**PH.D IN BIOENGINEERING**

**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>
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</thead>
<tbody>
<tr>
<td><strong>Core Course Requirements</strong></td>
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<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>
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<tr>
<td>BIOM 576/MECH 576</td>
<td>Quantitative Systems Physiology</td>
<td>4</td>
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<tr>
<td>BIOM 592</td>
<td>Seminar 1</td>
<td></td>
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<td></td>
<td>BIOM 799</td>
<td>Dissertation</td>
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</tbody>
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Select three credits from the following:  
- 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:  
- 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  

**Electives**  
- M.S. Earned  
- 30  
- Electives  
- 6-12  

**Program Total Credits:**  
- 72  

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

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 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.