Biological Science Courses for MS/PhD in Bioengineering

*Please note that not all courses will be offered every year/semester and it is up to the student to confirm they have the appropriate background/prerequisites for the course.

*Please also note that there may be alternative courses that will meet the requirement, they should be 500-level or greater and should generally be taught outside of SEAS. You should review the available courses found on the Registrar's website:
http://www.upenn.edu/registrar/

*Please note that not all courses will be offered every year/semester and it is up to the student to confirm they have the appropriate background/prerequisites for the course.

*Please also note that there may be alternative courses that will meet the requirement, they should be 5000-level or greater and should generally be taught outside of SEAS.

BE 5260 Immunology for Bioengineers
BE 5270 Immune Engineering
BE 5300 Theoretical and Computational Neuroscience
BE 5400 Principles of Molecular and Cellular Bioengineering
BE 5530 Principles, Methods, and Applications of Tissue Engineering
BE 5550 Nanoscale Systems Biology
BE 5560 Molecular Diagnostics for Precision
BE 5580 Principles of Biol Fabrication
BE 5610 Musculoskeletal Biology & Bioengineering
BE 5630 Advanced Topics in Musculoskeletal Biology & Bioengineering
BE 5650 Developmental Engineering of Tissues
BE 5660 Network Neuroscience
BE 5670 Modeling Biological Systems
BE 5690 Systems Biology of Cell Signaling and Behavior
BE 5760 The Cell as a Machine
BE 5780 – Principles of Controlled Release Systems
BIOL 5010 Advanced Cell Biology
BIOL 5062 – Biological Foundations for Bioengineering and Biotechnology: Cellular and Molecular Biology
BIOL 5262 Omics Analysis: From Genomes to Organisms
BIOL 5110 Neural Systems and Behavior
BIOL 5116 Neural Circuits for Survival
BIOL 5210 Molecular Biology and Genetics
BIOL 5220 Human Evolutionary Genomics
BIOL 5231 Genome Science and Genomic Medicine
BIOL 5234 Epigenetics
BIOL 5240 Genetic Analysis
BIOL 5262 – Biological Foundations for Bioengineering and Biotechnology: Genomics and Omics Technologies
BIOL 5318 Systems Biology: Integrative physiology and biomechanics of the muscular system

BIOL 5820 Biological Foundations: Exploring Groundbreaking Research
BIOL 5825 Biochemistry and Molecular Genetics Superlab
BIOM 5010 Mechanisms of Disease and Therapeutics
BIOM 6000 Cell Biology
BIOM 5020 Mechanisms of Disease
BIOM 5100 Case Studies in Translational Research
BMB 5080 Molecular Biophysics I
BMB 5090 Macromolecular Biophysics II
BMB 5100 Data Analysis and Scientific Inference
BMB 5670 Bioinorganic Chemistry
BMB 5850/BBCB 5850 Wistar Institute Cancer Biology Course: Signaling Pathways in Cancer
BMB 5900 Biological Physics
BMB 6140 Membrane Structural Biology
BMB 6160 Medical Problems in Modern Biochemistry
BMB 6220 Physical Principles of Mechano-Enzymes
BMB 6240 Ion Channels and Pumps
BMB 6250 Optical Methods in Cell Physiology
BMB 6260 Mass Spectrometry and Proteomics
BMIN 5010 Introduction to Biomedical and Health Informatics
BSTA 5090 Introduction to Epidemiology
BSTA 5100 Introduction to Anatomy and Physiology
BSTA 7510 Statistical Methods for Neuroimaging
CAMB 5100 Immunology
CAMB 5110 Principles of Development
CAMB 5220 Human Evolutionary Genomics
CAMB 5260 Experimental Principles in Cell and Molecular Biology
CAMB 5320 Human Physiology
CAMB 5500 Genetic Principles
CAMB 5970 Neural Development, Regeneration and Repair
CAMB 6090 Vaccines and Immunization Therapy
CAMB 6100 Molecular Basis of Gene Therapy
CAMB 6330 Advanced Seminar in Gene Therapy
CAMB 6380 Advanced Seminar in Cell Death and Survival
CAMB 6970 Biology of Stem Cells
CAMB 7070/REG 6210 Cell and Gene Therapy
CAMB 7520 Genomics
CBE 5170 Principles of Genome Engineering
CIS 5350 Introduction to Bioinformatics (also offered as GCB 5350 and MTR 5350)
GCB 5270 Genetics for Computational Biology
IMUN 5060 Immune Mechanisms
IMUN 5080 Immune Responses
IMUN 6090 Vaccines and Immune Therapeutics
INSC 5750 Neurobiology of Learning and Memory
MEAM 5550 Nanoscale Systems Biology

MPHY 6030 Image- Based Anatomy
MPHY 6070 Radiation Biology
MSE 5180 Structure and Function of Biological Materials
NGG 5720 Neuroscience Core Ii
NGG 5730 Neuroscience Core III
NGG 5750 Neurobiology of Learning and Memory
NGG 5870 Neurobiology of Disease
NGG 5880 Topics in Translational Neuroscience
NGG 5920 Cognitive Neuroscience of Memory
NGG 5930 Structural Neurobiology
NGG 5940 Theoretical and Computational Neuroscience
NGG 5970 Neural Development, Regeneration and Repair
NGG 5980 Advanced Systems Neuroscience
NGG 6180 Recovery after Neural Injury
NGG 6310 Cognitive Neuroscience Affect
NGG 6320 Cognitive Neuroscience Vision
PHRM 5310 Intro to Genome Science
PHRM 5700 Principles of Cardiovascular Biology
PHRM 6000 Medical Pharmacology
PHRM 6230 Fundamentals of Pharmacology
PSYC 5470 Foundations of Social, Cognitive, and Affective Neuroscience
PSYC 5490 A Neuroscience Perspective of Artificial Intelligence
REG 6210/CAMB 7070/MTR 6210 Cell and Gene Therapy
ANAT 5150 Human Anatomy: Musculoskeletal System
BE 5300 Theoretical and Computational Neuroscience
BE 5400 Biomolecular and Cellular Engineering
BE 5550 Nanoscale Systems Biology
BE 5740 Special Topics: Applied Neurophysiology.
BE 5780 Principles of Controlled Release Systems
BIOL 5062 Biological Foundations for Bioengineering and Biotechnology: Cellular and Molecular Biology
BIOL 5210 Molecular Biology and Genetics
BIOL 526 Experimental Principles in Cell and Molecular Biology
BIOL 527 Genetics for Computational Biology
BIOL 5250 Molecular Genetics of Development
BIOL 5262 Bioengineering and Biotechnology: Genomics and Omics Technologies
BIOL 540 Genetic Analysis
BIOL 5318 Systems Biology: Integrative physiology and biomechanics of the muscular system
BIOM 501 Mechanisms of Disease and Therapeutics
BIOM 600 Cell Biology
BIOM 502 Mechanisms of Disease
BIOM 510 Case Studies in Translational Research
BMB 508 Molecular Biophysics I

BMB 509 Macromolecular Biophysics II
BMB 567 Bioinorganic Chemistry
BMB 585 Macromolecular Biophysics: Principles and Methods
BMB 590 Biological Physics
BMB 614 Membrane Structural Biology
BMB 616 Medical Problems in Modern Biochemistry
BMB 622 Physical Principles of Mechano-Enzymes
BMB 624 Ion Channels and Pumps
BMB 625 Optical Methods in Cell Physiology
BMB 626 Mass Spectrometry and Proteomics
BMIN 5030 Data Science for Biomedical Informatics
BSTA 509 Introduction to Epidemiology
BSTA 510 Introduction to Anatomy and Physiology
CAMB 511 Principles of Development
CAMB 526 Experimental Principles in Cell and Molecular Biology
CAMB 5300 (The Cell Cycle, Genome Integrity and Cancer)
CAMB 532 Human Physiology
CAMB 550 Genetic Principles
CAMB 597 Developmental Neuroscience
CAMB 609 Vaccines and Immunization Therapy
CAMB 610 Molecular Basis of Gene Therapy
CAMB 638 Advanced Seminar in Cell Death and Survival
CAMB 752 Genomics
CAMB 609 Vaccines and Immune Therapeutics
CAMB 692 – Advanced Topics in Cell Biology, Physiology, and Metabolism II:Cell Signaling and Metabolism
CBE 5170 Principles of Genome Engineering
CIS 535 Introduction to Bioinformatics
GCB 527 Genetics for Computational Biology
GCB 5350 Bioinformatics
IMUN 506 Immune Mechanisms
IMUN 508 Immune Responses
IMUN 609 Vaccines and Immune Therapeutics
INSC 575 Neurobiology of Learning and Memory
MEAM 555 Nanoscale Systems Biology
MPHY 5000 Introduction to Global Oncology
MPHY 6030 Image- Based Anatomy
MPHY 6070 Radiation Biology
NGG 572 Neuroscience Core Ii
NGG 573 Neuroscience Core III
NGG 575 Neurobiology of Learning and Memory
NGG 587 Neurobiology of Disease
NGG 592 Cognitive Neuroscience of Memory
NGG 593 Structural Neurobiology

NGG 594	Theoretical and Computational Neuroscience
NGG 598	Advanced Systems Neuroscience
NGG 618	Recovery after Neural Injury
NGG 631	Cognitive Neuroscience Affect
NGG 632	Cognitive Neuroscience Vision
PHRM 531	Intro to Genome Science
PHRM 570	Principles of Cardiovascular Biology
PHRM 600	Medical Pharmacology
PHRM 623	Fundamentals of Pharmacology
PSYC 5470	Foundations of Social, Cognitive, and Affective Neuroscience
PSYC 5490,	A Neuroscience Perspective of Artificial Intelligence: