A Ph.D. in Bioengineering student performs original research guided by an advisor and contributes to the knowledge base in the scientific community. Students may be involved in the design and regulatory approval of advanced medical technologies, as well as the manufacturing of health care products. Funding opportunities include research or teaching assistantships and fellowships. Lab rotations, funded as graduate research assistantships, are available for top Ph.D. candidates and offer a one-year opportunity for students to rotate through research labs within the School of Biomedical Engineering to find the ideal match of research project and advisor for their dissertation research.

The Ph.D. curriculum includes core courses in advanced mathematics and statistics, biomedical engineering, and biotechnology, as well as technical electives chosen from numerous engineering and life science courses. The curriculum is designed to provide flexibility and support the chosen research specialty. Students are required to complete a Ph.D. qualifying process, present a research plan in a preliminary exam, and defend completed research in a final exam/dissertation defense.

Strengths of the program include the following:

- Opportunities to develop major advances in the health care field
- Nationally and internationally recognized faculty from over a dozen departments
- Practical and academic experience with regulatory issues and approval processes with animal and human subjects
- Conducting research in state-of-the-art facilities, including the nationally renowned Veterinary Teaching Hospital
- Community of innovators on the cutting edge of research in cancer, orthopedics, cardiovascular disease, nanotechnology, biosensors, and more

Requirements

Intra-University in Colleges of Health and Human Sciences, Engineering, Natural Sciences, Veterinary Medicine and Biomedical Sciences

Effective Fall 2021

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM 533/CIVE 533</td>
<td>Biomolecular Tools for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 570/MECH 570</td>
<td>Bioengineering</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 576/MECH 576</td>
<td>Quantitative Systems Physiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 592</td>
<td>Seminar</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 799</td>
<td>Dissertation</td>
<td>15-18</td>
</tr>
</tbody>
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Select three credits from the following: 3

- MATH 530  Mathematics for Scientists and Engineers
- MATH 535  Foundations of Applied Mathematics
- MATH 545  Partial Differential Equations I
- MATH 550/ENGR 550 | Numerical Methods in Science and Engineering |
- MATH 560  Linear Algebra
- MATH 569A  Linear Algebra for Data Science: Matrices and Vectors Spaces
- MATH 569B  Linear Algebra for Data Science: Geometric Techniques for Data Reduction

MATH 569C  Linear Algebra for Data Science: Matrix Factorizations and Transformations

MATH 569D  Linear Algebra for Data Science: Theoretical Foundations

Select four credits from the following: 4

- STAR 501  Data Wrangling/Visualization for Researchers
- STAR 502  Multivariate Analysis for Researchers
- STAR 512  Design and Data Analysis for Researchers II
- STAR 513  Regression Models for Researchers
- STAR 514  Experimental Design/Analysis for Researchers
- STAR 531  Generalized Regression Models for Researchers
- STAR 532  Mixed Models for Researchers
- STAR 534  Machine Learning for Researchers

M.S. Earned  30

Electives 2  6-12

Program Total Credits: 72

A minimum of 72 credits are required to complete this program. 3

1 BIOM 592 must be taken in four semesters.
2 Select a minimum of 6 credits of Engineering courses 500-level or above (either as a master’s student or Ph.D. student) with approval of advisor.
3 Program Total Credits must include a minimum of 42 semester credits earned at CSU (while in the graduate program), a minimum of 32 semester credits earned after admission to CSU, and a minimum of 12 semester credits earned at CSU (post-master’s degree) in 500-level or above courses (not including dissertation and independent study). 10 credits earned after a master’s degree is acceptable with approval from the student’s advisor, the Bioengineering program, and the Graduate School. Completion of the Ph.D. also requires successfully completing a qualifying exam, a preliminary exam, and a dissertation defense.