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1. INTRODUCTION

1.1 Biomedical Engineering Graduate Program

The Department of Biomedical Engineering at the University of Utah, is an internationally renowned center of basic and applied interdisciplinary research. The Department offers a Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) programs, as well as multiple dual-degree programs through the Graduate School at the University of Utah. These programs seek to prepare graduate students to function independently, competently and technically in a variety of settings including academic, research, technical, administrative, business management, legal, regulatory and investment career tracks. These goals are accomplished through formal didactic courses, seminars and journal clubs, laboratory research rotations, technical projects and dissertation research. Faculty and staff together seek to assist graduate students to complete these programs in a timely fashion.

1.2 Graduate Program Handbook

This handbook should serve as a guide to help graduate students, graduate advisors, supervisory committee members and other faculty and staff to understand the overall goals and requirements of the Department’s graduate program. The Handbook is an important reference and provides information and resources to help students navigate the necessary steps in order to receive the training and experience integral to the degree programs. It also lists the administrative steps required to satisfy student requirements and move smoothly through these programs.

1.3 Biomedical Engineering Graduate Program Faculty and Staff

**Department of Biomedical Engineering**

Sorenson Molecular Biotechnology Building (SMBB)
36 South Wasatch Drive, Suite 3100, Salt Lake City, Utah 84112 Phone: 801.581.8528
Website: bioen.utah.edu

**Dr. David Grainger**, Chair, Department of Biomedical Engineering

Office: 3227 SMBB, Email: david.grainger@utah.edu, Phone: 801.587.9263

The Department Chair oversees all research, academic, service and administrative functions of the department. The chair is responsible for setting the strategic direction for the department and ensuring that resources are provided for its different department functions in serving the university mission.

**Dr. Robert Hitchcock**, Director of Graduate Studies

Office: 4509 SMBB, Email: r.hitchcock@utah.edu, Phone: 801.585.7741

The Director of Graduate Studies oversees policies and procedures for all graduate degrees offered through the Department of Biomedical Engineering. He is available to answer general questions about the graduate program and to provide recommendations regarding coursework. He also serves as the default research advisor for new students who have not yet established a research advisor.

**Laura Olsen**, Graduate Academic Advisor

Office: 3223 SMBB, Email: l.olsen@utah.edu, Phone: 801.581.8559

The Graduate Academic Advisor assists students in all aspects relating to Biomedical Engineering graduate degrees, including applications, admissions, policies and procedures, graduation, tuition benefit and student health insurance. Students are expected to meet with Laura regularly as they progress towards their degree to ensure that procedures and forms are properly completed and submitted.

**Dr. Chuck Dorval**, B.S./M.S. Program Advisor

Office: 4535 SMBB, Email: chuck.dorval@utah.edu, Phone: 801.587.7631
The B.S./M.S. Program Advisor assists undergraduate students in determining progress in the B.S. degree and necessary steps that must be completed in order for students to matriculate into the M.S. program.

**Bri Mounteer, Academic Programs Coordinator**

Office: 3225 SMBB, Email: bri.mounteer@utah.edu, Phone: 801.587.1575

The Academic Program Coordinator assists the Graduate and Undergraduate Academic Advisors and serves as the Department liaison for the Graduate Student Advisory Committee. Bri also coordinates events, recruitment, community outreach and social media for the department.

**Sheila Olson, Administrative Manager**

Office: 3226 SMBB, Email: sheila.olson@utah.edu, Phone: 801.581.8953

The Administrative Manager works with faculty advisors to manage Graduate Student Research Assistant salaries, scholarships, and/or fellowships. All students should correspond regularly with the Administrative Manager and Graduate Academic Advisor concerning compensation, tuition benefits and eligibility.

### 1.4 Department of Biomedical Engineering Faculty

The University of Utah Department of Biomedical Engineering faculty are dispersed across the University campus in multiple facilities. Faculty have offices and laboratories throughout campus. Primary faculty offices are in SMBB, WEB, MEB and BPRB, while Career and Adjunct faculty may be located across main “lower” campus as well as the Health Sciences “upper” campus and Research Park, including the University Hospital, Huntsman Cancer Institute, Primary Children’s Hospital, Orthopedic Specialty Hospital, UCAIR, the School of Medicine and the College of Pharmacy. For current faculty and staff contact information, please see the faculty directories on our website.
2. DEPARTMENT CHAIR PHILOSOPHY

The Department’s M.S. and Ph.D. degree programs are designed and intended to be transient but intensive professional technical training experiences, best pursued and completed as directly and expeditiously as possible. Efficient student progression through various requirements and diverse opportunities offered by our graduate programs 1) ensures best use of student time and faculty resources, and 2) minimizes the “opportunity cost” of time away from the workplace. As such, our training program is neither a vocation nor a job. Each advanced degree from our department must be earned. Award of our graduate degree comes with new entitlements and privileges resulting from our formal recognition of new technical and workplace skills and Biomedical Engineering capabilities endowed to each of our graduates by virtue of their program accomplishments. Our Department’s Graduate Handbook provides the road map to our graduate program requirements, expectations, best practices, and deadlines for student performance and progress. The Chair expects adherence to the prescriptive requirements of the graduate programs as described in the Handbook, and a direct, disciplined and motivated path to the student’s future workplace as enabled by the program checkpoints, milestones and expectations.

The Utah graduate school experience is expected to be enriching, enabling and rigorous; our graduate students are expected to be productive, professional, focused and efficient. Financial support provided to our graduate students during graduate training is awarded as a stipend at the discretion of our faculty advisors, with specific technical objectives, deliverables and intellectual products anticipated and expected. Such support is a privilege for study; hence, student research productivity is an expected deliverable in return. It is not a wage since program participation is not formal employment; it is support for completion of the program requirements, a training experience and a productive student-mentor relationship that produces research results and progress: progress both in student capabilities relevant to a career, and in applications of biomedical principles to compelling world problems. This student-advisor relationship is best augmented by fulfilling the formal M.S. or Ph.D. didactic training components, the essential research requirements, and by regular critical review and input of the student’s doctoral supervisory committee. Effective communication and technical dissemination are expected learnings. Teaching and mentoring are also a formal expectation of all students: capabilities to assist others in team-based approaches is a real-world asset. Professional service is also an important opportunity: outreach, service learning, and efforts beyond the campus program are essential to our discipline.

As the Department can only improve its performance and impact through the collective work and dedicated group efforts involving our students and faculty, consistent student participation in the wide variety of required and elective department activities is encouraged and expected of all students. Student leadership, initiative and visible contributions to Department progress and growth can take numerous forms. In addition to student research productivity, additional student-based efforts in teaching/curriculum improvement, inter-student and peer networking and morale-building exercises, seminar attendance, research support and grant writing, interfacing with various graduate and student groups, faculty committees and College leaders, and outreach services to our off-campus lay-person and on-campus undergraduate communities are some possible opportunities to assist the Department’s continual quest for improved impact, visibility and international recognition.

We hope that this Biomedical Engineering Graduate Handbook provides all resources necessary to efficiently and effectively guide and expedite graduate student progression through our various graduate degree opportunities and expectations. We also hope that program training and milestones produce graduates highly qualified, confident and capable to improve the world around us in their diverse future careers.

David W. Grainger, Ph.D., Department Chair
3. DEPARTMENT MISSION STATEMENT

The mission of the Department of Biomedical Engineering is to advance human understanding, health, and quality of life through:

1) Internationally recognized research, discovery, and invention in the area of biomedical engineering
2) Education of world-class Ph.D. scientists and engineers for accomplishment in research, academics, medicine, and industry
3) Education of nationally recognized graduates for success and leadership in industry, and in preparation for future study in medicine, science and engineering
4) Transfer of scientific discoveries and biomedical technology to the private sector nationwide
5) Training of students throughout the College of Engineering in bio-based solutions to traditional engineering problems and in the application of their specialty to biological and biomedical science.
4. GRADUATE PROGRAMS

4.1 Doctor of Philosophy (Ph.D.) Program

Ph.D. Degree Requirements

Ph.D. students must meet all requirements specified by the University of Utah Graduate School. In addition, students must complete the following requirements to be eligible for the Doctor of Philosophy (Ph.D.) in Biomedical Engineering.

Ph.D. Supervisory Committee

All Ph.D. students must form a supervisory committee to guide, supervise and mentor their Ph.D. training within one year of entering the Ph.D. program. See the section on "Supervisory Committees" and the "Timeline for Program Completion" sections of this handbook for additional information.

Ph.D. Research

Ph.D. students must complete independent research and advance the state of knowledge in the field. Completion of the research requirement is demonstrated by writing and defending a PhD dissertation as described in the Dissertation section below.

TA Mentorship Requirement

Starting with the graduate students who entered the PhD program in 2011/12 academic year, every PhD student must fulfill the teaching mentorship requirement by completing 4 credit hours of BIOEN 7880 TA Mentorship course by the end of their fourth year and prior to the expiration of their tuition benefits. The teaching interests and current TA needs in the department are highly variable and TA assignments and opportunities are therefore also highly variable. Mentorship assignments will be determined based on the department needs first, and student track specialization second. Should students not voluntarily select TA duties expediently, they can be assigned based on department need.

To earn TA Mentorship credit a student may do one of the following:

- Complete 2 semesters as Half TA (2 credits each semester) of BIOEN 7880: TA Mentorship with an approved course average time commitment of 10 hours per week for the duration of each semester.
- Complete 1 semester as Full TA (4 credits) of BIOEN 7880: TA Mentorship with approved course average time commitment of 20 hours each week for the duration of the semester.
- In rare cases, courses may require a ¼ TA, which would require registration for 1 credit of TA with an approved average time commitment of 5 hours per week for the semester.
- The TA requirement of 4 credits must be completed by the end of student’s 4th year of Ph.D. graduate study or prior to the expiration of tuition benefit, but may be completed prior to this time if a student volunteers or is requested to fill a TA course assignment.

Teaching Assistantship requirements also include:

- TAs are required to strictly abide by the regulations set forth in the Family Educational Rights and Privacy Act or FERPA. This federal law protects the privacy of educational records of students. Information regarding FERPA is available at www.registrar.utah.edu/privacy.php.
- TAs are required to attend a mandatory training provided by the College of Engineering within the first 2 weeks of Fall Semester. The Department will notify prospective TAs of the date, time and location.
- TAs are required to meet with their assigned course instructor(s) prior to the beginning of the semester to initiate organization and to identify the expectations of the TAs role and duties.
- TAs are required to attend all lectures of their assigned course(s) and be sufficiently familiar with the materials covered in both the class and the homework to tutor the content effectively to enrolled students.
• TAs are expected to contribute in a substantive professional way to the pedagogical needs of their assigned course(s). The instructor and the nature of the course determine these needs. For example, TAs should expect to undertake one or more of the following activities: 1) deliver one or more course didactic lectures (with the course master present), 2) lead problem-solving or discussion sessions prior to exams, or 3) grade exams.

• The Teaching Assistantship requirement is for credit and is not eligible for consideration as a paid TA position until the 4 7880 course credit hours have been completed. However, financial support will continue from the student’s research advisor during 7880 assignment. Thereafter, additional TA financial support will be determined by the Department.

• TAs are required to be proficient in the English language in order to effectively interact with students in a leadership and pedagogical manner. To be eligible for the Tuition Benefit Program for teaching assistantships, the Graduate School requires all non-native English speaking graduate students to be cleared by the International Teaching Assistant or ITA Program prior to any teaching exposure. Therefore, clearance from the ITA Program is a compulsory requirement for all international students. This and additional information is available at www.gradschool.utah.edu/ita/.

• Unsatisfactory student TA performance, either paid or through the 7880 requirement will be subject to review and possible punitive responses including repeating the TA requirement.

TA workshops, as well as online teaching resources are available through the Center for Teaching and Learning Excellence or CTLE at the University of Utah.

Credit Hour Requirements

A Biomedical Engineering Ph.D. Program of Study typically includes 90-120 total credit hours beyond the baccalaureate level. Coursework should include at least 6 credit hours of advanced (7000 level) courses. Student completion of significant, independent, peer-reviewed, original research is the primary requirement of the Ph.D. program and usually requires at least 60 credit hours of dedicated research (BIOEN 7970). Students must also complete the graduate Biomedical Engineering core curriculum (17 credit hours of core courses or approved substitutes) and at least 13 credit hours of graduate level science and engineering courses for a total of 30 course credit hours beyond the baccalaureate level. These courses are typically selected in consultation with the student’s Supervisory Committee, with electives concentrated around the student’s anticipated research area.

The student’s research supervisory committee may require students to take additional courses depending on the student’s performance on the qualifying exam, academic background, area of research, and/or other factors. The minimum allowable grade for any courses counted toward the requirements for a student’s graduate degree in Biomedical Engineering is a B-.

Programs of Study

The student’s Preliminary Program of Study is used for planning purposes and in preparation for the PhD comprehensive exam. This Preliminary Program of Study is due by the end of their second year and should be developed in conjunction with the student’s supervisor and supervisory committee.

The student’s final Program of Study form lists all courses taken during the student’s PhD training. This list is developed with input from the student’s supervisory committee chair and other supervisory committee input. See the Graduate Handbook section titled "Programs of Study and Department Course Requirements" for additional information.

Up to 30 credit hours previously applied toward an M.S. degree in Biomedical Engineering can be included as part of the Ph.D. program of study and must be listed on the Program of Study Form as “0” credits applied to the Ph.D. itself. These prior courses can be used to justify waiver of all or part of the course credit hour requirements described above, subject to specific approval by the Director of Graduate Studies and the student’s Supervisory Committee.
Specialized Graduate Tracks

Biomedical Engineering is a multidisciplinary field that uses research tools and techniques from virtually all of the physical, life and biomedical sciences. The curriculum within the Department’s areas of specialization, or tracks, is designed to accommodate a wide range of approaches. Our goal is to provide an educational framework that will encourage our BME graduate students to excel in their chosen area of specialization. These include:

- bioInnovate
- Biomaterials and Therapeutics
- Biomechanics
- Cardiac Electrophysiology and Biophysics
- Computational Systems and Synthetic Biomedical Engineering
- Imaging
- Neuroengineering

See the "Specialized Graduate Tracks" section of this handbook for more details.

Qualifying Exams

The Ph.D. qualifying exam in Biomedical Engineering consists of two different exams at two different times: 1) a written comprehensive exam in the student’s area of specialization, and 2) a two-part original research proposal describing the student’s specific Ph.D. research. The written comprehensive exam should be taken no later than the Fall of their third year; the research proposal no later than the end of the third year. Additional information of the Ph.D. qualifying exams can be found in the "Examinations" section of this handbook.

Ph.D. Candidacy

A student becomes a Ph.D. candidate after passing the written comprehensive exam and successfully completing both parts of the research proposal, written and oral.

Seminar Presentation

Ph.D. students must present at least one oral podium presentation or seminar prior to applying to defend their dissertation.

Publications

The primary requirement of the PhD program is for students to demonstrate competency in independent research and advance the state of knowledge in biomedical engineering. To successfully complete this requirement, the Dissertation typically includes three or more peer reviewed publications written by the candidate that have (or will) appear in supervisory committee-approved journals. The dissertation will also include an introduction that outlines the motivation for research and the challenge in expert terms, with stated objectives and possibly an over-arching hypothesis, and a concluding chapter that provides a technical synopsis of accomplishment as well as an expert’s recommendation for specific technical steps for important future work in the area of the dissertation. Supervisory committees should be consulted for their expectations regarding publication of research results.
Dissertation

Dissertations must embody original insights, motivations, and results of the Ph.D. candidate’s independent creative scientific conduct and scholarly research. Above all, they must also provide clear evidence of the candidate’s scientific maturity, unique expertise, innovation, and ability to perform independent research and contribute new knowledge.

Dissertations must show a mastery of relevant literature and be presented in a style approved by the Department. The Approved Dissertation Style Guide for the Department of Biomedical Engineering is registered with the thesis and dissertation editor, who approves dissertations in accordance with Department and Graduate School policy.

Preparation of the dissertation must adhere to University of Utah Graduate School requirements. Chapters from student manuscripts “in press” (appropriately documented) or published may be inserted into the dissertation “as is” (i.e., complete publisher’s galley proof or journal off-print) as a chapter, and with additional amendments and author supplements as desired.

Ph.D. candidates are required to submit copies of their dissertation to their supervisory committee chair and external reviewer (if applicable) at least three weeks prior to the dissertation defense. Additionally, they are required to submit a copy of their dissertation to their supervisory committee members, research advisor, and the Biomedical Engineering graduate academic advisor at least two weeks prior to the dissertation defense. Doctoral dissertations are expected to be made available to other scholars and the general public. Therefore, a copy of the Ph.D. candidate’s dissertation will be made available by the Department for public viewing.

Detailed policies and procedures are contained within “A Handbook for Theses and Dissertations”, published by The Graduate School and available on The Graduate School webpage. Additional information regarding dissertations is available on the Thesis Office webpage.

External Reviewer

The review of the Ph.D. dissertation by an external reviewer is not required, but optional, and can be encouraged by the mentor or supervisory committee. The Ph.D. candidate along with their supervisory committee should consider this option if deemed necessary. The external reviewer must hold an academic appointment at an institution outside the University of Utah and should submit a written evaluation of the dissertation to be read at the time of defense.

Dissertation Defense

The Ph.D. candidate must successfully defend his/her dissertation in a public forum in accordance with the rules of the Department of Biomedical Engineering and the Graduate School. The title, location, date, and time of the student’s defense must be publicly announced at least 2 weeks in advance of the event along with an abstract of the dissertation. The oral presentation is followed by general questions from the public audience in an open session. If relevant, the external review of the dissertation is presented near the end of the public session. Following the public defense, the research supervisory committee further examines the candidate in a closed session (the external reviewer can be included in the closed session by supervisory committee invitation).

To successfully defend the dissertation, the candidate must effectively apply the scientific method, demonstrate the significance of his/her contributions to the field relative to the state of the field, and professionally communicate the results in both expert written and oral form. Following the defense, the supervisory committee and the external reviewer (if any) dismiss the candidate and meet privately to discuss the candidate’s work and defense performance. Votes to pass the candidate on both the dissertation and the oral defense are recorded by the committee alone; the external reviewer does not have a vote. The dissertation and oral defense are evaluated and voted upon separately. Based on the results of the votes, the committee will choose to a) pass the candidate, b) pass the candidate contingent upon the candidate successfully responding to issues with their defense (either written, or oral, or both), or c) fail the candidate. Ph.D. candidates have two opportunities to pass the dissertation defense in accordance with prevailing
policies from the Graduate School. Changes and improvements to the dissertation, as recommended or required by the reviewer and/or the committee members, must be incorporated into the student’s oral defense or dissertation document prior to obtaining final dissertation reading approval from the committee, the supervisory chair and final approval from the department chair as necessary for submission to the Graduate School thesis editor.

University Thesis and Dissertation Regulations are available in “A Handbook for Theses and Dissertations” which can be downloaded from the Graduate School Thesis Office website.

4.2 Master of Science (M.S.) Program

M.S. Degree Requirements

To earn an M.S. degree, students must meet the requirements specified by the University of Utah Graduate School. In addition, students must complete the following requirements to be eligible for the Master of Science (M.S.) in Biomedical Engineering.

M.S. Supervisory Committee

Within the first semester in the M.S. program, all students must form a supervisory committee. See the section on "Supervisory Committees” and the “Timeline for Program Completion" sections of this handbook for additional information.

M.S. Credit Hour Requirements

M.S. in Biomedical Engineering students must successfully complete a minimum of 30 semester credit hours at the 5000 level or above. A maximum of 9 semester credit hours may be taken as non-matriculated and a maximum of 6 credit hours or 2 courses (not to exceed 6 credit hours) may be transferred from another institution. Up to 6 credit hours may be petitioned undergraduate classes (5000 level or above). The minimum allowable grade for any course counted toward the requirements for an M.S. degree in Biomedical Engineering is a B-.

To maintain status in the program, students must register for a minimum of 3 credit hours per semester.

M.S. Thesis: Course and Project Options

Thesis Option M.S.

The Thesis Option M.S. program requires 9 credit hours of thesis research (BIOEN 6970) and submission of a Master of Science Thesis to the Graduate School in the required format. M.S. students will defend their thesis research in a public forum. The public defense is followed by an oral comprehensive examination administered by the supervisory committee.

MS students must effectively apply the scientific method, demonstrate the significance of their contribution to the field, and professionally communicate the results in both written and oral form. The M.S. candidate must successfully defend his/her thesis in a public forum in accordance with the rules of the Department of Biomedical Engineering and the Graduate School. The thesis title, location, date, and time of the defense must be publicly announced at least 2 weeks in advance of the event. The oral presentation is followed by general questions from the audience, then an oral comprehensive examination administered in closed session by the thesis committee.

To successfully defend the thesis, the candidate must effectively apply the scientific method, demonstrate the significance of his/her contributions to the field, and professionally communicate the results in both written and oral form. Following the defense, the supervisory committee meet in private to discuss the candidate’s work and defense. The vote to pass the candidate is taken by the committee alone. Based on the results of the vote, the committee will choose to a) pass the candidate, b) pass the candidate contingent upon the candidate successfully responding to issues
with their defense, or c) fail the candidate. M.S. candidates have two opportunities to pass the thesis defense. Changes and improvements to the thesis, recommended or required by the committee members, are incorporated into the document prior to obtaining final reading approval from the committee chair and the department chair for submission to the thesis editor.

University Thesis and Dissertation Regulations are available in “A Handbook for Theses and Dissertations” which can be downloaded from the Graduate School Thesis Office website.

Course Option M.S.
In lieu of a thesis, the Course Option M.S. program requires the successful completion of at least 9 credit hours of advanced coursework within a Biomedical Engineering track specialization. To demonstrate depth of knowledge within the field, the course option M.S. also requires students to pass an oral examination administered by the M.S. supervisory committee or the written portion of the Ph.D. qualifying examination within the student's track specialization.

Project Option M.S.
In lieu of a writing and defending a thesis, the Project Option M.S. program requires the successful completion of at least 9 credit hours of advanced coursework within a Biomedical Engineering track specialization. A project is selected by the student to serve as the basis for a scholarly body of work commensurate with their M.S. degree. This project may come from the workplace, extracurricular activities (e.g. Bench-to-Bedside activities) or from coursework (e.g. bioInnovate). To demonstrate depth of knowledge within the field, the Project Option M.S. also requires students to present their project to their supervisory committee and pass an oral exam administered by the M.S. supervisory committee. No public presentation is required.

M.S. Program of Study
The M.S. Program of Study lists all courses to be taken during the student's training. This list is developed through discussion with the student's supervisory committee and committee chair. See the Graduate Handbook section titled "Programs of Study and Department Course Requirements" for additional information.

Specialized Graduate Tracks
Biomedical Engineering is a multidisciplinary field that uses research tools and techniques from virtually all of the physical and life sciences. The curriculum within our areas of specialization, or tracks, is designed to accommodate a wide range of approaches. Our goal is to provide an educational framework that will encourage graduate students to excel in their chosen area of specialization.

- bioInnovate
- Biomaterials and Therapeutics
- Biomechanics
- Cardiac Electrophysiology and Biophysics
- Computational Systems and Synthetic Biomedical Engineering
- Imaging
- Neuroengineering

For additional information and course information for areas of specialization, see the "Specialized Graduate Tracks" section of this handbook.
5. DUAL DEGREE PROGRAMS

5.1 M.S./M.B.A. Degree Program

This Dual Degree Program enables students to earn both a two-year Biomedical Engineering Master of Science degree, and a two-year Master of Business Administration (M.B.A.) degree in as little as 2.5 years.

In addition, this program combines students’ applied interests and training in engineering with a comprehensive business exposure, providing them with professional flexibility in transitioning between the technical and commercial domains. Combining their training and experience, graduates are qualified to direct and/or manage the creation, transition, and improvement of new products, processes, and systems from the laboratory to the boardroom.

M.S./M.B.A. Degree Requirements

- To complete these degrees simultaneously, students are required to apply for, and be accepted to both the Biomedical Engineering M.S. and full-time M.B.A. programs.
- Students are required to successfully complete a minimum of 74 credit hours, 24 credit hours in Biomedical Engineering and 50 credit hours in Business Administration.
  - Biomedical Engineering: minimum of 6 credit hours of Life Science Fundamentals, 6 credit hours of Bioengineering Fundamentals, 1 credit hour of Scientific Presentation and 11 elective/track credit hours
  - Business: 38 "MBA Core" credit hours and 12 Business Elective credit hours (at 6000 level or above)
  - Combined Biomedical Engineering and Business: 6 credit hours of Capstone courses
- The Biomedical Engineering M.S. requirements for this program are the same as the traditional M.S. requirements listed in previous "M.S. Program" with the exception of the 6 credit hours of Capstone courses that are shared with the M.B.A. program and applied to both Programs of Study

M.S./M.B.A. Typical Course Load and Registration Requirement

To complete both programs within 2.5 years typically requires a course load of 16-18 credits hours each semester (Fall and Spring) as follows:

Year One:
- Fall Semester = 18 credit hours (14.5 MBA core + .5 BME MS core + 3 Electives)
- Spring Semester = 17 credit hours (13.5 MBA core + .5 BME MS core + 3 Electives)
- Summer Semester = MBA Internship Strongly Recommended

Year Two:
- Fall Semester = 16 credit hours (7 MBA core + 6 BME MS core + 3 Electives)
- Spring Semester = 17.5 credit hours (2.5 MBA core + 6 BME MS core + 6 Capstone + 3 Electives)
- Summer Semester = MBA Internship Strongly Recommended

Year Three (optional to complete requirements):
- Fall Semester = 6 credit hours (6 BME MS Electives)

While the Graduate School enforces a maximum of 16 credit hours for most graduate students, the maximum of 18 credit hours per semester is allowed for M.S./M.B.A. dual degree students. Registration above 18 credit hours would require a petition to the Graduate School.

For additional information, please visit the David Eccles School of Business website.
5.2 B.S./M.S. BME Dual Degree Program

This dual degree program is designed to allow students to begin their M.S. studies while still enrolled as undergraduates; thereby, taking advantage of additional coursework successfully completed as an undergraduate in order to accelerate the completion of the M.S. in Biomedical Engineering degree. A standard M.S. in Biomedical Engineering degree typically requires 2 or more years of study beyond the B.S. degree while the B.S./M.S. program shortens that time, typically to a single year beyond the B.S. degree.

Students must meet the requirements specified by the Department of Biomedical Engineering and the University of Utah Graduate School. In addition, students must successfully complete the following requirements to be eligible for the Bachelor of Science (B.S.) in Biomedical Engineering and the Master of Science (M.S.) in Biomedical Engineering degrees.

B.S./M.S. Program Requirements

Students complete both their BS and MS degrees at the same time and must meet the following requirements.

- A minimum of 122 credit hours that meet the requirements of the Biomedical Engineering BS major
- A minimum of 30 credit hours that meet the requirements of the Biomedical Engineering MS degree
- A maximum of 12 Graduate level credit hours (of the required 30) may be completed while students are still in undergraduate status

Bachelor of Science in Biomedical Engineering Requirements

All requirements for the standard Bachelor of Science in Biomedical Engineering are listed in the Undergraduate Handbook. Students should reference the handbook that correlates with their “catalog year”, i.e., the academic year of their admission to major status.

Master of Science in Biomedical Engineering Requirements

The standard M.S. degree requirements are found in the “M.S. Degree Program” section of this handbook.

B.S./M.S. Application Eligibility and Procedures

To be eligible to apply, students must be U.S. citizens (or Permanent Residents), have full major status in the Biomedical Engineering B.S. program, have completed a minimum of 90 undergraduate credit hours by the end of the semester of application, not yet completed the Senior Thesis I course (BIOEN 4991), and have a minimum 3.0 cumulative GPA.

For eligible students, two separate applications are required. The first is a Department application designed to allow students to join the program beginning their senior year, yet maintain full Undergraduate status and privileges (undergraduate financial aid, tuition rates, etc.). The second is a formal application to the University of Utah Graduate School for admission to “Graduate Status” to complete their MS year in the program.

Department Dual Degree Application Procedure:

Before applying to the B.S./M.S. program, students are encouraged to meet with the Department B.S./M.S. Program Advisor. In addition, for undergraduate students to be eligible to apply to the B.S./M.S. program, they are required to be at major status and enrolled in good standing in their junior year of the Bachelor of Science in Biomedical Engineering at the University of Utah.

The application form and instructions can be found on the Biomedical Engineering Graduate Studies website. The application deadline is April 1 for fall semester admission and November 1 for spring semester admission. The application must be submitted to the Graduate Academic Advisor in the Biomedical Engineering Office. Supporting
documents will include a one-page Personal Statement, unofficial Transcript (or DARS), and a professional résumé or CV. Additionally, applicants with a cumulative GPA between 3.000 and 3.499 will be required to provide three letters of recommendation, including at least one from a Biomedical Engineering Core faculty member. Applicants are not required to submit GRE scores for admission to the B.S./M.S. Dual Degree program.

**Dual Degree Graduate School application procedure:**

Students apply for “Graduate” status after completing 122 semester credit hours of qualified studies, or in the application semester, they complete the maximum of 12 credit hours of 5000+ courses for application to their MS degree requirements. Students must follow regular University of Utah Graduate School application procedures to apply online using the “Apply Yourself” application system.

Students who have advanced to graduate status and who are funded as Graduate Research Assistants in a lab may be eligible for the University of Utah’s Graduate Tuition Benefit Program (TBP). See the Handbook’s Tuition Benefit section.

Note that while students are enrolled with graduate status, all Graduate School rules apply (e.g., graduate tuition structure, tuition benefit program (TBP), health insurance program, etc.). When deciding on change of status from undergraduate to graduate, students should read the TBP guidelines and weigh benefits (e.g., tuition benefit and health insurance) vs. negatives (e.g., no scholarships, more costly tuition).

**Dual Degree: Petitioning for Graduate credit**

Students enrolled in this program may request up to a maximum of 12 credit hours of coursework taken as an undergraduate. All courses must be at the 5000 level or above and students must submit the “Request for Graduate Credit in the BS/MS Program” to the Registrar’s office during their first semester in graduate status. The Request for Graduate Credit in BS/MS Program form must be reviewed by the Biomedical Engineering Graduate Academic Advisor before being submitted by the Department to the Office of the Registrar for approval. The Registrar’s Office will update the DARS from all B.S./M.S. students, noting that the requested courses have been reserved for graduate credit. Please note that these updates are final and cannot be reversed.

Requested courses that have been approved by the Office of the Registrar be “Reserved” on the student’s undergraduate record, and no longer eligible to apply toward the B.S. degree. However, they will be eligible for credit toward the M.S. degree and must be included on the student’s MS Program of Study for approval consideration from their supervisory committee.

**Criteria:**

- The requested course(s) must have a letter grade of B or better
- The requested course(s) may not be used to fulfill requirements toward any other degree (including B.S. core courses). However, up to 6 credit hours can come from the undergraduate elective requirements approved by the Director of Undergraduate Studies.
- Once requested courses have been approved through the Office of the Registrar, students who subsequently withdraw from the B.S./M.S. program will not be allowed to use those approved courses to fulfill the B.S. degree requirements and may not be allowed to use them to fulfill M.S. degree requirements.
- B.S./M.S. candidates must maintain two separate enrollment records (undergraduate and graduate) and are responsible to register for the remaining undergraduate courses on their undergraduate enrollment and graduate courses under their graduate enrollment.
Graduation from the B.S./M.S. Program

Following successful completion of all requirements in both degree programs, the B.S. and M.S. degrees are both conferred simultaneously. The M.S. degree will not be awarded to any student who has not successfully completed all of the requirements for the B.S. in Biomedical Engineering program.

Discontinuing the B.S./M.S. Program

Students who request to exit the B.S./M.S., dual-degree program, may do so without penalty if they do so before achieving Graduate status. At that time, qualified coursework will be applied toward the traditional B.S. and M.S. degree requirements, respectively. Graduate Status students who have reserved up to 12 credits of 5000+ coursework can apply only 6 of those credits to a future graduate degree. Additionally, they can no longer be applied to the B.S. degree requirements and could cause a credit deficit and delay in the B.S. degree program completion.
6. SPECIALIZED GRADUATE TRACKS

The goal of the graduate program is to provide an educational framework that will encourage students to excel in a chosen area of specialization with relevant technical competence. Each student works with a graduate track advisor, their research advisor, and their supervisory committee to design a program of study that meets the M.S. or Ph.D. requirements. The program of study should reflect the specific research interests of the student and be designed to develop the highest possible level of expertise.

The Ph.D. written qualifying exam is structured around each student’s area of specialization and therefore courses completed as part of the program of study serve as partial preparation for the qualifying exam. The following Specialized Track areas form the basis for Ph.D. writing qualifying exams and M.S. programs of study.

BIOINNOVATE

Dr. Robert Hitchcock, Advisor

- Medical Device Design and Development
- Business Plan Development

The bioInnovate track aims to provide a comprehensive biomedical device design training program through the use of a multidisciplinary, hands-on teaching approach in classroom, clinical, and laboratory settings. The track will focus students on clinical problem identification, medical device innovation, and commercial translation; all within the regulatory framework of the FDA. Students will immerse themselves within clinical environments and learn to observe procedures and medical devices to uncover unmet clinical needs. By refining these needs into feasible medical device products with commercial potential, student teams will further develop these ideas into testable prototypes and develop business. Upon completion of the bioInnovate track, students will be able to 1) observe and identify unmet needs in clinical environments, 2) work effectively in multidisciplinary teams in asynchronous environments, 3) understand and apply FDA QSR in the design and development of medical devices, 4) develop a business plan, attract potential funding sources and start a company in the medical device industry.

Ph.D. Students

Ph.D. Qualifying Exam: Ph.D. students in the bioInnovate track are expected to have general knowledge in the field. General knowledge includes Biomedical Engineering fundamentals, clinical needs identification, concept generation, FDA QSR, medical device design and development, prototyping and testing, business concepts, and business plan development. The purpose of the Ph.D. Qualifying Exam is to encourage students to revisit the fundamental principles in Biomedical Engineering, regulatory compliance, medical device innovation, and business development. Students should take the exam in the second year of study. Although the specific content of the exam changes each year, approximately 25% of the exam covers material from the M.S. level Biomedical Engineering core curriculum and 75% of the exam covers topics specific to the field of medical device development and clinical needs finding. Although specific courses are not required, the following set of courses serve as a basis for the bioInnovate qualifying exam. Additional information on the Ph.D. Qualifying Exam can be found in the...

For students in the bioInnovate Track, the Program of Study in Biomedical Engineering should include a hierarchy of courses selected to develop expertise in a focus area. Although there are no specific requirements, knowledge in fundamental areas noted above will be required to pass the Qualifying Exam. Additional expertise in a focus area will be required to perform well on the research proposal.

Additional courses must be completed to meet the minimum course credit hour requirements for the Ph.D. A typical plan of study would include approximately 5 specialized courses in addition to the bioInnovate track core courses to reach the course credit requirement. A limited set of example courses are given below. The specific set of courses, over and above the bioInnovate track core courses, should be selected on an individual basis to maximize expertise in the area most closely related to the student’s area of research.
bioInnovate Courses

Core Courses
- BIOEN 6081: Biomedical Device Innovation I
- BIOEN 6082: Biomedical Device Innovation II

Competitive Admission Track Courses
- BIOEN 6181: Clinical Problem Solving Through Strategic Analysis I
- BIOEN 6182: Clinical Problem Solving Through Strategic Analysis II

bioInnovate Advanced Courses

Business

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCTG 5620</td>
<td>Business Valuation and Analysis</td>
<td>3 Credits</td>
</tr>
<tr>
<td>ENTP 5770</td>
<td>Business Discovery and Creation</td>
<td>3 Credits</td>
</tr>
<tr>
<td>ENTP 5774</td>
<td>Funding the Social Enterprise</td>
<td>3 Credits</td>
</tr>
<tr>
<td>ENTP 6810</td>
<td>Venture Foundations</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>ENTP 6820</td>
<td>Venture Trends</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>ENTP 6830</td>
<td>Applied Venture Skills</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>ENTP 6840</td>
<td>Venture Planning</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>ENTP 6860</td>
<td>Lassonde Venture</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>FINAN 5300</td>
<td>New Venture Finance</td>
<td>3 Credits</td>
</tr>
<tr>
<td>FINAN 5881</td>
<td>Managing the Venture Process</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>FINAN 6300</td>
<td>Venture Capital</td>
<td>1.5 Credits</td>
</tr>
<tr>
<td>FINAN 6881</td>
<td>Venture Planning</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>MBA 6860</td>
<td>Technology Commercialization</td>
<td>3 Credits</td>
</tr>
<tr>
<td>MHA 6550</td>
<td>Marketing for Health Professionals</td>
<td>3 Credits</td>
</tr>
<tr>
<td>MHA 6553</td>
<td>Health Care Financial Management</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>MKTG 6551</td>
<td>The Environment of Healthcare I: Management and Administration</td>
<td>1.5 Credits</td>
</tr>
<tr>
<td>MKTG 6552</td>
<td>The Environment of Healthcare II: Management and Administration</td>
<td>1.5 Credits</td>
</tr>
<tr>
<td>MKTG 6715</td>
<td>Entrepreneurial Marketing</td>
<td>1.5 Credits</td>
</tr>
<tr>
<td>MKTG 6860</td>
<td>Marketing Research</td>
<td>1.5 – 3 Credits</td>
</tr>
<tr>
<td>MST 6020</td>
<td>Effective Leadership and Management for Scientists</td>
<td>1 Credit</td>
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<tr>
<td>MST 6021</td>
<td>Strategic Planning and Marketing for Scientists</td>
<td>1 Credit</td>
</tr>
<tr>
<td>MST 6022</td>
<td>Production and Operations Management for Scientists</td>
<td>1 Credit</td>
</tr>
<tr>
<td>MST 6600</td>
<td>Applied Statistical Techniques</td>
<td>3 Credits</td>
</tr>
<tr>
<td>STRAT 5750</td>
<td>Profiles of Leadership</td>
<td>1 – 3 Credits</td>
</tr>
<tr>
<td>STRAT 6710</td>
<td>Strategy and Technology</td>
<td>1.5 – 3 Credits</td>
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</table>
BIOMATERIALS AND THERAPEUTICS

Dr. Russell Stewart, Advisor

- Biomedical Polymers
- Biomolecular Engineering
- Synthetic Biology
- Tissue Engineering
- Drug Delivery and Nanomedicine

The Biomaterials and Therapeutics track covers an interdisciplinary field focused on the physical and biological study of biomaterials and drug delivery systems and their applications to modern biomedical problems. It encompasses synthetic materials, macromolecules, bioconjugates, modern drug delivery systems, genetically programmed materials and networks, composites and hybrid materials, cell-material combinations and self-assembling systems, as well as their interactions with biological environments and physiological systems. Students in the Biomaterials and Therapeutics track should understand the relationships between the
structure and designs of biomaterials, synthetic biology, and drug delivery systems and their interactions with complex biological systems.

### Biomaterials and Therapeutics Elective Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOEN 6140</td>
<td>Fundamentals of Tissue Engineering</td>
<td>2</td>
</tr>
<tr>
<td>BIOEN 6405</td>
<td>Nanomedicine</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 7160</td>
<td>Physics Nature of Surfaces</td>
<td>3</td>
</tr>
<tr>
<td>PHCEU 7011</td>
<td>Fundamentals of Pharmacokinetics</td>
<td>3</td>
</tr>
<tr>
<td>PHCEU 7030</td>
<td>Macromolecular Therapeutics and Drug Delivery</td>
<td>4</td>
</tr>
<tr>
<td>PHCEU 7040</td>
<td>Biotechnology</td>
<td>4</td>
</tr>
</tbody>
</table>

### BIOMECHANICS

Dr. Jeffrey Weiss, Advisor

- Molecular, Cell, Tissue, Organ and System Levels
- Biosolids, Biofluids, and Biofluid-solid Interactions
- Biological Transport Phenomena
- Biomimetics and Biorobotics

Biomechanics is a broad field covering topics ranging from the thermodynamics of mass transport on a subcellular level to athletic performance. The University of Utah has faculty conducting biomechanics research in areas such as sensation, balance and control movements; orthopedic biomechanics, bone, implants, reconstructive surgery; animal propulsion, flight and swimming; computational biomechanics, muscle, ligaments, cartilage, blood flow; sports mechanics; ergonomics; biomimetic robotics; virtual reality; prosthetic limbs and control; prosthetic organs; ultrasound hyperthermia; perfusion and transport; and several additional areas. The Biomechanics track is designed to support these areas of research by providing training in the application of fundamental principles of mechanics to biological systems and/or biomedical devices.

### Biomechanics Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOEN 5250</td>
<td>Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 7210</td>
<td>Biosolid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7650</td>
<td>Advanced Conduction Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7660</td>
<td>Advanced Convection Heat Transfer</td>
<td>3</td>
</tr>
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</table>

### Biomechanics Areas of Specialization

Biorobotics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6310</td>
<td>Robotics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6570</td>
<td>Adaptive Control</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6410</td>
<td>Ordinary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 6220</td>
<td>Robotics</td>
<td>3</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<tr>
<td>-------------</td>
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</tr>
<tr>
<td>ME EN 7210</td>
<td>Optimal Control</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7220</td>
<td>System Identification for Robotics</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7230</td>
<td>Robot Mobility and Manipulation</td>
<td>3</td>
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</table>

Continuum Biomechanics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOEN 7210</td>
<td>Biosolid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CS 6210</td>
<td>Advanced Scientific Computing I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 5600</td>
<td>Survey of Numerical Analysis</td>
<td>4</td>
</tr>
<tr>
<td>MATH 6420</td>
<td>Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6440</td>
<td>Advanced Dynamical Systems</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6630</td>
<td>Numerical Solutions of Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6770</td>
<td>Mathematical Biology I</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 6510</td>
<td>Introduction to Finite Elements</td>
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Bioheat Transfer and Thermoscience

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH 5600</td>
<td>Survey of Numerical Analysis</td>
<td>4</td>
</tr>
<tr>
<td>MATH 6070</td>
<td>Mathematical Statistics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6420</td>
<td>Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6770</td>
<td>Mathematical Biology I</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 6600</td>
<td>Intermediate Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7600</td>
<td>Advanced Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7650</td>
<td>Advanced Conduction Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7660</td>
<td>Advanced Convection Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7670</td>
<td>Advanced Radiation Heat Transfer</td>
<td>3</td>
</tr>
</tbody>
</table>

CARDIAC ELECTROPHYSIOLOGY AND BIOPHYSICS

Dr. Rob MacLeod, Advisor

- Membrane Ion Transport and Ionic Channels
- Cell Action Potentials and Ion Currents, Ion Regulation, and Contraction
- Cell to Cell Coupling and Spread of Excitation
- Electrocardiography and Volume Conductors
- Experimental and Simulation Techniques

Cardiac electrophysiology and biophysics is a discipline that encompasses all the electrical activity of the heart, includes both basic science and clinical components, and spans a spectrum from the molecular to the complete body. Research in this area addresses some of the most basic questions of how cells, organs, and the body function and also seeks to develop methods, interventions, and devices that could have profound impact on diseases of the heart and vasculature. Despite dramatic improvements in clinical detection and care, cardiovascular diseases remain the leading causes of death in developed countries. Research in cardiac
electrophysiology makes use of the most advanced technologies in areas such as bioinstrumentation, multichannel signal acquisition and processing, molecular biology, imaging across many modalities, mathematical simulation and modeling, and all aspects of computer technology.

As a result of this diversity of biomedical and technical opportunities, students with graduate training in cardiac electrophysiology and biophysics receive a very broad education in both physiology and biomedical technology and will be extremely well-equipped for careers in academia and industry. The program makes use of background courses from several departments as well as specialized training in the discipline through both courses and extensive laboratory experiences. Because of the outstanding research emphasis on cardiac electrophysiology and biophysics at Utah, rich opportunities exist for student interactions with a wide range of experts in the field as well as involvement in interdisciplinary projects within teams of related researchers and students.

Cardiac Electrophysiology and Biophysics Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 6000</td>
<td>Systems Physiology I: Cardiovascular, Respiratory and Renal Systems</td>
<td>4 Credits</td>
</tr>
<tr>
<td>BIOEN 6003</td>
<td>Cellular Electrophysiology and Biophysics</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6460</td>
<td>Electrophysiology and Bioelectricity of Tissues</td>
<td>3 Credits</td>
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</table>

Biomedical Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOEN 6330</td>
<td>Principles of Magnetic Resonance Imaging (MRI)</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6500</td>
<td>Mathematical Foundations of Imaging</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6640</td>
<td>Introduction to Digital Image Processing</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 7310</td>
<td>Advanced Topics in Magnetic Resonance Imaging (MRI)</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 7320</td>
<td>3D Reconstruction Techniques in Medical Imaging</td>
<td>3 Credits</td>
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Biology

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>BIOL 5110</td>
<td>Molecular Biology and Genetic Engineering</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOL 5210</td>
<td>Cell Structure and Function</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOL 5910</td>
<td>Mathematical Models in Biology</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOL 6500</td>
<td>Advanced Statistical Modeling for Biologists</td>
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Computer Science (scientific computing and software)

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<th>Course</th>
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</thead>
<tbody>
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<td>CS 6100</td>
<td>Theory of Computation</td>
<td>3 Credits</td>
</tr>
<tr>
<td>CS 6210</td>
<td>Advanced Scientific Computing I</td>
<td>3 Credits</td>
</tr>
<tr>
<td>CS 6220</td>
<td>Advanced Scientific Computing II</td>
<td>3 Credits</td>
</tr>
<tr>
<td>ECE 7820</td>
<td>Parallel Computer Architecture</td>
<td>3 Credits</td>
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</table>
### Electrical Engineering (signal processing, electromagnetics)

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<tr>
<td>ECE 5510</td>
<td>Random Processes</td>
<td>3</td>
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<tr>
<td>ECE 5530</td>
<td>Digital Signal Processing</td>
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<tr>
<td>ECE 6340</td>
<td>Numerical Techniques in Electromagnetics</td>
<td>3</td>
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<tr>
<td>ECE 6533</td>
<td>Advanced Digital Signal Processing I</td>
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<td>ECE 6534</td>
<td>Advanced Digital Signal Processing II</td>
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<td>ECE 6540</td>
<td>Estimation Theory</td>
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<td>ECE 6560</td>
<td>Multivariable Systems</td>
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### Mathematics

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<tbody>
<tr>
<td>MATH 5040</td>
<td>Stochastic Processes and Simulation I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 5050</td>
<td>Stochastic Processes and Simulation II</td>
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</tr>
<tr>
<td>MATH 5110</td>
<td>Mathematical Biology I</td>
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</tr>
<tr>
<td>MATH 5120</td>
<td>Mathematical Biology II</td>
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<tr>
<td>MATH 5410</td>
<td>Introduction to Ordinary Differential Equations</td>
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</tr>
<tr>
<td>MATH 5440</td>
<td>Introduction to Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 5600</td>
<td>Survey of Numerical Analysis</td>
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</tr>
<tr>
<td>MATH 5610</td>
<td>Introduction to Numerical Analysis I</td>
<td>4</td>
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<tr>
<td>MATH 5740</td>
<td>Mathematical Modeling</td>
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<td>MATH 6630</td>
<td>Numerical Solutions of Partial Differential Equations</td>
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<td>Bifurcation Theory</td>
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### Physics

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<tr>
<td>PHYS 6720</td>
<td>Introduction to Computing in Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 6730</td>
<td>Computational Physics II</td>
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</tbody>
</table>

### COMPUTATIONAL SYSTEMS AND SYNTHETIC BIOMEDICAL ENGINEERING

Dr. Orly Alter and Dr. Tara Deans, Advisors

- Cellular Systems Biomedical Engineering
- Cellular Synthetic Biomedical Engineering
- Computational Data Science, and Mathematical and Statistical Modeling
- High-Throughput Molecular Biotechnologies
Systems and Synthetic Biomedical Engineering are complementary emergent fields that combine experimental, computational and theoretical methods to solve challenging biomedical problems. Systems Biomedical Engineering is based on a holistic approach of integrating large amounts of molecular information to elucidate the relationships between genotype and phenotype. This multi-scale understanding of biological systems will help answer important questions about physiological systems, human disease, and therapeutic strategies. Synthetic Biomedical Engineering is the design and construction of biological systems from molecular biological components for useful purposes. Such systems have applications in a wide range of complex biomedical problems.

Among the greatest challenges in these fields are how to obtain, manipulate, and interpret massive datasets. Research in this area also requires a multi-scale understanding of the system of interest, from molecules to cells, to organisms to ecosystems. Computational systems and synthetic Biomedical Engineering draw from a wide range of specialties including mathematical modeling, scientific computing, signal processing, molecular biology, and high-throughput technologies to provide a unique approach to solving biomedical problems.

This track draws from the rich set of resources currently available at the University of Utah to provide students with valuable interdisciplinary academic and research experiences. Students receive training in desirable skills including large-scale data analysis and genomic technologies, making them well-suited for careers in academia, industry and government.

Because computational systems and synthetic Biomedical Engineering are inherently interdisciplinary, the program supplements a strong Biomedical Engineering core with courses from a variety of departments. Below are summaries of the proposed course and research requirements for the track.

Computational Systems and Synthetic Biomedical Engineering Courses

**Biomedical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 6000</td>
<td>Systems Physiology I: Cardiovascular, Respiratory and Renal Systems</td>
<td>4 Credits</td>
</tr>
<tr>
<td>BIOEN 6010</td>
<td>Systemic Physiology II</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6002</td>
<td>Molecular Biophysics</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6003</td>
<td>Cellular Biophysics and Electrophysiology</td>
<td>3 Credits</td>
</tr>
</tbody>
</table>

**Biology**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 5110</td>
<td>Molecular Biology and Genetic Engineering</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOL 5140</td>
<td>Genome Biology</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOL 6500</td>
<td>Advanced Statistical Modeling for Biologists</td>
<td>3 Credits</td>
</tr>
</tbody>
</table>

**Biological Chemistry**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLCHM 6400</td>
<td>Genetic Engineering</td>
<td>2 Credits</td>
</tr>
</tbody>
</table>

**Biomedical Informatics**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI 6030</td>
<td>Foundations of Bioinformatics</td>
<td>2 Credits</td>
</tr>
<tr>
<td>BMI 6420</td>
<td>Advanced Biomedical Computing</td>
<td>2 Credits</td>
</tr>
<tr>
<td>BMI 6530</td>
<td>Bioinformatics Data Integration and Analysis</td>
<td>3 Credits</td>
</tr>
</tbody>
</table>
### Computer Science

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6140</td>
<td>Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>CS 6150</td>
<td>Advanced Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 6220</td>
<td>Advanced Scientific Computing II</td>
<td>3</td>
</tr>
<tr>
<td>CS 6350</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CS 6530</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 7120</td>
<td>Information-Based Complexity</td>
<td></td>
</tr>
</tbody>
</table>

### Electrical and Computer Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 6520</td>
<td>Information Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6530</td>
<td>Digital Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6540</td>
<td>Estimation Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6550</td>
<td>Adaptive Filters</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6570</td>
<td>Adaptive Control</td>
<td>3</td>
</tr>
</tbody>
</table>

### Family and Preventive Medicine

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBHLT 6107</td>
<td>Survival Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PBHLT 7120</td>
<td>Linear and Logistic Regression Models</td>
<td>3</td>
</tr>
</tbody>
</table>

### Human Genetics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 5920</td>
<td>Advanced Eukaryotic Genetics</td>
<td>3</td>
</tr>
<tr>
<td>H GEN 6500</td>
<td>Human Genetics</td>
<td>3</td>
</tr>
<tr>
<td>H GEN 6503</td>
<td>Clinical Cancer Genetics</td>
<td>3</td>
</tr>
</tbody>
</table>

### Mathematics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 6770</td>
<td>Mathematical Biology I/II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6780</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 6810</td>
<td>Stochastic Processes and Simulation I/II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6815</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 6845</td>
<td>Ordinary Differential Equations and Dynamical Systems</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6855</td>
<td>Survey of Numerical Methods</td>
<td>4</td>
</tr>
<tr>
<td>MATH 6860</td>
<td>Introduction to Numerical Analysis I/II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 6865</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IMAGING

Dr. Edward Hsu, Advisor

- Medical Imaging
- Optical Systems, Imaging Methods and Hardware

Visualization of anatomical and physiological processes of the body plays an indispensable role in today’s clinical healthcare as well as basic science research. This is the interdisciplinary field of imaging, which encompasses hardware instrumentation, acquisition methodology, contrast agent development, post-processing analysis, and the application of any combination of the above in biomedical research. The Imaging track curriculum is designed to cover both the breadth and depth in the training, and to prepare students for research in the development or application of biomedical imaging technologies.

Imaging Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 5480</td>
<td>Principles of Ultrasound</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6330</td>
<td>Principles of Magnetic Resonance Imaging (MRI)</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6500</td>
<td>Mathematical Foundations of Imaging</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6640</td>
<td>Introduction to Digital Image Processing</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 7310</td>
<td>Advanced Topics in Magnetic Resonance Imaging (MRI)</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 7320</td>
<td>3D Reconstruction Techniques in Medical Imaging</td>
<td>3 Credits</td>
</tr>
<tr>
<td>PHCEU 7110</td>
<td>Molecular Imaging</td>
<td>2 Credits</td>
</tr>
</tbody>
</table>

NEUROENGINEERING (formerly Neural Interfaces)

Dr. Gregory Clark, Advisor

- Electrophysiology
- Biomaterials
- Computational / Modeling

The Neuroengineering Track trains students in the fields of basic and applied neuroscience and neuroengineering. Its goals include the application of engineering approaches to the treatment of neural dysfunction, and conversely, the discovery of effective strategies utilized by biological nervous systems and their application to traditional engineering problems. Research areas of Biomedical Engineering faculty in Neuroengineering area include electrical neural interfaces and neuroprostheses; cell and chemical delivery
systems for neural tissue; engineering of neural self-repair; neural plasticity; neural coding in sensory and motor systems; neural imaging; and non-traditional modes of stimulating neural tissue (e.g., focused ultrasound and magnetic stimulation)

Students in the Neuroengineering Track are expected to have general knowledge in the fields of basic and applied neuroscience.

Ph.D. students in the Neuroengineering Track typically are required to complete successfully the required Neuroengineering core courses below. The core courses are intended to provide knowledge in the major areas of the field. They also will provide considerable assistance in preparing for the written portion of the Neuroengineering qualifying exam. A student’s Supervisory Committee may grant exemptions to these course requirements on a case-by-case basis if the exemptions are sufficiently justified. Students may take either or both of the two computational courses: BIOEN 6050 (offered in Spring Semester of odd years) or BIOEN 60xx (pending and under development; expected to be offered in Spring Semester of even years). Either course will suffice to help prepare for the qualifying exam, although they will have somewhat different emphases. In practice, the Qualifying Exam may combine topics across courses; e.g., questions regarding cellular or systems neuroscience may be asked from a quantitative perspective.

Course readings also serve as way for students to prepare for the qualifying exam, although not all core courses have assigned textbooks. The first portion of Kandel et al., Principles of Neural Science, provides an excellent text for the study of cellular neurosciences; the latter portion of this text is used for BIOEN 6430 Systems Neuroscience.

Masters students in the Neuroengineering Track typically are required to complete successfully the same required core courses as do PhD students, with the exception that NEUSC 6040 Cellular and Molecular Neuroscience is not required for Masters students. Understanding of cellular/molecular neuroscience is nonetheless still required for exams for Masters students.

Two of the Neuroengineering Track core courses (BIOEN 6430 Systems Neuroscience and BIOEN 6440 Neural Engineering) may also count as two of the required Biomedical Engineering core courses.

Neuroengineering Track students are also expected to enroll and participate routinely in BIOEN 6470 Neural Engineering Research Group (NERG).

The purpose of the written portion of the Neuroengineering Qualifying Exam is to encourage students to approach their graduate education as an experience that transcends the boundaries of individual courses; to revisit the fundamental principles in basic and applied neuroscience; and to consolidate, synthesize, and integrate this material. Specific topics that may be covered on the qualifying exam are covered in the Neuroengineering Track core courses.

### Neuroengineering Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 6005 or BIOEN 60xx</td>
<td>Computational Neuroscience or Computational Neuroscience, Systems/Quantitative Neuroscience (pending; under development)</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6430</td>
<td>Systems Neuroscience</td>
<td>4 Credits</td>
</tr>
<tr>
<td>BIOEN 6440</td>
<td>Neural Engineering</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6470</td>
<td>Neural Engineering Research Group (NERG) (2 semesters)</td>
<td>0.5 Credits</td>
</tr>
<tr>
<td>NEUSC 6040</td>
<td>Cellular and Molecular Neuroscience (not required for Masters students)</td>
<td>4 Credits</td>
</tr>
</tbody>
</table>

### Additional Generally Useful Courses
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 6010</td>
<td>Systemic Physiology II</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 6140</td>
<td>Fundamentals of Tissue Engineering</td>
<td>2</td>
</tr>
<tr>
<td>BIOEN 6230</td>
<td>Functional Anatomy for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 6433</td>
<td>Biological Statistical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 6460</td>
<td>Electrophysiology and Bioelectricity</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 7120</td>
<td>Biocompatibility</td>
<td>2</td>
</tr>
<tr>
<td>ECE 6520</td>
<td>Information Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6540</td>
<td>Estimation Theory</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6770</td>
<td>Mathematical Biology I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6780</td>
<td>Mathematical Biology II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6790</td>
<td>Case Studies in Computational Engineering and Science</td>
<td>3</td>
</tr>
<tr>
<td>MDCRC 6450</td>
<td>Grant Writing</td>
<td>3</td>
</tr>
<tr>
<td>NEUSC 6060</td>
<td>Neuroanatomy</td>
<td>1.5</td>
</tr>
<tr>
<td>NEUSC 6010</td>
<td>Frontiers in Neuroscience (seminar)</td>
<td>1</td>
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</tbody>
</table>

### Additional Advanced Courses in Neuroengineering

#### Electrophysiology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOEN 6003</td>
<td>Cellular Biophysics</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 6421</td>
<td>Fundamentals of Micromachining</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 6433</td>
<td>Biological Statistical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6550</td>
<td>Adaptive Filters</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6533</td>
<td>Advanced Digital Signal Processing I</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6534</td>
<td>Advanced Digital Signal Processing II</td>
<td>3</td>
</tr>
<tr>
<td>ECE 6710</td>
<td>Digital VLSI Design</td>
<td>4</td>
</tr>
<tr>
<td>NEUSC 7750</td>
<td>Developmental Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>NEUSC 6245</td>
<td>Cellular and Molecular Neurophysiology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>ONCSC 6150</td>
<td>Biostatistics</td>
<td></td>
</tr>
<tr>
<td>RHSCI 7200</td>
<td>Neuromuscular Performance &amp; Adaptation</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Biomaterials

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 6140</td>
<td>Fundamentals of Tissue Engineering</td>
<td>2</td>
</tr>
<tr>
<td>BIOEN 6302</td>
<td>Biomaterials</td>
<td>3</td>
</tr>
<tr>
<td>BIOEN 7120</td>
<td>Biocompatibility</td>
<td>2</td>
</tr>
<tr>
<td>BIOEN 7160</td>
<td>Physical Nature of Surfaces</td>
<td>3</td>
</tr>
</tbody>
</table>
### Computational/ Modeling

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6210</td>
<td>Advanced Scientific Computing I</td>
<td>3</td>
</tr>
<tr>
<td>CS 6355</td>
<td>Structured Prediction (machine learning)</td>
<td>3</td>
</tr>
<tr>
<td>CS 6955</td>
<td>Deep Learning (advanced neural networks and applications)</td>
<td></td>
</tr>
<tr>
<td>CS 7960</td>
<td>Neuromorphic Architectures (neural networks)</td>
<td></td>
</tr>
<tr>
<td>MATH 6070</td>
<td>Mathematical Statistics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6440</td>
<td>Advanced Dynamical Systems</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6630</td>
<td>Numerical Solutions of Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 6740</td>
<td>Bifurcation Theory</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7200</td>
<td>Nonlinear Controls</td>
<td>3</td>
</tr>
<tr>
<td>ME EN 7210</td>
<td>Optimal Controls</td>
<td>3</td>
</tr>
</tbody>
</table>
7. SUPERVISORY COMMITTEES

Supervisory Committee

Supervisory committees are responsible for approving a graduate student’s academic programs, preparing and judging student’s qualifying examinations, approving student’s thesis/dissertation subjects, reading and approving student’s thesis/dissertations, and administering and judging student’s final oral examination or thesis/dissertation defense. In addition, supervisory committees are responsible for arbitrating disputes, resolving conflicts, or difficult strategic programming decisions between the student and the advisor, determining student pace or progress in research and graduate programming, and directing the research and writing of student’s thesis/dissertation, including its quality for submission to the Department Chair and the Graduate School.

Ph.D. Supervisory Committees

Ph.D. supervisory committees are required to be formed within one year after entering the graduate program. In consultation with their research advisor, all students are responsible for contacting prospective committee members about their willingness and availability to serve as a member of their supervisory committee. Best practices include writing a short synopsis of the intended research project and motivation, and rationale for why the contributions of a specific faculty are deemed important to guide the student in such a project. Committee consensus should guide student coursework selection and resulting program of study approvals.

Ph.D. supervisory committees must consist of five faculty members (minimum). The majority of the supervisory committee, including the committee chair, must be tenure-line faculty in the Department of Biomedical Engineering. One member of the supervisory committee must be from another department, normally from another University of Utah department. The process of forming a supervisory committee is completed by student’s filing the Request for Supervisory Committee form with the Department for approval by the Director of Graduate Studies.

All students are required to meet with their supervisory committee annually to evaluate and discuss their research progress, strategies, success, coursework advancement, and any issues, technical or otherwise. These meetings are to be documented by the student in the form of meeting minutes distributed to the committee members subsequent to the committee meeting. Additional Ph.D. Supervisory Committee information is available on The Graduate School’s webpage.

M.S. Supervisory Committees

Within the first semester of admission to the M.S. program, students are required to form a supervisory committee consisting of at least three Department of Biomedical Engineering faculty members. This committee must include a committee chair, who is required to have a faculty appointment in the Department of Biomedical Engineering, and minimum of two additional committee members. Two of the three committee members are required to be tenure-track faculty members in the Department of Biomedical Engineering.

The process of forming a supervisory committee is completed by student’s filing the Request for Supervisory Committee form with the Department for approval by the Director of Graduate Studies. Students are responsible for contacting prospective committee members about their willingness and availability to serve as a member of their supervisory committee. Best practices include writing a short synopsis of the intended research project and motivation, and rationale for why the contributions of a specific faculty are deemed important to guide the student in such a project. Non-thesis students should first contact their specialized Graduate Track Advisor to determine an appropriate Committee Chair and members.

Students are required to meet with their supervisory committee annually to evaluate and discuss their research progress, strategies, success, coursework advancement, and any issues, technical or otherwise. These meetings are to be documented by the student in the form of meeting minutes distributed to the committee members subsequent to the committee meeting. Additional M.S. Supervisory Committee information is available on The Graduate School’s webpage.
8. PROGRAMS OF STUDY AND DEPARTMENT COURSE REQUIREMENTS

Programs of Study

Programs of study are compilations of courses students plan to complete as part of their M.S. or Ph.D. program requirements. The Graduate School requires candidates for master’s and Ph.D. degrees to work with a track advisor, research advisor and supervisory committee to design a program of study that meets the Ph.D. or M.S. program requirements. Programs of study should reflect a student’s specific research interests and should be designed to develop the highest level of expertise.

As described below, Ph.D. students are required to submit both a 1) preliminary program of study and 2) a final program of study to the Department after each member of student’s supervisory committee has signed their approval. M.S. students are required to submit a final program of study (only) to the Department after each member of student’s supervisory committee have signed their approval. The Program of Study must ultimately be approved by the supervisory committee and the Director of Graduate Studies.

Ph.D. Preliminary Program of Study

The Ph.D. preliminary Program of Study lists courses that students plan to complete as part of their Ph.D. program requirements. Students are required to submit their Preliminary Program of Study form to the Department for approvals from the student’s supervisory committee and the Director of Graduate Studies before they take the written comprehensive exam. The preliminary program of study ensures the both the student and the supervisory committee agree on the student’s program completion courses. If a student’s preliminary coursework is deficient, their supervisory committee may require the completion of additional courses. The thesis advisor and supervisory committee should both be consulted before selecting specific courses.

Ph.D. Final Program of Study

The Ph.D. final program of study is a list of all courses students have taken beyond the baccalaureate degree, and must also list all research credits (7970) that will be or are projected to be applied toward the Ph.D. degree. A Ph.D. final program of study typically includes 90-120 total credit hours beyond the baccalaureate level and must contain:

- 30 credit hours of coursework
- At least 6 credits of advanced 7000 level courses. This requirement may be reduced at the discretion of the Supervisory Committee
- 60 credit hours of dedicated research: BIOEN 7970 “Ph.D. Thesis Research”
- 17 credits of Core Curriculum (or approved substitutes)
- At least 13 credit hours of graduate level science and engineering elective courses; typically from the Specialized Graduate Track courses
- 4 credit hours of graded BIOEN 7880 “TA Mentorship”

BIOEN 7990: Continuous Registration does not count toward the fulfillment of the Ph.D. degree requirements and should not be listed on the program of study.

Up to 30 credit hours previously applied toward an M.S. degree in Biomedical Engineering can be included as part of the Ph.D. program of study but listed on the program of study form at “0” credits applied to the Ph.D. itself. These prior courses can be used to justify waiver of all or part of the course credit hour requirements described above, subject to specific approval by the Ph.D. supervisory committee and Director of Graduate Studies

Students are required to submit their final Ph.D. Program of Study form to the Department no later than one semester prior to the semester in which they will defend. After the program of study has received all necessary approvals, it is then entered into the student’s CIS record and reviewed by the Graduate School.

M.S Final Program of Study

The M.S program of study is a list of all courses students have taken beyond the baccalaureate degree, and must also list all research credits (6970, if appropriate) to be applied toward the M.S. degree.
A Program of Study including courses focused within a well-defined area of specialization must be approved by the research supervisory committee, as well as the Biomedical Engineering Director of Graduate Studies. The student’s advisor and supervisory committee should both be consulted before selecting specific courses.

Department Core Course Requirements

Our Biomedical Engineering core curriculum builds upon course material introduced to students in undergraduate biology, chemistry, mathematics, and physics. Students must complete the graduate core curriculum (or committee-approved substitutes) as part of the required 30 course credit hours minimum beyond the baccalaureate level.

Coursework should align with student’s educational goals and areas of specialization, and be an approved part of their Program of Study. Student’s supervisory committees may require students to take additional courses depending on the student’s performance on the qualifying exam, academic background, or other factors.

Life Science Fundamentals:
Minimum of 6 credit hours required for all students from the following courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 6000</td>
<td>Systems Physiology for Engineers</td>
<td>4 Credits</td>
</tr>
<tr>
<td>BIOEN 6303</td>
<td>Cell and Tissue Engineering I</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6430</td>
<td>Systems Neuroscience</td>
<td>4 Credits</td>
</tr>
<tr>
<td>BIOEN 6440</td>
<td>Neural Engineering</td>
<td>3 Credits</td>
</tr>
</tbody>
</table>

Biomedical Engineering Fundamentals:
Minimum of 6 credit hours required for all students from the following courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 5401</td>
<td>Medical Imaging Systems</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6002</td>
<td>Molecular Biophysics</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6250</td>
<td>Biomechanics II</td>
<td>3 Credits</td>
</tr>
<tr>
<td>BIOEN 6302</td>
<td>Biomaterials</td>
<td>3 Credits</td>
</tr>
</tbody>
</table>

Scientific Presentations:
Minimum of 1 credit hour required for all students from the following

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 6090</td>
<td>Department Seminar</td>
<td>0.5 Credits</td>
</tr>
</tbody>
</table>

  *To be taken the first semester in the program*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 6090</td>
<td>Department Seminar</td>
<td>0.5 Credits</td>
</tr>
</tbody>
</table>

  *To be taken the second semester in the program*

Minimum of 4 credit hour required for Ph.D. students (only) from the following

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 7070</td>
<td>Proposal Writing and Presentations I</td>
<td>2 Credits</td>
</tr>
</tbody>
</table>

  *To be taken Spring Semester of 2nd year*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOEN 7071</td>
<td>Proposal Writing and Presentations II</td>
<td>2 Credits</td>
</tr>
</tbody>
</table>

  *To be taken Fall Semester of 3rd year*
Department Core Curriculum Substitution Guidelines

Students may have documented evidence of equivalent previous experiences and knowledge in the “Fundamental” curriculum areas, based on previous degree curriculum and research experience. When this is the case, students may consider selecting alternative courses related to the Fundamental areas of study which would better meet their needs and interests.

However, students with limited experience or knowledge in the core curriculum may be required by their Research advisor or Supervisory Committee to complete additional coursework within a “Fundamental” area.

Any core curriculum substitutions are to be requested in the form of a memorandum and must be approved by the supervisory committee prior to approval by the Director of Graduate Studies. Approvals will be based on the student’s demonstrated proficiency in the subject matter and previous degree fields as follows:

**Students with B.S. Degrees in the Formal Sciences, the Physical Sciences, or Traditional Engineering**

Students who enter the graduate program with a B.S. degree in the formal sciences (i.e. mathematics or statistics), the physical sciences (i.e. physics or chemistry), or traditional engineering (i.e. chemical, computer, electrical, materials, or mechanical) may have little training in the life sciences.

Students in this category may be required to complete independent self-study and/or prerequisite coursework prior to enrolling in life science fundamentals courses. Students in this category are strongly encouraged to take 3 courses (a minimum of 9 credits) in the life science fundamentals core instead of the required 2 courses (a minimum of 6 credits).

It is rare for Life Science Fundamental core curriculum substitutions to be approved for students in this category.

**Students with B.S. Degrees in the Life Sciences**

Students who enter the graduate program with a B.S. degree in the life sciences (i.e. biology, microbiology, physiology, or biochemistry) may have little training in engineering, mathematics, and/or physics.

Students in this category may be required to complete independent self-study and/or prerequisite coursework prior to enrolling in Biomedical Engineering fundamentals courses. Students in this category are strongly encouraged to take 3 courses (a minimum of 9 credits) in the Biomedical Engineering fundamentals core instead of the required 2 courses (a minimum of 6 credits).

It is rare for Biomedical Engineering Fundamental core curriculum substitutions to be approved for students in this category.

**Students with B.S. Degrees in Biomedical Engineering or Biomedical Engineering**

Typically, students who enter the graduate program with a B.S. degree in Biomedical Engineering or Biomedical Engineering have completed introductory courses similar to the life science and Biomedical Engineering fundamental core courses.

Students in this category are permitted to choose alternate life science and Biomedical Engineering courses to fulfill the core curriculum requirements. Students are given considerable flexibility when requesting Life Science and Biomedical Engineering Fundamental course substitutions, based on their individual backgrounds and research interests.

**Course Substitution Procedure**

Students intending to request relevant course substitutions for the department core course requirements must submit a written proposal outlining their request to their supervisory committee and the Director of Graduate Studies. Proposals should indicate the following:

- The student’s experience/background in the core area including a list of specific courses and when taken.
- The reason(s) the proposed course(s) meets the aim/scope of a "Fundamental" requirement in that area
- The student’s research focus and why the proposed course(s) would be in their best interest.
Proposals will be submitted with the student’s Program of Study form (or Preliminary Program of Study form) for their Supervisory Committee’s approval. An additional approval of the Director of Graduate Studies will also be required.

**Department Seminar**

During the academic semesters, the Department hosts topical seminar speakers on a weekly basis. These speakers are leaders in their fields from both the University of Utah as well as outside institutions. All Biomedical Engineering graduate students are expected to attend these seminars without exception. This is an important part of our Biomedical Engineering community and many good ideas come from listening to seminar speakers who are speaking in areas outside of the student’s dissertation research area. Although attendance is not taken at these seminars, it is clear to the faculty, committee members and the Department administration who attends the seminars and how regularly they attend. All graduate students are expected to attend seminar.

**GRADUATE SCHOOL Registration Requirements**

**Credit Hour Policies**

For graduate students, 9 credit hours is considered full-time enrollment until the Enrollment Residency Requirements is completed (see below). After that point, just 3 credit hours of Thesis Research credit (BIOEN 6970 and BIEON 7970 only) will qualify a student in good standing for full-time student status (and at in-state tuition rates). Students are not allowed to register for more than 16 credit hours without approval from the Dean of the Graduate School. Students are required to enroll in at least one course in the semester they complete their final exam or defend their thesis/dissertation. BIOEN 7990 “Continuing Registration” is only available to Ph.D. students who have been admitted to candidacy and are not using University resources other than the library (i.e., not performing any research on campus, occupying university space beyond the library, not using faculty or staff time). BIOEN 7990 registration is limited to 4 semesters and does not qualify a student for full or part-time enrollment status for loan deferments or insurance eligibility, etc. Students who are not U.S. citizens should refer to the University of Utah International Student Scholar Services office for additional registration requirements.

**Enrollment Residency Requirement**

- Ph.D. students are required to complete at least one year (two consecutive semesters) of the Ph.D. program in full-time academic work at the University of Utah.
- M.S. students are required to complete at least 24 credits of resident study at the University of Utah.

These requirements do not refer to or fulfill the other State Residency Requirements for graduate students from the Graduate School. Per policy, domestic, out-of-state students must apply for Utah State residency upon completion of 40 graduate level semester credit hours at the University of Utah. Details on qualifying and applying for Utah residency reclassification are available on the Admissions office website. For additional information on the Enrollment Residency Requirement, please see Degree Requirements on the Graduate School’s website.

**Continuous Registration**

Graduate students are required to be registered for at least one course from the time of formal admission through completion of all requirements for the degree they are seeking, unless granted an official leave of absence. The Biomedical Engineering department requires a minimum registration of 3 credit hours per semester for all graduate students through their final exam/defense semester. This is typically BIOEN 7990 “Continuing Registration”. Summer semesters are excluded from the registration requirement unless the student will complete their final exam/defense during the summer semester. Non-compliance with this policy will result in discontinuation from graduate study and the student will be required to re-apply for admission to the program.
Leaves of Absence

Requests for leaves of absence may be granted for up to one year for circumstances related to:

- a serious health condition of the student or family member
- parental leave to care for a newborn or newly adopted child
- a call to serve in military service
- other compelling reasons that the student’s department believes is in the best interests of both the student and the University.

The form requesting a leave of absence for a current semester must be completed and received in The Office of the Registrar by the last day of classes of that semester. Leaves of absence are not granted retroactively. Students must officially withdraw from classes in any semester for which a leave is granted; failure to formally withdraw results in the reporting of E or EU grades for all classes.

The period during which a leave of absence is granted does not count toward the period allowed to complete the degree. Leaves are granted for a maximum of one year at a time, and may be renewed by submitting a new form to The Office of the Registrar. The leave of absence is void if a student registers for classes in a semester for which a leave was granted.

Please refer to the Graduate School website for additional information on Leaves of Absence.
9. TIMELINE FOR PROGRAM COMPLETION

The timelines for each degree program differ and are summarized below.

**PhD completion timeline:**

Students typically graduate within 5 years of entering the BME Ph.D. program. However, the nature of some projects and methods require longer time commitments for full completion of dissertation work.

The official time limit for completing the Biomedical Engineering Ph.D. degree is 8 years. If a student in good standing has not completed the Ph.D. program within 8 years, a time limit extension may be requested with a letter of support from the student’s Supervisory Committee Chair to the Department Chair and Graduate School, justifying reasons for the extension and including a forecast for student completion. Time limit extensions must be approved by the Department Director of Graduate Studies as well as the Dean of the Graduate School.

The following timeline is based on a five-year plan for students entering the Ph.D. program with Bachelor’s degree. Please note that students entering with their master’s degree will typically follow a more accelerated three- or four-year plan depending on their M.S. degree institution. (see the Tuition Benefit section)

**First Year**
- Begin the Core Curriculum courses
- Identify a Research Advisor (and typically Committee Chair) by the end of the first semester
- Begin dedicated Ph.D. research (BIOEN 7970)
- Select an Area of Specialization/Track
- Establish full Ph.D. Supervisory Committee before the end of the second semester and convene first committee meeting

**Second Year**
- Meet with Supervisory Committee to report progress, planned coursework, research aims, set goals, etc.
- Take advanced courses and complete Core course requirements
- Begin TA Mentorship requirement
- Submit Preliminary Program of Study by the end of the fourth semester
- Prepare for the Ph.D. Qualifying Examination

**Third Year**
- Meet with Supervisory Committee to report progress and prepare Research Proposal
- Take written Ph.D. Qualifying Exam
- Submit written Research Proposal
- Complete and present oral Ph.D. Qualifying Exam
- Take specialized research track courses
- Report research at public seminar

**Fourth Year**
- Meet with Supervisory Committee to report progress
- Complete any remaining course requirements, including TA Mentorship
- Report research at scientific meeting
- Identify External Reviewer (if applicable)
- Submit Final Program of Study for the Ph.D. degree to the Department

Fifth Year
- Meet with Supervisory Committee to report progress
- Report research at scientific meeting
- Deliver Dissertation
- Submit the Report of the Final Oral Examination and Dissertation for the Ph.D. degree to the Thesis Office and Graduate School

Note: Failure to take the written Ph.D. Qualifying Exam in the fall semester and take the oral qualifying exam by the end of spring semester of Year 3 may result in a loss of tuition benefit eligibility.

M.S. completion timeline:
Students typically graduate within 2 years of entering the BME M.S. program. However, the nature of some projects and methods requires longer time commitments for full completion of thesis work, etc.

The time limit for completing the Biomedical Engineering M.S. degree is 4 years. If a student in good standing has not completed the M.S. program within 4 years, a time limit extension may be requested with a letter of support from the student’s Supervisory Committee Chair to the Graduate School, justifying reasons for the extension and including a forecast for student completion timeline. Time limit extensions must be approved by the Department Director of Graduate Studies as well as the Dean of the Graduate School.

The following timeline is based on a two-year plan for traditional full-time M.S. students. Please note that students in a dual degree program or part-time M.S. may need to adjust their timeline accordingly

First Year
- Begin the Core Curriculum courses
- Select a Specialized Graduate Track
- Form a Supervisory Committee and submit Supervisory Request form by the end of the first semester
- Meet with Supervisory Committee at the beginning of the second semester to report planned coursework, timeline for completion, expectations, etc.
- Thesis students may begin dedicated M.S. research (BIOEN 6970)
- Begin Specialized Graduate Track courses

Second Year
- Take advanced Track courses (6000+) and complete Core course requirements
- Meet with Supervisory Committee at the beginning of the second year to report progress, finalized/approve Program of Study and plan for Final Exam or Defense
- Submit Program of Study form
- Apply for graduation
- Complete all course requirements and Thesis Research credits (if applicable)
- Non-thesis Students must complete a final exam/oral presentation by the last day of Finals and submit “Report Final Exam” form
- Thesis students must complete a thesis defense/exam and submit “Report Final Exam” form
- Thesis Students must also submit their written manuscript to the Thesis Office for publication. See the Thesis Office website for policies and deadlines.
10. EXAMINATIONS

Ph.D. Written Comprehensive Exam

The Ph.D. written comprehensive exam is administered by the Dept. of Biomedical Engineering each year within the first two weeks of the fall semester. Students should inform the Director of Graduate Studies of their intent to take the exam and submit a proposed Preliminary Program of Study at least one semester prior to the exam date. The preliminary program of study is a list of all courses that the student plans to complete as part of the requirements for the Ph.D. as approved by their supervisory committee.

The preliminary program of study must be approved by the graduate advisor and the supervisory committee. Students can choose to take the exam in any of the PhD program tracks. Please consult with the Director of Graduate Studies or research supervisory committee to select the most appropriate exam. Exams are prepared and graded by a committee of Biomedical Engineering faculty members with expertise in the exam area.

Students may contact the chairperson of their exam committee to discuss the format of the exam. The format of the exams may vary somewhat from committee to committee, but will generally consist of a set of in-depth questions from the field of specialization and will include comprehensive questions from the Biomedical Engineering core.

The written comprehensive exam will take 8 hours. Books and notes will not be allowed in the exam. The Director of Graduate Studies will inform the students of their exam outcomes. Students who fail will be given a second opportunity to pass the exam. The strengths and weaknesses of students that pass the exam will be noted by their exam committee in a written report that will be placed in the student’s file. The student’s supervisory committee will review this report before the oral qualifying exam and may direct their questions accordingly.

Ph.D. Research Proposal

The student’s research proposal consists of a formal written and oral presentation of their proposed Ph.D. research. The written portion of the qualifying exam research proposal should follow the NIH R01 format, including all page limits, margins, formatting and with all technical sections as required for the specific research. Adherence to the PhD time-lines expected: a failure to deliver Oral Qualifying Exam by the end of year 3 may result in a tuition benefit eligibility.

The complete written portion of the exam’s research proposal must be provided to the supervisory committee at least two weeks prior to the student’s scheduled oral presentation. An announcement and title/abstract of the proposal presentation must be publicly posted at least one week prior to the presentation. The public oral presentation is followed by questions from the audience. The supervisory committee then meets in a closed-door session to examine the student in the absence of their graduate research advisor.

To pass the exam, the student must demonstrate adequate preparation to begin effective independent research: the student must be well-versed in the fundamentals, have cogent familiarity with the primary literature in the proposed area of research, and demonstrate an ability to design and effectively communicate a competent, sound scientific research plan.

In some cases, the committee may pass the student contingent upon successfully responding to issues raised during the oral qualifying exam. These issues can be focused on both the written and/or oral components of the exam. Contingencies can include proposal revisions, supplemental coursework, supplemental written reporting, new supporting data and/or additional oral presentations. Students are given two opportunities to pass this oral/written research proposal exam. A report of the written research proposal and oral exam outcome must be signed by the supervisory committee and delivered to the Department and then to the Graduate School.
11. ACADEMIC PERFORMANCE, STANDARDS AND STANDING

All graduate students are required to maintain good academic standing by meeting the minimum academic standards as defined by the Graduate School and the Department. The Graduate School academic standards can be found on the University of Utah Graduate School website. Many privileges associated with graduate standing require this minimal academic performance. Students who fall below minimum academic performance requirements are placed immediately on academic probation for one semester.

If these students fail to correct their record after one semester with subsequent sufficient improvements in academic performance so to maintain minimal standards as defined by the Graduate School, then they will lose benefits, including fellowships, tuition support, and stipend. This may require that they leave the program, either voluntarily or involuntarily. As per the Graduate Student Handbook for the Graduate School at the University of Utah, “Candidates for graduate degrees are required to maintain a 3.0 or higher GPA in coursework counted toward the degree (i.e. courses on the program of study).“

The Graduate School’s policy to remain in good academic standing is to maintain a 3.0 GPA or higher in coursework counted towards the fulfillment of degree requirements. The Biomedical Engineering students must remain in good academic standing with the Graduate School (i.e., GPA > or equal to 3.0) or risk probation and/or dismissal. If the student is on probation from the Graduate School, one semester is allowed to increase the student’s GPA to meet the minimum GPA requirements before termination of the Tuition Benefit Plan and dismissal from the Graduate program. In addition, students must pass each of the core Biomedical Engineering courses and electives with a B- or better grade. If a student does not achieve a B- minus grade or better in all Biomedical Engineering core courses, one additional opportunity is allowed for remediation prior to dismissal from the Biomedical Engineering program. The student will be informed that there is a student academic deficiency as delineated in the Department Policies and Procedures and the Code of Student Rights and Responsibilities. The student, supervisory committee chair, Director of Graduate Studies, and Department Chair will be notified in writing. If the situation is not remedied, the Director of Graduate Studies will provide a letter of notification that the student has not remedied the deficiency, resulting in his/her termination.

Below is a list of common conditions that cause a student to be academically deficient within the Ph.D. program. If a student satisfies any of the conditions below, then the student is academically deficient unless a previous formalized arrangement is signed off with the Director of Graduate Studies for approved deviation from the corresponding academic requirement(s). Problem areas for dismissal concerns include:

- Failure to identify and research advisor by the end the first semester of graduate study
- Failure to establish a graduate supervisory committee and meet together by the end of the first year of graduate study
- Failure to have annual evaluations between the student and supervisory committee
- Failure to take the written comprehensive exam by the fall semester of the third year of graduate study
- Failure to pass the written comprehensive exam on the second attempt
- Failure to present the oral portion of the Ph.D. qualifying exam by the end of the spring semester of their third year
- Failure to pass either the written or oral portions of the Ph.D. qualifying exam by the date specified by the department chair, director of graduate studies, or the student’s supervisory committee
- Failure to maintain a 3.0 grade point average as required by the Graduate School
- Failure to meet satisfactory progress as determined by the supervisory committee chair, Director of Graduate Studies or Department Chair
- Failure to meet any individualized requirements specified by student’s supervisory committees and/or the Director of Graduate Studies as stipulated in writing
• Failure to graduate by the date specified in student’s most recent letter of support, or within the 8-year time limit from matriculation into the Ph.D. program

Students who are remiss in satisfying any of these categories, or who fail to meet other requirements specified for their program, can be dismissed from the graduate program. In these cases, students must promptly appeal to the Director of Graduate Studies and Department Chair if they wish to continue in the program (these deficiencies may be pointed out to the student earlier). Dismissal from the Biomedical Engineering graduate program shall result in termination of graduate student support, stipends or funding.

**Academic, Behavioral, and Professional Misconduct Policies**

All Biomedical Engineering graduate students, as well as any students taking a Biomedical Engineering course or course cross-listed with Biomedical Engineering are required to read and understand the Department of Biomedical Engineering policy statement on academic misconduct and to sign and file the associated student acknowledgement form with the Department Graduate Advisor.

“Academic misconduct includes, but is not limited to, cheating, misrepresenting one’s work, inappropriately collaborating, plagiarism, and fabrication or falsification of information. It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct.”

The University’s complete “Student Code” policy, Policy 6-400: Code of Student Rights and Responsibilities from the Regulations Library, includes the 7 sections listed below.

• Section I: General Provisions and Definitions – ACADEMIC SANCTION
• Section II: Student Bill of Rights
• Section III: Student Behavior – STANDARDS OF BEHAVIOR
• Section IV: Student Academic Performance
• Section V: Student Academic Conduct
• Section VI: Student Professional and Ethical Conduct
• Section VII: Student Records

“Students at the University of Utah are members of an academic community committed to basic and broadly shared ethical principles and concepts of civility. Integrity, autonomy, justice, respect and responsibility represent the basis for the rights and responsibilities that follow. Participation in the University of Utah community obligates each member to follow a code of civilized behavior.”

“The purposes of the Code of Student Rights and Responsibilities are to set forth the specific authority and responsibility of the University to maintain social discipline, to establish guidelines that facilitate a just and civil campus community, and to outline the educational process for determining student and student organization responsibility for alleged violations of University regulations. University policies have been designed to protect individuals and the campus community and create an environment conducive to achieving the academic mission of the institution. The University encourages informal resolution of problems, and students are urged to discuss their concerns with the involved faculty member, department chair, dean of the college or dean of students. Informal resolution of problems by mutual consent of all parties is highly desired and is appropriate at any time.”

“Section VI. A. Standards of Professional Conduct – To ensure that the highest standards of professional and ethical conduct are promoted and supported at the University, students must adhere to the prescribed professional and ethical standards of the profession or discipline for which the student is preparing, as adopted or recognized as authoritative by the relevant academic program.” “Section VI. B. Professional Misconduct – A student who engages in academic misconduct may be subject to academic sanctions including, but not limited to, a grade reduction, failing grade, probation, suspension or dismissal from the program or the University, or revocation of the student’s degree or certificate. Sanctions may also include community service, a written reprimand, and/or a written statement of
misconduct that can be put into an appropriate record maintained for purposes of the profession or discipline for which the student is preparing.”

**Program Suspension and Dismissal Policies**

Matriculated graduate students in the program who fail to comply with performance expectations in either their graduate research and/or didactic coursework, and/or with codified university policies for graduate conduct (including plagiarism) can be dismissed from either the Department’s academic program or from the Graduate School, or both.

Student’s progress, academic and research performance is evaluated annually in meetings held with students and their Supervisory Committees. These meetings are considered formal reviews of student progress in the program and are the student’s responsibility to initiate and complete. Failure to produce this annual review and reporting is considered a major student programmatic deficiency. Should any issues regarding continuation in the program arise, these issues will be discussed at the Committee level and documented with the student, first in a formal letter emanating from the Director of Graduate Studies (with input from the faculty advisor after faculty meeting discussions) followed by discussion with the faculty advisor.

However, individual faculty members can coordinate with the Director of Graduate studies to initiate the dismissal process of a student from the Biomedical Engineering graduate program and/or the Graduate School at any time for failure to meet the academic requirements of the program and for academic or professional misconduct. An ad hoc committee of faculty may be called to arbitrate if necessary. Final decision is provided to the student by the Department Chair.
12. LABORATORY PERFORMANCE AND EXPECTATIONS

Research creativity, consistent productivity, evident progress, independence and motivation are the hallmarks of successful graduate student performance. Those students who perform in their academics and research generally succeed and proceed expeditiously through the graduate program. Unfortunately, unsatisfactory student performance and progress in their graduate research program can result in their dismissal from the program and loss of stipend support. University policy 6-309 Section D Orderly Dismissal) provides a basis for this evaluation and dismissal process.

Section III.D.1 states:

“Performance Evaluation. Any person appointed according to the provisions of this section may be dismissed for cause. The individual’s designated supervisor shall provide timely informal evaluations of the individual’s job performance and make conscientious efforts to assist the individual to correct any unsatisfactory aspects of job performance. If unsatisfactory aspects of job performance persist, the supervisor must provide the individual with a written statement of difficulties and a reasonable time in which to correct them.”

The Department faculty supervising the student reserves the right to dismiss students who, after notice of their sub-optimal performance and deficiencies, fail to either perform to expected standards or to exhibit an acceptable trajectory of substantial improvement, effort and motivation. Department policy mandates that the student will be provided written notification of the advisor’s dissatisfaction and evidence for failure to progress or insufficient research performance.

Upon meeting with the research advisor, the student shall sign this written notice, acknowledging the meeting’s occurrence (whether they agree with the assertions or not) and this document will be placed in their graduate file.

The student can lodge a protest with their supervisory committee first, then the Chair, and if also use the University’s appeal process desired to counter these assertions. Following this meeting, the student will be given a 6-week probationary period to change their performance as prescribed and produce tangible evidence of improvement and productivity. A second student-advisor meeting at this 6-week time-point will produce a second written evaluation of the student’s performance and evidence asserting either improvements, further concerns or non-improvements as evidence of failure to progress. Another second 6–week period will be the final evaluation period.

At termination of 12 weeks, the student is provided a written permission from the advisor to continue in their specific research program or for dismissal from that advisor/mentor’s group based on specific cited criteria for poor productivity, poor performance, sub-optimal motivation or failure to progress.

The student can remain in the department’s graduate program, but without support/stipend, as long as they remain in good academic standing, but must find another willing faculty mentor to produce a qualified research project that satisfies department graduate program requirements in order to finish their degree. This policy does not supersede current student rights accorded by the University’s Policy and Procedures Manual (PPM), and its references to student participation in formal Family Leave or Medical leave policies and procedures.

Responsible Conduct of Research

The National Science Foundation (NSF) and the National Institutes of Health (NIH) require appropriate training in the Responsible Conduct of Research (RCR) for certain types of grants. RCR instruction must be undertaken at least once during each career stage, and at a frequency of no less than once every four years.

The NSF requirements apply to all postdoctoral scholars, graduate and undergraduate students participating on a funded project. The NIH policy requires inclusion of a plan to receive RCR instruction in applications of most types of training grants including fellowships, career development awards, research education grants, and dissertation research grants.
13. FINANCIAL SUPPORT AND TUITION

Biomedical Engineering graduate students at the University of Utah are often supported by Graduate Research Fellowships through the College of Engineering, Research Assistantships, Teaching Assistantships or Extramural Fellowships. Financial support is a privilege and intended to support direct, efficient progression of the student through their graduate experience.

Admission to the Ph.D. program generally includes a research-based Research Assistantship and stipend or salary provided by the research advisor. Note: this salary is not guaranteed. It is based on the availability of research funding from various sources (grants and contracts). A subsidy may be provided for individual health insurance at the research advisor’s discretion, but is not required or expected.

Financial support for the period in which the student is conducting dissertation research is the responsibility of the student’s faculty mentor and is normally derived from faculty research grants. No Departmental funds are available for this purpose; no guarantees for graduate student financial support come from the Department, although it attempts to mediate extenuating circumstances and unusual hardships as resources allow.

Hence, the award of a Research Assistantship is considered a privileged position for each student, one to be respected, and should be considered the primary means of support for the primary focus of the student in the program: expedient and efficient pursuit of the graduate degree.

Financial support may also be rescinded by supervising faculty for documented student failure to progress both in research and in performing to minimal academic standards. Although this can be a unilateral advisor decision, faculty-student relationships would best enroll the advice of the student’s supervisory committee before withdrawing stipend support. Additionally, the University Policies and Procedures Manual provides specific recommendations and process for addressing “failure to progress” and other student performance deficiencies with documentation, warnings, and written responses.

Differential Tuition

Per current College policy, all students, regardless of class standing, will be charged an additional College of Engineering differential fee per credit hour for graduate level courses in the College of Engineering. This differential tuition is not included as part of the Graduate School’s tuition benefit program and must be paid by the student. Please see the Income Accounting Tuition website detailed tuition and fee rates.

Other Fees and University Expenses

- Special Course Fees. For those courses requiring them, special fees are shown in a column of the course listings. These fees, which must be paid with tuition, are in addition to regular tuition and mandatory fee charges.

- Mandatory Fees. The mandatory fees include the following fees: ASUU Activity, Athletic, Building, Collegiate Reader Program, Computing, Fine Arts, Utilities, Health, Library, Publication Council, Recreation, Study Abroad, Sustainability, Money Management and Transportation. The amounts for these fees are included in the Tuition and Fee schedule listed above.

- Health Insurance. All BME graduate students are required to have documented health insurance.
  - Subsidized insurance is available to TAs and RAs who are receiving a full 100% tuition benefit. They may hold both a TA and an RA position (with the total adding up to 100% tuition benefit) to qualify. The insurance is the same Student Health Insurance policy offered to all U of U students. Coverage for dependents is not subsidized. Qualifying students are billed for 20% of the premium through Income Accounting and the Graduate School pays the remaining 80% at the start of the semester.
  - If not qualified for the TBP-subsidized insurance Program, students are responsible to purchase their own health insurance. Policy and premium information is available from University Student Health Services.
14. FELLOWSHIPS AND ASSISTANTSHIPS

Fellowships
Students are encouraged to continually seek out and apply for university, state, national and international fellowships to supplement or replace their stipend support. Although faculty advisors determine support levels, fellowship support is a distinction, and therefore, all fellowship support should remain the property of the student receiving this honorary award, with stipend support adjusted at the faculty advisor’s discretion. Stipend and fellowship support levels are determined by the faculty advisor although it is recognized that fellowship support is a distinction, and therefore, all fellowship support should remain the property of the student receiving this honorary award, with stipend support adjusted per advisor discretion. Additionally, students are encouraged to continually seek and submit their own fellowship applications from numerous university, national and international agencies that sponsor these awards.

Extramural Fellowships
A current listing of Extramural Fellowships is available online through the Graduate School.

Research Fellowships
Several outstanding Biomedical Engineering students receive support each year from fellowship administered through the College of Engineering. The Department Scholarship Committee nominates these students based on the application information provided and the Department Chair must support their nomination in writing. Additional information regarding the College of Engineering fellowships can be found on the College of Engineering website.

Research Assistantships (RA)
Individual faculty members from the Department of Biomedical Engineering offer Research Assistant or RA positions, supported by research grants and contracts, to a vast majority of graduate students. The Department recommends that stipends offered to students align with NIH pre-doctoral level of support for Ph.D. students. In addition, students receive tuition waivers through the Graduate School’s Tuition Benefit Program (TBP).

The Graduate Admissions Committee can assist students with identifying potential faculty sponsors, but ultimately, it is student’s responsibility to secure an RA position, stipend and benefits.

During on-campus admissions interviews and after acceptance to the Biomedical Engineering Graduate Program, students are strongly encouraged to arrange interviews with potential faculty advisors to sponsor an RA position.

Continuation of tuition waivers, stipend and increases are contingent upon continuous enrollment, rules of The Graduate School, and satisfactory progress in the BME graduate program.

Teaching Assistantships (TA)
Teaching Assistantships provide Ph.D. students with valuable pedagogical leadership experiences and mentoring opportunities. The Department determines which Biomedical Engineering undergraduate and graduate courses will utilize TAs. Duties may include lecturing, holding discussion or problem sessions, conducting laboratory sections, grading, tutoring and holding office hours.

Ph.D. students must first fulfill the 4 required credit hours of TA Mentorship (BIOEN7880) prior to accepting a paid Teaching Assistantship.

Teaching Assistantship Time Commitment:
- Students may complete 2 semesters (2 credits each semester) of BIOEN 7880: TA Mentorship with a time commitment of 10 hours each week for the duration of each semester, or
- Students may complete 1 semester (4 credits) of BIOEN 7880: TA Mentorship with a time commitment of 20 hours each week for the duration of the semester.
- In rare cases, courses may require a ¼ TA, which would only require registration for 1 credit of TA.

Teaching Assistantship requirements also include:
• TAs are required to strictly abide by the regulations set forth in the Family Educational Rights and Privacy Act or FERPA. This federal law protects the privacy of educational records of students.

• TAs are required to attend a mandatory training provided by the College of Engineering within the first 2 weeks of Fall Semester. The Department will notify TAs of the date, time and location.

• TAs are required to meet with their assigned course instructor(s) prior to the beginning of the semester to initiate organization and to identify the expectations of the TAs role and duties.

• TAs are required to attend all lectures of their assigned course(s) and be sufficiently familiar with the materials covered in both the class and the homework to tutor the content.

• TAs are expected to contribute in a substantive way to the pedagogical needs of their assigned course(s). The instructor and the nature of the course determine these needs. For example, TAs should expect to undertake one or more of the following activities: 1) deliver one or more course lectures, 2) lead problem-solving or discussion sessions prior to exams, or 3) grade exams.

• The TA requirement of 4 credits must be completed by the end of student’s 4th year of Ph.D. graduate study, and prior to the end of their TBP, but may be completed prior to this time if a student volunteers or is asked for a TA course assignment.

• The Teaching Assistantship requirement is for credit and is not eligible for consideration of a paid position until the four 7880 credit hours have been completed. However, financial stipend support will continue from the student’s research advisor. Thereafter, additional financial support will be determined by the Department.

• TAs are required to be proficient in the English language in order to effectively interact with students in a leadership and pedagogical manner. To be eligible for the Tuition Benefit Program for teaching assistantships, the Graduate School requires all non-native English speaking graduate students to be cleared by the International Teaching Assistant or ITA Program prior to any teaching exposure. Therefore, clearance from the ITA Program is a compulsory requirement for all international students.

• TA workshops, as well as online teaching resources are available through the Center for Teaching and Learning Excellence (CTLE).

• Student TAs are not allowed to provide formal didactic lectures without a department faculty or faculty or record in the classroom; or prior review and approval of the lecture presentation.

• For all other students, TA and Grader positions will be made available at the discretion of the Department Chair.
15. OUTSIDE EMPLOYMENT

The Department of Biomedical Engineering considers a full-time research stipend for graduate support to be a full-time traineeship, with the privilege of support, and expectation of long and irregular hours required for successful degree completion. Responsibilities of such conditions of graduate study preclude the pursuit of other gainful employment without interference with doctoral program progress.

Therefore, students are strongly discouraged from engaging in employment outside of the Department. Such arrangements must be approved in writing and in advance of the situation, from both the faculty advisor and supervisory committee. If a student is employed outside the Department, the student’s supervisory committee and department faculty will monitor whether such employment interferes with the expectations of the program (i.e. the student’s progress in course and research work, research or other program requirements). Outside employment includes employment, internships or other "out of lab" training that occurs at the University of Utah (e.g. Lassonde internship, Center for Medical Innovation internship, Bench to Bedside competition, etc.) or outside the University of Utah (e.g. employment at a private / public corporation).

If the supervisory committee or department faculty determines that outside employment is unduly interfering with the student’s doctoral progress, the student may be asked to reduce their outside employment commitments or to leave the program.
16. TUITION BENEFIT PROGRAM

Administered by the Graduate School, the Tuition Benefit Program (TBP) provides payment of general graduate tuition and mandatory fees for eligible students who are compensated through the University of Utah. Students receiving this benefit are responsible to pay all differential tuition and non-mandatory fee charges.

Categories of Supported Graduate Students

The four eligible classifications qualifying a student for TBP participation are:

- **Graduate Research Assistant (RA)** with Exempt job code 9314: Students assigned directly to an externally funded research grant (5000 fund) and performing research for that project.

- **Graduate Assistant (GA)** with Exempt job code 9330: Students assigned work related to their degree program and not covered in the previous two categories. A GA must be funded from within their department and not supported by external grant funding.

- **Graduate Teaching Assistant (TA)** with Exempt job code 9416: Students with instructional responsibilities as the instructor of record, assistant to the instructor of record, or tutor. International students must be cleared through the International Teaching Assistant Program before being assigned a TA position.

- **Graduate Fellow (GF):** Students on a fellowship, whose tuition is not paid by their award. If tuition is included in a student’s fellowship award, the student may not also use the tuition benefit. The University must administer the award and a service expectation may or may not accompany it.

Graduate School Requirements for TBP

- Students must be matriculated and in good standing.

- Students must maintain the Graduate School’s minimum cumulative GPA of 3.0.

- Students must be registered for a minimum of 9 credit hours (full-time for graduate students) for the duration of both fall and spring semesters.

- Students must meet minimum financial support levels indicated on the TBP website. These levels vary by semester/year. Financial support must be paid through the University of Utah.

- Non-resident, non-international graduate students receiving the tuition benefit must apply for Utah residency upon completion of 40 semester credit hours at the University of Utah per Graduate School policy. This is to avoid billing the university for out-of-state student tuition at unnecessary out of state rates. Additional information regarding the Residency for Tuition Purposes policy is available on the Office of Admissions website, as well as the Residency Reclassification Application.

- Both, students and the Department are responsible for maintaining an accurate count of the semesters students receive TBP support. If students receive TBP support for more semesters than they are eligible, they may be retroactively billed and liable for tuition (in-state or out-of-state if not UT resident) for ineligible semesters.

- Students covered by TBP support who withdraw mid-semester or fail to comply with TBP requirements mid-semester (or summer) may be required to re-pay TB support (in-state or out-of-state if not UT resident).

Tuition Benefit Coverage Guidelines

- For GAs, TAs, and GFs, the tuition benefit covers 9-12 credit hours in fall and spring semesters (only).

- For RAs, the tuition benefit covers 9-11 credit hours in fall and spring semesters, and 3 credit hours in summer semester.
  
  - For summer semesters, the tuition benefit is only available to RAs who were classified on TBP and paid as 100% RA in the preceding fall and/or spring semesters, and who will continue to be classified and paid as an RA in summer semester.
  
  - Summer TBP covers only 3 credit hours and students must register for 3 credits to be eligible.
- Summer semesters do not count against the total number of semesters students are eligible for the tuition benefit.

- The TBP covers student’s non-resident tuition in full, with the exception of RAs who exceed 84 cumulative credit hours. In the semester an RA exceeds 84 cumulative credit hours, the tuition benefit will cover only resident tuition amounts. To avoid being charged non-resident tuition, non-resident RAs who have completed their required coursework should only register for 9 credit hours of BIOEN 7970: Ph.D. Thesis Research.

**Restrictions**

- The recommended Full-Time Equivalent (FTE) maximum is 0.50 (20 hrs/week) and cannot exceed 0.74 FTE. Other paid positions on campus (internships, tutoring, etc.) are counted toward the student’s FTE.

- Courses designated as undergraduate (below 5000 level), contract, audit, repeat, and credit/non-credit will count toward the required minimum of 9 credit hours, but do not qualify and will not be paid for by the tuition benefit.

- The tuition benefit program will not pay for any withdrawn credit hours, and if a student’s registration falls below 9 credit hours at any time during the semester, they will become ineligible for tuition benefit support and will be billed full tuition for that semester.

- Students may register for the maximum of 16 credit hours, but will be responsible to pay all tuition and fee amounts above 12 credit hours (or 11 for RAs).

- Non-matriculated students, part-time students, and students on academic probation are not eligible to participate in the tuition benefit program.

**Semester Limits**

Students are limited in the number of semesters, which are not required to be sequential, that they may participate in the tuition benefit program.

- Students enrolled in the M.S. program are limited to 4 semesters (2 years) of tuition benefit support.

- Students who enter the Ph.D. program with a bachelor’s degree are limited to 10 semesters (5 years) of tuition benefit support.

- Students enrolled in the Ph.D. program who receive(d) a master’s degree from the University of Utah are limited to 10 semesters (5 years) total of tuition benefit support, 4 semesters (2 years) for a master’s degree and 6 semesters (3 years) for a doctorate degree. The 4 semesters of TBP designated to the master’s degree do not carry over to the doctoral degree if not used. Therefore, students who earn a master’s degree from the University of Utah are eligible for a maximum of 6 semesters (3 years) of TBP for their PhD program.

- Students who enter the Ph.D. program with a master’s degree from another university are eligible for 8 semesters (4 years) of tuition benefit support.

Additional information regarding the Tuition Benefit Program and its policies is available on the Graduate School’s website under Fellowships and Benefits.
17. SUBSIDIZED GRADUATE STUDENT HEALTH INSURANCE

Subsidized Graduate Student Health Insurance

Subsidized health insurance is available to TAs and RA’s who receive 100% tuition benefit. It is also available to students classified as 50% TA and 50% RA, as long as their combined tuition benefit total equals 100%.

Students who qualify will be billed 20% of the premium and the Graduate School will pay the remaining 80% at the beginning of the semester.

Insurance coverage is not subsidized for dependents, but rates for are available online through United Healthcare for health insurance and EMI Health for vision and dental insurance.

Students who are not eligible for the subsidized health insurance program, but would like to enroll at their own cost can find information and rates online through the Student Health Center.

Additional information regarding Subsidized Graduate Student Health Insurance is available online.
Parental Leave for Employees

Parental leave is available to full-time graduate students who are employed part-time in a research lab and in good standing following the birth or adoption of a child who will serve as the primary caregiver to their own or their partner’s newborn or newly adopted child during the requested leave time.

Students who become new parents are entitled to six weeks of parental leave with full pay, and an additional six weeks of parental leave without pay, during which students will retain their benefits. Students will also receive their normal financial compensation for the duration of the leave, provided that they 1) use their vacation allowance during that year as part of the parental leave, and 2) the research advisor and/or Department can provide this funding commensurate with University policies and procedures for funded projects.

To request parental leave, students must submit the Parental Leave of Absence request in writing to the Department prior to the expected arrival of the child. Under normal circumstances, students should arrange the parental leave time with their advisor and the Department at least 30 days in advance. The parental leave should be complete within six months of the arrival of the new child, and may only be taken for purposes relating to childcare.

Upon approval, the parental leave will begin on the date requested, and students will be released from professional duties and not be expected to maintain scholarly productivity for the duration of the approved parental leave.

No extensions of this leave will be granted. If additional time is required due to medical and/or other reasons, an unpaid, formal Leave of Absence from the program should be requested through the Office of the Registrar.

The Director of Graduate Studies must approve exceptions to these and other eligibility criteria.

Students who experience a medical condition associated with their pregnancy and need accommodations recommended by their medical provider should review the Pregnancy and Pregnancy-Related Accommodations online, where the Pregnancy Accommodation Request form is available and which is a service provided by the Office of Equal Opportunity, Affirmative Action, and Title IX.

Leave of Absence from Academic Program

For information regarding a leave of absence for domestic and international students, please see the Leave of Absence on the Graduate School webpage. A leave of absence request must be approved by the student’s supervisory committee and/or the department chair or director of graduate studies. If additional time is required due to medical and/or other reasons, an unpaid and formal leave of absence from the program should be requested through the Office of the Registrar. Information regarding a Leave of Absence is available online.

Disability Access and Accommodation

For information regarding disability access and accommodation, and the Americans with Disabilities Act (ADA), please visit the Office of Equal Opportunity, Affirmative Action, and Title IX.

Students requesting accommodations should contact the Center for Disability and Access at 801.581.5020 to schedule an appointment. Students may also access the Process for Students Requesting ADA Accommodations, the Center for Disability and Access Student Handbook, and the Documentation Guidelines through the How to Qualify for Services website.
19. GRADUATE PROGRAM TRANSFER CREDITS

Transfer of Credit from Another Institution

Students who received credit for graduate courses from regionally-accredited institutions, may petition for those courses to be transferred to the University of Utah as part of the fulfillment of their Biomedical Engineering degree requirements. Restrictions:

- No more than 6 graduate semester hours or 2 courses (not to exceed 6 credits) may be transferred.
- Transfer credits may be applied to one degree only and cannot have been used to earn a previous degree.
- Must be graduate level courses equivalent to the UofU 5000 level or above
- The student must have earned a letter grade of B or higher for the requested transfer course
- Credit only grades are not acceptable
- Must be relevant and applicable to the students Biomedical Engineering degree program and approved by student’s supervisory committees
- Requested transfer credits must have been taken within 4 years of M.S. student’s semester of admission and within 7 years of Ph.D. student’s semester of admission

Non-Matriculated Course Credit

Students who completed courses as a non-matriculated student at the University of Utah may request those courses to be applied toward the fulfillment of their degree requirements. Restrictions:

- A maximum of 9 graduate semester hours
- Must be graduate courses at 5000 level or above
- Non-matriculated credits may be applied to one degree only.
- Must be relevant and applicable to the students Biomedical Engineering degree program and approved by student’s supervisory committees
- Requested non-matriculated credits must have been taken within 3 years of the student’s semester of admission to any graduate program

Undergraduate Petition for Graduate Credit

Students who received credit for graduate courses from the University of Utah during their undergraduate program, may petition for those courses to be applied to their graduate degree as part of the fulfillment of their Biomedical Engineering degree requirements. Restrictions:

- No more than 6 graduate semester hours or 2 courses may be transferred (whichever comes first)
- Credits used to earn an undergraduate degree cannot be applied toward a graduate degree also.
- Must be graduate courses at 5000 level or above
- The student must have earned a letter grade of B or higher for the requested course
- “Credit” only grades are not acceptable
- Must be relevant and applicable to the students Biomedical Engineering degree program and approved by student’s supervisory committees
- Requested credits must have been taken within 3 years of the student’s semester of admission to any graduate program

Request for Graduate Credit in BS/MS Program

BS/MS Dual Degree program students (only) who earn credit for graduate level courses from the University of Utah before matriculating to graduate status, may petition for those courses to be applied to their graduate degree as part of the fulfillment of their Biomedical Engineering MS degree requirements once graduate status is achieved. Restrictions:

- No more than 12 graduate semester hours may be “reserved” for the MS degree
- Credits to be used to earn an undergraduate degree cannot be applied toward a graduate degree also.
- Must be graduate courses at 5000 level or above
- The student must have earned a letter grade of B or higher for the requested course(s)
- “Credit” only grades are not acceptable
- Must be relevant and applicable to the students Biomedical Engineering degree program and approved by student’s supervisory committees
- Credits must be “reserved” for the MS degree during the first semester as graduate status
- If discontinuing the BS/MS program, the “reserved” graduate credits cannot be applied toward an undergraduate degree.

20. GRADUATE STUDENT ADVISORY COMMITTEE
The Biomedical Engineering Graduate Student Activities Committee (GSAC) is run by Biomedical Engineering graduate students to work as a liaison between students and the Department and to organize events to build the Biomedical Engineering community and support our students. The GSAC help to support our Department and the graduate student community by:

- Organizing the annual Utah Biomedical Engineering Conference (UBEC)
- Planning the prospective Biomedical Engineering graduate student weekend
- Planning student social events
- Volunteering for local science and engineering outreach activities

21. DISCLAIMER
Although some content herein is recommended for best practices as a graduate student in the Department, other university and department policies described in this handbook are intended to be read, understood and followed by all department graduate students. Violations of university and department policies are grounds for immediate dismissal from the program. No policies or recommendations in this Handbook are intended, interpreted or construed to conflict with or violate standing College or University policies except where allowed. Given such a university conflict without allowance, this Handbook defers to standing universities policies and expectations.