# BIOMEDICAL ENGINEERING (PHD)

The Department of Biomedical Engineering offers a degree program leading to a Doctor of Philosophy (Ph.D.) degrees. Upon entering the Ph.D. program in Biomedical Engineering students are required to select their area of study or track in one of the following specialties: Biomaterials, Biomechanics, Biomedical Imaging and Biosensors, Bioinformatics and Systems Genomics, and Neuroengineering. Course requirements for the Ph.D. in Biomedical Engineering are determined in conjunction with the major advisor and advisory committee. Courses are selected from a track specific list of approved courses maintained on the Biomedical Engineering website.

## Location

- Storrs Campus

## Modality

- In Person

## Ph.D. in Biomedical Engineering

The Ph.D. is primarily a research degree, and may be undertaken after the M.S. or following the B.S. To be awarded the Ph.D., the student must satisfy all requirements of the Biomedical Engineering Department and all requirements of the Graduate School. These requirements are more extensive than those associated with the M.S. degree and the major ones are as follows. The Ph.D. in Biomedical Engineering does not have a related area or foreign language requirement.

### Ph.D. Qualifying Examination

The Biomedical Engineering Ph.D. Qualifying Examination consists of the written proposal and oral examination component. The Qualifying Examination is taken at the end of the second year of the Ph.D. program. The written component of the Qualifying Examination follows the format of a grant proposal on a particular research topic, while the oral component the student is required to defend the proposal. The advisory committee makes a final pass/fail decision for the Ph.D. Qualifying Examination based on the combined results of the written component and oral presentation. In the event of an unsuccessful attempt, the exam may be repeated once if necessary and at the discretion of the committee.

### Ph.D. Prospectus

Before the Ph.D. dissertation is well under way, the student must file a prospectus, dissertation proposal, of the proposed research, according to Graduate School regulations. The student's advisory committee and the Biomedical Engineering Director of Graduate Studies must approve the prospectus.

### Ph.D. Dissertation

The most important part of the study for the Ph.D. degree is the dissertation. A dissertation must be an original and significant contribution to the field of engineering science and must be defended orally according to Graduate School requirements.

### Ph.D. Final Examination

The final examination, an oral examination often called the dissertation defense, deals mainly with the subject matter of the dissertation. The decision as to whether the student passes the examination is based on a vote of the advisory committee.

### Ph.D. Publications

The student must have submitted a minimum of two papers for publication in the peer reviewed archival literature (journals), and have at least one of these papers published or accepted for publication at the time of the Ph.D. defense. These papers must be based on the student's dissertation research and must be co-authored by the student's faculty advisor from the Biomedical Engineering Department.

### Ph.D. Required Credit Hours

For the Ph.D. following the M.S. degree, a minimum of 17 credit hours after the M.S. (excluding requirements for dissertation, language and minor area) is required; for the Ph.D. following the B.S. degree, a minimum of 32 credit hours after the B.S. (excluding requirements for dissertation, language and minor area) is required; at most, six credit hours or two classes may be transferred from other institutions, subject to department approval through a Graduate Petition and to the Graduate School regulations outlined in the Graduate Catalog; all course work for the Ph.D. degree must be at the 5-6000 level; and the advisory committees may require more than the minimum number of credits.

### Ph.D. Plan of Study

Ph.D. following a B.S.: Five graduate level engineering courses (15 credits) in the student's track; two life science course (six credits). Life science courses are typically selected from anatomy and physiology, cell and molecular biology or biophysical chemistry, but are not limited to these areas; one graduate level experimental design course with Biostatistics for three credits; two electives totaling six credits. These consist of graduate level courses selected in consultation with the Major Advisor in the area related to the student's track; fifteen GRAD 6950 Doctoral Dissertation Research or GRAD 6960 Full-Time Doctoral Research course credits, as described in the Graduate Catalog; two semesters (totaling two credits; one credit per semester) of graduate BME seminar; and all course work for the Ph.D. degree must be at the 5-6000 level. BIST 5625 Introduction to Biostatistics can be used to satisfy the Experimental Design Course with Biostatistics requirement and BME 5000 to satisfy engineering or life science course requirement, even if these courses were used on a UConn undergraduate Plan of Study.

### Ph.D. following an M.S.

Three graduate level engineering courses (nine credits) in the student's track; one life science course for three credits. Life science courses are typically selected from anatomy and physiology, cell and molecular biology or biophysical chemistry, but are not limited to these areas; one graduate level experimental design course with Biostatistics for three credits; fifteen GRAD 6950 Doctoral Dissertation Research or GRAD 6960 Full-Time Doctoral Research course credits, as described in the Graduate Catalog; two semesters (totaling two credits; one credit per semester) of graduate BME seminar; and all course work for the Ph.D. degree must be at the 5-6000 level. BIST 5625 Introduction to Biostatistics can be used to satisfy the Experimental Design Course with Biostatistics requirement and BME 5000 to satisfy engineering or life science course requirement, even if these courses were used on a UConn undergraduate Plan of Study.

### Course Substitutions

If a student has completed equivalent courses in a well-established graduate program, they can apply for a waiver by petitioning the BME

Department Head by the end of the first semester. If a waiver is granted, the student may substitute an equal or greater number of elective graduate course credits for the waived course credits.

### Independent Study Courses

At most two independent study courses can be applied towards course work requirements and only one independent study course can be taken with the student's major advisor as instructor.

## Learning Objectives

1. Knowledge: Demonstrate appropriate breadth and depth of disciplinary knowledge and comprehension of the major topics, theories, and issues of a discipline within Biomedical Engineering, including demonstration of specialized knowledge of a sub-field sufficient to carry out substantive independent research, experiment design, and/or technology development.
2. Research/applied skills: Use disciplinary methods and techniques to apply knowledge, critically analyze, and, as appropriate to the degree, create new knowledge or achieve advanced technological accomplishments.
3. Communication: Communicate proficiently and effectively to technical (e.g., engineers, clinicians, scientists) and non-technical audience, verbally and in writing, a structured, coherent academic presentation, representation, or argument that cogently summarizes their research or technological pursuit, relevant literature, and its significance at the level appropriate to a discipline within Biomedical Engineering.
4. Ethics/Professional behavior: Conduct themselves in accordance with the highest ethical and responsible standards, values, and, where these are defined, the best practices of the discipline.