

Track Courses (AY 2024-2025)

Biomaterials Track

Highly Recommended

- BMD_ENG 343 OR BMD_ENG 344 (only one can count; see note)
- BMD_ENG 444 Organic Nanomaterials
- Biol_Sci 355 Immunobiology
- IGP 450 Tumor Cell Biology
- BME 495-0-01: Biological Phenomena in Cell/Cell-Free Systems
- CHEM_ENG 379: Computational Biology: Principles and Applications

Recommended

- BMD_ENG 346 Tissue Engineering
- BMD_ENG 347 OR BMD_ENG 348 (only one can count; see note)
- BMD_ENG 353 (Bioelectronics)
- BMD_ENG 340 Pharmaceutical Engineering: From Discovery to Therapeutics
- BIOL_SCI 315 Advanced Cell Biology
- BIOL_SCI 391 Development and Evolution of Body Plans
- CHEM 411 (Organic Spectroscopy)
- CHEM_ENG 376: Principles in Synthetic Biology
- MAT_SCI 380 (Intro to Surface Science & Spectroscopy)
- BIOL_SCI 390 (Advanced Molecular Biology)

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Bioelectronics and Sensing Specialization Track

Highly Recommended

- BMD_ENG 353 OR BMD_ENG 354 (only one can count; see note)
- ELEC_ENG 435 Deep Learning Foundations from Scratch

Recommended

- BMD_ENG 317 Biosensors
- BMD_ENG 343 OR BMD_ENG 344 (only one can count; see note)
- BMD_ENG 346 Tissue Engineering
- BME 380-0-01: Medical Devices, Disease & Global Health

NOTE: only one of (343, 344) and one of (353, 354) can count towards the PhD

- BMD_ENG 343 Biomaterials and Medical Devices
- BMD_ENG 344 Biological Performance of Materials
- BMD_ENG 353 Bioelectronics

- BMD_ENG 354 Bioelectronics Lab

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Regenerative Engineering Track

Note: The four courses listed under "Highly Recommended" are those required for the T32 Regenerative Engineering Training Program

Highly Recommended

- BMD ENG 346 Tissue Engineering
- BMD ENG 347 OR BMD ENG 348 (only one can count)
- BIOL SCI 391 Development and Evolution of Body Plans
- BMD ENG 495 Pharmaceutical Engineering: From Discovery to Therapeutics

Recommended

- BMD_ENG 343 OR 344 (only one can count)
- BIOL_SCI 315 Advanced Cell Biology
- BMD_ENG 346 Tissue Engineering
- BMD ENG 495 Experimental Regenerative Engineering Laboratory

NOTE: only one of (343, 344) can count towards the PhD

- BMD_ENG 343 Biomaterials and Medical Devices
- BMD_ENG 344 Biological Performance of Materials

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Biophotonics and Imaging Track

MRI

- ELEC_ENG 359 Digital Signal Processing
- BMD_ENG 327 Magnetic Resonance Imaging
- BMD_ENG 427 Advanced MRI Imaging
- BMD_ENG 426 MRI Modeling of Brain Physiology
- ELEC_ENG 418 (Advanced Digital Signal Processing)

Biophotonics

- ELEC_ENG 359 Digital Signal Processing
 - BMD_ENG 333 Optical Microscopy
 - BMD_ENG 429 Advanced Physical and Applied Optics
 - ELEC_ENG 418 (Advanced Digital Signal Processing)
 - ELEC_ENG 379 (Lasers and Coherent Optics)
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Mechanics and Transport Track

Highly Recommended

- BME 452 Transport through Connective Tissue
- BME 377 Intermediate Fluid Mechanics
- BMD_ENG 478 Advanced Mass and Heat Transfer**

****NOTE: If you have not taken a course in fluid mechanics as an undergraduate, then you should take BMD_ENG 377 before BMD_ENG 478**

Recommended

- BMD_ENG 452 (Transport through Connective Tissues)
 - CHEM_ENG 424-1,2 (Transport Phenomena)
 - CHEM_ENG 462 (Viscoelasticity and Flow in Polymer Systems)
 - CIV_ENV 356 (Transport Processes in Porous Media)
 - ES_APPM 426 (Theory of Flows with Small Inertia)
 - ES_APPM 420-1 (Asymptomatic and Perturbation Methods in Applied Mathematics)
 - MECH_ENG 362 (Stress Analysis)
 - MECH_ENG 327 (Finite Elements Methods in Mechanics)
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Neural Engineering Track

Highly Recommended

At least one course in machine learning, including but not limited to:

- COMP_SCI 349 Machine Learning
- ELEC_ENG 435 Deep Learning Foundations from Scratch

- ELEC_ENG 4** or COMP_SCI 4** *(Any 400 level EE or CS course related to ML)

Recommended

- BMD_ENG 366 Biomechanics of Movement
- BMD_ENG 462 Sensory Acquisition
- BMD_ENG 465 (Biomechanical Modeling and Computer Simulation of Human Movement)
- BMD_ENG 468 Comp. Neuromechanics & Neuroethology
- BMD_ENG 463 Advanced Signal Processing Methods in Neuropathology
- NUIN 480 Circuits and Systems for Motor Control
- MECH_ENG 390 Introduction to Dynamic Systems
- ELEC_ENG 360 (Introduction to Feedback Systems)
- MECH_ENG 314 (Theory of Machines - Dynamics)
- ELEC_ENG 359 Digital Signal Processing
- ES_APPM 370 Introduction to Computational Neuroscience
- NUIN 442 Issues in Movement and Rehabilitation Science

Courses listed in the robotics concentration [here are all potentially useful to look at](#)[Links to an external site.](#)

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Rehabilitation Track

Highly Recommended

At least one course in machine learning, including but not limited to:

- COMP_SCI 349 Machine Learning
- ELEC_ENG 435 Deep Learning Foundations from Scratch
- ELEC_ENG 4** or COMP_SCI 4** *(Any 400 level EE or CS course related to ML)

Recommended

- BMD_ENG 366 Biomechanics of Movement
- BMD_ENG 462 Sensory Acquisition
- BMD_ENG 465 (Biomechanical Modeling and Computer Simulation of Human Movement)
- BMD_ENG 468 Comp. Neuromechanics & Neuroethology
- BMD_ENG 463 Advanced Signal Processing Methods in Neuropathology

- NUIN 480 Circuits and Systems for Motor Control
- MECH_ENG 390 Introduction to Dynamic Systems
- ELEC_ENG 360 (Introduction to Feedback Systems)
- MECH_ENG 314 (Theory of Machines - Dynamics)
- ELEC_ENG 359 Digital Signal Processing
- ES_APPM 370 Introduction to Computational Neuroscience
- NUIN 442 Issues in Movement and Rehabilitation Science

Courses listed in the robotics concentration [here are all potentially useful to look at](#)[Links to an external site.](#)

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Computational Genomics and Molecular Engineering Track

Highly Recommended

- BMD_ENG 311 Computational Genomics
- IBIS 402 OR IGP 410
- A class ML or DL (e.g., BME 495 or comp sci 349) COMP_SCI 349 ELEC_ENG 435

Recommended

Genomics, Molecular Biology, and Human Diseases:

- IGP 401/IBIS 401 (Biochemistry/Molecular Biophysics)
- IGP 405/IBIS 406 (Cell Biology/ Advanced Topics in Cell Biology)
- DPG 402 Fundamentals of Biomedical Sciences II
- DGP 435-0 (Signal Transduction and Human Diseases)
- DGP 440-0 (Immunology)
- DGP 450-0 (Tumor Cell Biology)

Physics/Computational Modeling of Biomedical Processes:

- IBiS 404 (Principles and Methods in Systems Biology)
- ES_APPM 375 (Quantitative Biology)
- BIOL_SCI 323-0 (Bioinformatics: Sequence and Structure Analysis)
- IGP 485 (Data Science for Biomedical Researchers)

- ESAM 472 (Introduction to the Analysis of RNA Sequencing Data)
- IBiS 410 Quantitative Biology

AI, Programming, and Computational Science:

- ELEC_ENG 473 (Deep Reinforcement Learning from Scratch)
- IEMS 315 (Stochastic Models)
- MSIA 422 (Intro to Java & Python Programming)
- ES_APPM 448 (Numerical Methods for Random Processes)
- COMP_SCI 449 (Deep Learning)