**College of Engineering and Applied Science: PhD Bioengineering Program Sheet**

The PhD in bioengineering requires 30 credit hours of coursework and at least 30 credit hours of dissertation work.

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| **Life Sciences Core (6 credits)** | | | |
| Course ID and Title | Semester Taken | Grade | Credits Earned |
| **Core I** | | | |
| BIOE 5010 - Cell and Molecular Biology for Bioengineers (Fall Only, REQUIRED) |  |  |  |
| **Core II -** (Choose one the following)  *Please refer to the current class schedule for fall/spring course offerings.* | | | |
| BIOE 5011 - Systems Physiology for Bioengineers (Spring Only) |  |  |  |
| BIOE 5073 - Neural Interfaces & Bionic Limbs |  |  |  |
| CANB 7600 - Cancer Biology |  |  |  |
| NRSC 7600 - Cellular and Molecular Biology\* |  |  |  |
| NRSC 7610 - Fundamentals of Neuroscience\* |  |  |  |
| Life Sciences Core Earned Credit Subtotal: | | |  |

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| **Quantitative Methods Core (6 credits)** | | | |
| Course ID and Title | Semester Taken | Grade | Credits Earned |
| **Core I** | | | |
| BIOE 5020 – Analytics and Machine Learning (Fall Only) |  |  |  |
| **Core II** | | | |
| BIOE 5021 - Numerical Methods for Engineering Analysis (Spring Only) |  |  |  |
| Quantitative Methods Core Earned Credit Subtotal: | | |  |

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| **Technology Core (6 credits) -** Choose a minimum of 6 credits (usually two courses) from the following list. Please refer to the current class schedule for fall/spring course offerings. | | | |
| Course ID and Title | Semester Taken | Grade | Credits Earned |
| BIOE 5053 - Optics and Microscopy in Biomedical Research |  |  |  |
| BIOE 5054 - Regulatory Affairs |  |  |  |
| BIOE 5057 - Rehabilitation and Assistive Technology |  |  |  |
| BIOE 5063 - 3D Modeling for Bioengineers |  |  |  |
| BIOE 5064 - Advanced MatLab for Bioengineers and Life Scientists |  |  |  |
| BIOE 5068 - Introduction to Medical Imaging |  |  |  |
| BIOE 5067 – Human Factors and Usability Testing |  |  |  |
| BIOE 5069 - Advanced Biomechanics |  |  |  |
| BIOE 5073 - Neural Interfaces & Bionic Limbs |  |  |  |
| BIOE 5074 - Introduction to Laboratory Animal Research\*\* |  |  |  |
| BIOE 5083 - Polymers in Biomedical Applications |  |  |  |
| BIOE 5420 - Special Topics in Bioengineering (for the following topics only):   * Introduction to Design, Disability, and Aging * Mechatronics * Stem Cell and Regenerative Medicine * Biomedical Device Design and Entrepreneurship * Data Science Methods * MedTech Commercialization (1 credit) * Medical Device and Entrepreneurship: Market Access (2 credits) * Image Processing for Bioengineers * Anatomy & Physiology and Medical Terminology * Bioengineering and Diabetes (1 credit) |  |  |  |
| BIOL 6764 - Biological Data Analysis |  |  |  |
| CSCI 5211 - Mobile Computing and Programming |  |  |  |
| ELEC 5638 - Digital Imaging Processing |  |  |  |
| ELEC 5667 - Wavelet Theory and Application |  |  |  |
| MECH 5020 - Biomechanics |  |  |  |
| MECH 5025 - Advanced Biomechanics |  |  |  |
| MECH 5175 - Finite Element Stress Analysis |  |  |  |
| MECH 5143 - Theory of Elasticity |  |  |  |
| **Students may also apply the following courses from the University of Colorado Boulder toward the Technology Core Requirement.**  See ‘concurrent registration’ in this document for more information. | | | |
| Course ID and Title | Semester Taken | Grade | Credits Earned |
| MCEN 5115 - Mechatronics & Robotics I (Boulder) |  |  |  |
| MCEN 5023 - Solid Mechanics I (Boulder) |  |  |  |
| Technology Core Earned Credit Subtotal: | | |  |

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| **Research & Clinical Core (3 credits)** | | | |
| Course ID and Title | Semester Taken | Grade | Credits Earned |
| BIOE 5041 - Clinical Experiences for Bioengineers (Spring Only, 1 credit) |  |  |  |
| BIOE 5040 - Research Methods for Bioengineers (Spring Only, 2 credits) |  |  |  |
| Research & Clinical Core Earned Credit Subtotal: | | |  |

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| **Electives (9 credits) – Should be approved by committee** | | | |
| Course ID and Title | Semester Taken | Grade | Credits Earned |
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| Research & Clinical Core Earned Credit Subtotal: | | |  |

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| **Research (30 credits)** | | | |
| Course ID and Title | Semester Taken | Grade | Credits Earned |
| BIOE 8990 – Doctoral Dissertation |  |  |  |
| Research Earned Credit Subtotal: | | |  |

**\*These dates do not follow the regular semester schedule. NRSC 7600 in particular starts before the official start of spring semester. Interested students should contact the course directors long in advance (if possible) so they can get on the appropriate mailing lists.**

**\*\*Not offered every year.**