the knowledge in the field, may be missing an obscure reference or two
2. Ability to Demonstrate a Creative Solution to the Problem	Proposed concept is well known to be described in technical literature or is impossible/absurd	Proposed work is original and possible but derivative/incremental in nature	Proposed work is original, practical and high-risk/high-payoff
3. Application of Science and Engineering Fundamentals	Science/Engineering principles underlying Research Hypothesis and Objectives not clearly discussed	Science/Engineering principles underlying Research Hypothesis and Objectives discussed	Science/Engineering principles underlying Research Hypothesis and Objectives discussed; as appropriate math models and associated predictions developed
4a. Quality of Written Communication	Profuse grammatical errors, poor sentence construction and/or poor document structuring makes it impossible to read through	Adequate document structure, grammar and writing enables adequate understanding of the material presented	Near publication quality, great reading with minor flaws
4b. Quality of Oral Communication	Disorganized presentation with low real content; Excessively poor communication skills; Answers to questions show weakness in depth of knowledge in subject matter and/or poor critical thinking skills	Adequately organized presentation where concepts flow logically; Adequate communication skills; Answers show adequate knowledge in subject area and adequate critical thinking skills	Highly engaging conference quality presentation; Excellent communication skills; Answers show superior knowledge in subject area and well developed critical thinking skills

During the examination process I did not perceive any lapses in ethical performance and/or reporting of research: _____

Examiner: Please use the reverse of this form for written commentary as needed.

GRADUATE LEARNING OUTCOMES FOR BIOENGINEERING PHD STUDENTS

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. Thesis and Final Oral Examination (“Defense”).

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.

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. Thesis and Final Oral Examination.