

# SEAS MATH/SCIENCE/ ENGRNG (EUMS)

Code	Title	Course Units
AMCS 5461	Advanced Applied Probability	1
AMCS 6081	Analysis	1
AMCS 6091	Analysis	1
AMCS 6481	Probability Theory	1
ASTR 1211	Introduction to Astrophysics I	1
ASTR 1212	Introduction to Astrophysics II	1
ASTR 1250	Astronomical Techniques	1
ASTR 3392	Life and Death of Stars	1
BBCB 5810	Techniques of Magnetic Resonance Imaging	1
BCHE 2280	Physical Models of Biological Systems	1
BE 1000	Introduction to Bioengineering	0.5
BE 2000	Introduction to Biomechanics	1
BE 2200	Biomaterials	1
BE 3010	Bioengineering Signals and Systems	1
BE 3090	Bioengineering Modeling, Analysis and Design Laboratory I	1
BE 3100	Bioengineering Modeling, Analysis and Design Laboratory II	1
BE 3300	Self-Assembly of Soft Materials	1
BE 3500	Introduction to Biotransport Processes	1
BE 4000	Preceptorship in Clinical Bioengineering	1
BE 4700	Medical Devices	1
BE 4800	Introduction to Biomedical Imaging	1
BE 4900	Independent Project in Bioengineering	1
BE 4920	Independent Project in Bioengineering	1
BE 4950	Senior Design Project	1
BE 4960	Senior Design Project	1
BE 4970	Senior Thesis in Biomedical Science	1
BE 5020	From Biomedical Science to the Marketplace	1
BE 5100	Biomechanics and Biotransport	1
BE 5120	Bioengineering III: Biomaterials	1
BE 5180	Optical Microscopy	1
BE 5300	Theoretical and Computational Neuroscience	1
BE 5370	Biomedical Image Analysis	1
BE 5400	Principles of Molecular and Cellular Bioengineering	1
BE 5500	Continuum Tissue Mechanics	1
BE 5530	Principles, Methods, and Applications of Tissue Engineering	1
BE 5550	Nanoscale Systems Biology	1
BE 5620	Drug Discovery and Development	1
BE 5650	Developmental Engineering of Tissues	1
BE 5660	Networked Neuroscience	1
BE 5850	Materials for Bioelectronics	1
BE 6620	Advanced Molecular Thermodynamics	1
BE 8990	PhD Independent Study	1-4
BE 9950	Doctoral Dissertation Status	0
BE 9990	Thesis/Dissertation Research	1-4
BEPP 7610	Risk Analysis and Environmental Management	1
BIOL 1101	Introduction to Biology A	1.5
BIOL 1102	Introduction to Biology B	1.5
BIOL 1110	Introduction to Brain and Behavior	1
BIOL 1121	Introduction to Biology - The Molecular Biology of Life	1
BIOL 1123	Introductory Molecular Biology Laboratory	.5
BIOL 1124	Introductory Organismal Biology Lab	.5
BIOL 1604	Humans and the Environment	1
BIOL 2001	Essentials of Cell Biology	1
BIOL 2010	Cell Biology	1
BIOL 2110	Molecular and Cellular Neurobiology	1
BIOL 2140	Evolution of Behavior: Animal Behavior	1
BIOL 2201	Essentials of Molecular Biology and Genetics	1
BIOL 2210	Molecular Biology and Genetics	1
BIOL 2410	Evolutionary Biology	1
BIOL 2610	Ecology: From individuals to ecosystems	1
BIOL 2801	Essentials of Biochemistry	1
BIOL 2810	Biochemistry	1
BIOL 3004	Infectious Disease Biology	1
BIOL 3006	Histology	1
BIOL 3054	Developmental Biology	1
BIOL 3313	Essentials of Pathophysiology	1
BIOL 3430	Comparative Vertebrate Anatomy and Evolution	1
BIOL 3625	Marine Biology	1
BIOL 3999	Independent Study	1
BIOL 4004	Immunobiology	1
BIOL 4010	Advanced Cell Biology	1
BIOL 4016	Molecular Mechanisms of Infectious Disease Biology	1
BIOL 4077	The Science and Art of Biotechnology	1
BIOL 4110	Neural Systems and Behavior	1
BIOL 4116	Neural Circuits for Survival	1
BIOL 4142	Neurobiology of Learning and Memory	1
BIOL 4210	Molecular Genetics	1
BIOL 4231	Genome Science and Genomic Medicine	1
BIOL 4233	Genes in Conflict: How sex and selfish genetic elements drive genome evolution	1
BIOL 4234	Epigenetics	1
BIOL 4235	The RNA World: A functional and computational analysis	1
BIOL 4313	Energy Transformations and Living off-the-Grid	1
BIOL 4314	Molecular Evolution of Physiological Functions	1
BIOL 4318	Systems Biology: Integrative physiology and biomechanics of the muscular system	1

BIOL 4410	Advanced Evolution	1	CAMB 4850	The RNA World: A functional and computational analysis	1
BIOL 4411	Evolutionary Ecology	1	CAMB 5220	Human Evolutionary Genomics	1
BIOL 4430	Evolution and Ecology of Infectious Diseases	1	CBE 1500	Introduction to Biotechnology	1
BIOL 4517	Theoretical Population Biology	1	CBE 1600	Introduction to Chemical Engineering	1
BIOL 4536	Introduction to Computational Biology & Biological Modeling	1	CBE 2300	Material and Energy Balances of Chemical Processes	1
BIOL 4600	Field Botany	1	CBE 2310	Thermodynamics of Fluids	1
BIOL 4615	Freshwater Ecology	1	CBE 3300A	Discover, Design, Build and Test: A Hands-On Introduction to Product and Device Design	0-0.5
BIOL 4623	Plant Ecology	1	CBE 3300B	Discover, Design, Build and Test: A Hands-On Introduction to Product and Device Design	0-0.5
BIOL 4701	Prokaryotic Microbiology: A Pragmatic View	1	CBE 3500	Fluid Mechanics	1
BIOL 4710	Topics in Prokaryotic Biology: From Molecules to Microbiomes	1	CBE 3510	Heat and Mass Transport	1
BIOL 4825	Biochemistry and Molecular Genetics Superlab	1	CBE 3530	Molecular Thermodynamics and Chemical Kinetics	1
BIOL 4999	Advanced Independent Study	1	CBE 3710	Separation Processes	1
BIOL 5010	Advanced Cell Biology	1	CBE 3750	Engineering and the Environment	1
BIOL 5016	Molecular Mechanisms of Infectious Disease Biology	1	CBE 4000	Introduction to Product and Process Design	1
BIOL 5022	Cell Signaling	1	CBE 4100	Chemical Engineering Laboratory	1
BIOL 5116	Neural Circuits for Survival	1	CBE 4215	Energy and Sustainability: Science, Engineering and Technology	1
BIOL 5220	Human Evolutionary Genomics	1	CBE 4300	Introduction to Polymers	1
BIOL 5231	Genome Science and Genomic Medicine	1	CBE 4470	Societally Significant Soft Matter Solutions	1
BIOL 5233	Genes in Conflict: How sex and selfish genetic elements drive genome evolution	1	CBE 4510	Chemical Reactor Design	1
BIOL 5234	Epigenetics	1	CBE 4590	Product and Process Design Projects	1
BIOL 5240	Genetic Analysis	1	CBE 4790	Biotechnology and Biochemical Engineering	1
BIOL 5314	Molecular Evolution of Physiological Functions	1	CBE 4800	Laboratory in Biotechnology and Biochemical Engineering	1
BIOL 5318	Systems Biology: Integrative physiology and biomechanics of the muscular system	1	CBE 5000	Special Topics in Chemical and Biomolecular Engineering	1
BIOL 5410	Evolutionary Biology	1	CBE 5080	Probability and Statistics for Biotechnology	1
BIOL 5430	Evolution and Ecology of Infectious Diseases	1	CBE 5100	Introduction to Polymers	1
BIOL 5510	Statistics for Biologists	1	CBE 5215	Energy and Sustainability: Science, Engineering and Technology	1
BIOL 5517	Theoretical Population Biology	1	CBE 5270	Advancements and Applications in Genome Editing and Engineering	1
BIOL 5535	Introduction to Computational Biology & Biological Modeling	1	CBE 5300	Electrochemistry Fundamentals, Practices, and Analysis	1
BIOL 5536	Fundamentals of Computational Biology	1	CBE 5310	Nano-Transport	1
BIOL 5615	Freshwater Ecology	1	CBE 5400	Principles of Molecular and Cellular Bioengineering	1
BIOL 5720	Topics in Prokaryotic Biology: From Molecules to Microbiomes	1	CBE 5430	Sustainable Development of Water Resource Systems	1
BIOL 5825	Biochemistry and Molecular Genetics Superlab	1	CBE 5450	Electrochemical Energy Conversion and Storage	1
BIOL 5999	Master's Independent Study	0.5-3	CBE 5470	Societally Significant Soft Matter Solutions	1
BIOL 7000	Advanced Topics in Current Biological Research	1	CBE 5540	Engineering Biotechnology	1
BIOL 9999	Independent Study and Research	0.5-4	CBE 5550	Nanoscale Systems Biology	1
BIOM 5350	Introduction to Bioinformatics	1	CBE 5570	Stem Cells, Proteomics and Drug Delivery - Soft Matter Fundamentals	1
CAMB 4310	Genome Science and Genomic Medicine	1			
CAMB 4800	Advanced Cell Biology	1			
CAMB 4830	Epigenetics	1			

CBE 5620	Drug Discovery and Development	1	CIS 1901	C++ Programming	0-0.5
CBE 5640	Drug Delivery Systems: Targeted Therapeutics and Translational Nanomedicine	1	CIS 1902	Python Programming	0-0.5
CBE 5800	Masters Biotechnology Lab	1	CIS 1903	Go Programming	0-0.5
CBE 5801	Laboratory in Biotechnology and Biochemical Engineering	1	CIS 1904	Introduction to Haskell Programming	0-0.5
CBE 6010	Deep Learning for Scientists and Engineers	1	CIS 1905	Rust Programming	0-0.5
CBE 6180	Advanced Molecular Thermodynamics	1	CIS 1911	Using and Understanding Unix and Linux	0-0.5
CBE 6210	Advanced Chemical Kinetics and Reactor Design	1	CIS 1912	DevOps	0-0.5
CBE 6400	Transport Processes I	1	CIS 1921	Solving Hard Problems in Practice	0-0.5
CBE 8990	Independent Study	1-4	CIS 1951	iOS Programming	0-0.5
CBE 9950	Dissertation	0	CIS 1952	Android Programming	0-0.5
CBE 9990	Thesis/Dissertation Research	1-4	CIS 1961	Ruby on Rails Web Development	0-0.5
CHEM 1022	General Chemistry II	1	CIS 1962	JavaScript Programming	0-0.5
CHEM 1101	General Chemistry Laboratory I	.5	CIS 1990	Special Topics	0-0.5
CHEM 1102	General Chemistry Laboratory II	.5	CIS 2330	Introduction to Blockchain	1
CHEM 2210	Physical Chemistry I	1	CIS 2400	Introduction to Computer Systems	1
CHEM 2220	Physical Chemistry II	1	CIS 2450	Big Data Analytics	1
CHEM 2230	Experimental Physical Chemistry I	1	CIS 2610	Discrete Probability, Stochastic Processes, and Statistical Inference	1
CHEM 2410	Principles of Organic Chemistry I	1	CIS 2620	Automata, Computability, and Complexity	1
CHEM 2420	Principles of Organic Chemistry II	1	CIS 3200	Introduction to Algorithms	1
CHEM 2451	Experimental Organic Chemistry A	.5	CIS 3340	Advanced Topics in Algorithms	1
CHEM 2460	Advanced Synthesis and Spectroscopy Laboratory	1	CIS 3410	Compilers and Interpreters	1
CHEM 2510	Principles of Biological Chemistry	1	CIS 3500	Software Design/Engineering	1
CHEM 2999	Directed Study and Seminar	1	CIS 3900	Robotics: Planning Perception	1
CHEM 3999	Independent Research	1	CIS 3980	Quantum Computer and Information Science	1
CHEM 5210	Statistical Mechanics I	1	CIS 3990	Special Topics	0.5-1
CHEM 5220	Statistical Mechanics II	1	CIS 4000	Senior Project	1
CHEM 5230	Quantum Chemistry I	1	CIS 4010	Senior Project	1
CHEM 5240	Quantum Chemistry II	1	CIS 4100	CIS Senior Thesis	1
CHEM 5250	Molecular Spectroscopy	0.5	CIS 4120	Introduction to Human Computer Interaction	1
CHEM 5260	Chemical Dynamics	1	CIS 4300	Natural Language Processing	1
CHEM 5410	Chemical Kinetics	0.5	CIS 4360	Introduction to Computational Biology & Biological Modeling	1
CHEM 5411	Physical Organic Chemistry	1	CIS 4410	Embedded Software for Life-Critical Applications	1
CHEM 5430	Modern Organic Synthesis	1	CIS 4480	Operating Systems Design and Implementation	1
CHEM 5440	Organic Reaction Mechanisms	1	CIS 4500	Database and Information Systems	1
CHEM 5510	Biological Chemistry I	1	CIS 4510	Computer and Network Security	1
CHEM 5520	Biological Chemistry II	1	CIS 4550	Internet and Web Systems	1
CHEM 5570	Mechanisms of Biological Catalysis	1	CIS 4600	Interactive Computer Graphics	1
CHEM 5620	Inorganic Chemistry II	1	CIS 4610	Advanced Rendering	1
CHEM 5640	Organometallics	1	CIS 4620	Computer Animation	1
CHEM 5650	Main Group Chemistry	1	CIS 4710	Computer Organization and Design	1
CHEM 6520	Proposal Writing for Biological and Physical Chemists	0.5	CIS 4810	Computer Vision & Computational Photography	1
CHEM 9999	Independent Study and Research	0.5-4	CIS 5000	Software Foundations	1
CIS 1100	Introduction to Computer Programming	1	CIS 5010	Computer Architecture	1
CIS 1200	Programming Languages and Techniques I	1	CIS 5020	Analysis of Algorithms	1
CIS 1210	Programming Languages and Techniques II	1	CIS 5050	Software Systems	1
CIS 1600	Mathematical Foundations of Computer Science	1	CIS 5110	Theory of Computation	1

CIS 5120	Introduction to Human Computer Interaction	1	CIS 9990	Thesis/Dissertation Research	1-4
CIS 5150	Fundamentals of Linear Algebra and Optimization	1	CPLN 7500	Advanced Transportation Seminar	1
CIS 5180	Topics in Logic: Finite Model Theory and Descriptive Complexity	1	EESC 1090	Introduction to Geotechnical Science	1.5
CIS 5200	Machine Learning	1	EESC 5400	Evolution/Revolution of Land Ecosystems	1
CIS 5210	Artificial Intelligence	1	EESC 6200	Advanced Geochemistry	1
CIS 5300	Natural Language Processing	1	EESC 6540	Advanced Paleocology Discovering Lost Ecosystems	1
CIS 5350	Introduction to Bioinformatics	1	EESC 6610	Sustainable Development of Water Resource Systems	1
CIS 5360	Fundamentals of Computational Biology	1	ENGR 1010	Introduction to Engineering: Energy, Environment and Sustainability	1
CIS 5370	Biomedical Image Analysis	1	ENGR 1050	Introduction to Scientific Computing	1
CIS 5400	Principles of Embedded Computation	1	ENGR 1400	Penn Global Seminar: Robotics and Rehabilitation	1
CIS 5410	Embedded Software for Life-Critical Applications	1	ENGR 2120	Concepts in Micro- and Nanotechnology	1
CIS 5420	Embedded Systems Programming	1	ENGR 2500	Energy Systems, Resources and Technology	1
CIS 5450	Big Data Analytics	1	ENGR 3300A	Discover, Design, Build and Test: A Hands-On Introduction to Product and Device Design	0-0.5
CIS 5480	Operating Systems Design and Implementation	1	ENGR 3300B	Discover, Design, Build and Test: A Hands-On Introduction to Product and Device Design	0-0.5
CIS 5500	Database and Information Systems	1	ENGR 4215	Energy and Sustainability: Science, Engineering and Technology	1
CIS 5510	Computer and Network Security	1	ENGR 4500	Modern Biotechnology for Engineers	1
CIS 5520	Advanced Programming	1	ENGR 5030	Engineering in Oil, Gas and Coal, from Production to End Use	1
CIS 5550	Internet and Web Systems	1	ENGR 5040	Fundamental Concepts in Nanotechnology	1
CIS 5560	Cryptography	1	ENGR 5215	Energy and Sustainability: Science, Engineering and Technology	1
CIS 5570	Programming for the Web	1	ENGR 5500	Modern Biotechnology for Engineers	1
CIS 5600	Interactive Computer Graphics	1	ENM 2510	Analytical Methods for Engineering	1
CIS 5610	Advanced Computer Graphics	1	ENM 3600	Introduction to Data-driven Modeling	1
CIS 5620	Computer Animation	1	ENM 3750	Biological Data Science I - Fundamentals of Biostatistics	1
CIS 5640	Game Design and Development	1	ENM 5020	Numerical Methods and Modeling	1
CIS 5710	Computer Organization and Design	1	ENM 5030	Introduction to Probability and Statistics	1
CIS 5730	Software Engineering	1	ENM 5100	Foundations of Engineering Mathematics - I	1
CIS 5800	Machine Perception	1	ENM 5110	Foundations of Engineering Mathematics - II	1
CIS 5810	Computer Vision & Computational Photography	1	ENM 5200	Principles and Techniques of Applied Math I	1
CIS 6100	Advanced Geometric Methods in Computer Science	1	ENM 5400	Topics In Computational Science and Engineering	1
CIS 6200	Advanced Topics in Machine Learning	1	ENVS 2390	Freshwater Ecology	1
CIS 6300	Advanced Topics in Natural Language Processing	1	ESE 1110	Atoms, Bits, Circuits and Systems	1
CIS 6400	Advance Topics in Software Systems: Data Driven IoT/Edge Computing	1	ESE 2000	Artificial Intelligence Lab: Data, Systems, and Decisions	1
CIS 6500	Advanced Topics in Databases	1	ESE 2100	Introduction to Dynamic Systems	1
CIS 6600	Advanced Topics in Computer Graphics and Animation	1	ESE 2150	Electrical Circuits and Systems	1.5
CIS 6700	Advanced Topics in Programming Languages	1	ESE 2180	Electronic, Photonic, and Electromechanical Devices	1.5
CIS 6730	Computer-Aided Verification	1	ESE 2240	Signal and Information Processing	1.5
CIS 6770	Advanced Topics in Algorithms and Complexity	1			
CIS 6800	Advanced Topics in Machine Perception	1			
CIS 6820	Friendly Logics	1			
CIS 7000	Special Topics	1			
CIS 8990	Doctoral Independent Study	1-4			
CIS 9950	Dissertation	0			

ESE 3010	Engineering Probability	1	ESE 6740	Information Theory	1
ESE 3030	Stochastic Systems Analysis and Simulation	1	ESE 6800	Special Topics in Electrical and Systems Engineering	1
ESE 3050	Foundations of Data Science	1	ESE 8990	Independent Study for PhD credit	1-4
ESE 3190	Fundamentals of Solid-State Circuits	1.5	ESE 9990	Thesis/Dissertation Research	1-4
ESE 3200	Qubit Lab – A Hands on Introduction to Quantum Devices	1.5	GCB 5360	Fundamentals of Computational Biology	1
ESE 3250	Fourier Analysis and Applications in Engineering, Mathematics, and the Sciences	1	IPD 5010	Integrated Computer-Aided Design, Manufacturing and Analysis	1
ESE 3400	Medical Devices Laboratory	1	IPD 5140	Design for Manufacturability	1
ESE 3500	Embedded Systems/Microcontroller Laboratory	1.5	IPD 5150	Product Design	1
ESE 3600	TinyML: Tiny Machine Learning for Embedded Systems	1	IPD 5160	Advanced Mechatronic Reactive Spaces.	1
ESE 3990	Special Topics	1	LGIC 1710	Introduction to Logic	1
ESE 4000	Engineering Economics	1	LGIC 2100	Discrete Mathematics I	1
ESE 4040	Engineering Markets	1	LGIC 2200	Discrete Mathematics II	1
ESE 4190	Analog Integrated Circuits	1	MATH 2020	Proving Things: Analysis	1
ESE 4210	Control For Autonomous Robots	1.5	MATH 2030	Proving things: Algebra	1
ESE 4380	Machine Learning for Time-Series Data	1	MATH 2400	Calculus, Part III	1
ESE 4440	Project Management	1	MATH 2410	Calculus, Part IV	1
ESE 5000	Linear Systems Theory	1	MATH 2600	Honors Calculus, Part II	1
ESE 5010	Networking - Theory and Fundamentals	1	MATH 3120	Linear Algebra	1
ESE 5050	Feedback Control Design and Analysis	1	MATH 3130	Computational Linear Algebra	1
ESE 5060	Introduction to Optimization Theory	1	MATH 3140	Advanced Linear Algebra	1
ESE 5070	Introduction to Networks and Protocols	1	MATH 3200	Computer Methods in Mathematical Science I	1
ESE 5090	Quantum Circuits and Systems	1	MATH 3400	Discrete Mathematics I	1
ESE 5100	Electromagnetic and Optics	1	MATH 3410	Discrete Mathematics II	1
ESE 5210	The Physics of Solid State Energy Devices	1	MATH 3500	Number Theory	1
ESE 5230	Quantum Engineering	1	MATH 3600	Advanced Calculus	1
ESE 5250	Nanoscale Science and Engineering	1	MATH 3610	Advanced Calculus	1
ESE 5290	Introduction to Micro- and Nano-electromechanical Technologies	1	MATH 3700	Algebra	1
ESE 5300	Elements of Probability Theory	1	MATH 3710	Algebra	1
ESE 5310	Digital Signal Processing	1	MATH 4100	Complex Analysis	1
ESE 5330	Stochastic Processes	1	MATH 4200	Ordinary Differential Equations	1
ESE 5390	Hardware/Software Co-Design for Machine Learning	1	MATH 4250	Partial Differential Equations	1
ESE 5430	Human Systems Engineering	1	MATH 4320	Game Theory.	1
ESE 5440	Project Management	1	MATH 4600	Topology	1
ESE 5500	Advanced Transportation Seminar	1	MATH 4650	Differential Geometry	1
ESE 5660	Networked Neuroscience	1	MATH 4800	Topics in Modern Math	1
ESE 5670	Risk Analysis and Environmental Management	1	MATH 4990	Supervised Study	0-1
ESE 5700	Digital Integrated Circuits and VLSI-Fundamentals	1	MATH 5000	Topology	1
ESE 5720	Analog Integrated Circuits	1	MATH 5010	Differential Geometry	1
ESE 5780	RFIC (Radio Frequency Integrated Circuit) Design	1	MATH 5020	Abstract Algebra	1
ESE 5800	Power Electronics	1	MATH 5030	Abstract Algebra	1
ESE 6050	Modern Convex Optimization	1	MATH 5040	Graduate Proseminar in Mathematics	1
ESE 6170	Non-Linear Control Theory	1	MATH 5050	Graduate Proseminar in Mathematics	1
ESE 6650	Datacenter Architecture	1	MATH 5080	Advanced Analysis	1
			MATH 5090	Advanced Analysis	1
			MATH 5120	Advanced Linear Algebra	1
			MATH 5130	Computational Linear Algebra	1
			MATH 5200	Selections from Algebra	1
			MATH 5460	Advanced Applied Probability	1
			MATH 5600	Selections from Geometry and Topology	1
			MATH 5610	Selections from Geometry and Topology	1

MATH 5700	Logic and Computability 1	1	MATH 8200	Algebra Seminar	1
MATH 5710	Logic and Computability 2	1	MATH 8300	Geometry-Topology Seminar	1
MATH 5800	Combinatorial Analysis	1	MATH 8310	Geometry-Topology Seminar	1
MATH 5810	Topics in Combinatorial Theory	1	MATH 8710	Logic Seminar	1
MATH 5940	Mathematical Methods of Physics	1	MATH 8810	Combinatorics Seminar	1
MATH 5999	Independent Study	1-4	MEAM 1010	Introduction to Mechanical Design	1
MATH 6000	Topology and Geometric Analysis	1	MEAM 1100	Introduction to Mechanics	1
MATH 6010	Topology and Geometric Analysis	1	MEAM 2010	Machine Design and Manufacturing	1
MATH 6020	Algebra	1	MEAM 2030	Thermodynamics I	1
MATH 6030	Algebra	1	MEAM 2100	Statics and Strength of Materials	1
MATH 6080	Analysis	1	MEAM 2110	Engineering Mechanics: Dynamics	1
MATH 6090	Analysis	1	MEAM 2200	Introduction to Materials Science and Engineering	1
MATH 6120	Selections from Algebra	1	MEAM 2250	Engineering in the Environment	1
MATH 6180	Algebraic Topology, Part I	1	MEAM 2300	Bicycles: The Mechanical Advantage	1
MATH 6190	Algebraic Topology, Part I	1	MEAM 2470	Mechanical Engineering Laboratory I	.5
MATH 6200	Algebraic Number Theory	1	MEAM 3020	Fluid Mechanics	1
MATH 6210	Algebraic Number Theory	1	MEAM 3200	Intro to Mechanical and Mechatronic Systems	1
MATH 6220	Complex Algebraic Geometry	1	MEAM 3210	Dynamic Systems and Control	1
MATH 6230	Complex Algebraic Geometry	1	MEAM 3330	Heat and Mass Transfer	1
MATH 6240	Algebraic Geometry	1	MEAM 3470	Mechanical Engineering Design Laboratory	1
MATH 6250	Algebraic Geometry	1	MEAM 4050	Mechanical Properties of Macro/Nanoscale Materials	1
MATH 6260	Commutative Algebra	1	MEAM 4150	Product Design	1
MATH 6280	Homological Algebra	1	MEAM 4210	Control For Autonomous Robots	1.5
MATH 6290	Homological Algebra	1	MEAM 4450	Mechanical Engineering Design Projects	1
MATH 6420	Topics in Partial Differential Equations	1	MEAM 4460	Mechanical Engineering Design Projects	1
MATH 6440	Partial Differential Equations	1	MEAM 5020	Energy Engineering in Power Plants and Transportation Systems	1
MATH 6450	Partial Differential Equations	1	MEAM 5040	Tribology	1
MATH 6480	Probability Theory	1	MEAM 5050	Mechanical Properties of Macro/Nanoscale Materials	1
MATH 6520	Operator Theory	1	MEAM 5060	Failure Analysis of Engineering Materials	1
MATH 6540	Lie Groups	1	MEAM 5080	Materials and Manufacturing for Mechanical Design	1
MATH 6550	Lie Groups	1	MEAM 5100	Design of Mechatronic Systems	1
MATH 6560	Representation of Continuous Groups	1	MEAM 5130	Feedback Control Design and Analysis	1
MATH 6600	Differential Geometry	1	MEAM 5140	Design for Manufacturability	1
MATH 6610	Differential Geometry	1	MEAM 5160	Advanced Mechatronic Reactive Spaces.	1
MATH 6710	Topics in Logic	1	MEAM 5170	Control and Optimization with Applications in Robotics	1
MATH 6940	Mathematical Foundations of Theoretical Physics	1	MEAM 5190	Elasticity and Micromechanics of Materials	1
MATH 6950	Mathematical Foundations of Theoretical Physics	1	MEAM 5200	Introduction to Robotics	1
MATH 6982	Representation of Continuous Groups	1	MEAM 5270	Finite Element Analysis	1
MATH 7020	Topics in Algebra	1	MEAM 5290	Introduction to Micro- and Nano-electromechanical Technologies	1
MATH 7200	Advanced Number Theory	1	MEAM 5300	Continuum Mechanics	1
MATH 7210	Advanced Number Theory	1	MEAM 5350	Advanced Dynamics	1
MATH 7240	Topics in Algebraic Geometry	1	MEAM 5360	Viscous Fluid Flow and Modern Applications	1
MATH 7300	Topics in Algebraic and Differential Topology	1	MEAM 5370	Nanotribology	1
MATH 7310	Topics in Algebraic and Differential Topology	1	MEAM 5450	Aerodynamics	1
MATH 7480	Topics in Classical Analysis	1	MEAM 5500	Design of Microelectromechanical Systems	1
MATH 7520	Topics in Operator theory	1			
MATH 7530	Topics in Operator Theory	1			
MATH 7600	Topics in Differential Geometry	1			
MATH 7610	Topics in Differential Geometry	1			

MEAM 5530	Atomic Modeling in Materials Science	1	MSE 5040	Materials Sustainability	0.5
MEAM 5550	Nanoscale Systems Biology	1	MSE 5050	Mechanical Properties of Macro/Nanoscale Materials	1
MEAM 5610	Thermodynamics: Foundations, Energy, Materials	1	MSE 5060	Failure Analysis of Engineering Materials	1
MEAM 5620	Water Treatment Engineering	1	MSE 5150	Mathematical Methods for Engineering Applications	1
MEAM 5700	Transport Processes I	1	MSE 5180	Structure and Function of Biological Materials	1
MEAM 5710	Advanced Topics in Transport Phenomena	1	MSE 5200	Structure of Materials	1
MEAM 5750	Micro and Nano Fluidics	1	MSE 5250	Nanoscale Science and Engineering	1
MEAM 6130	Non-Linear Control Theory	1	MSE 5300	Thermodynamics and Phase Equilibria	1
MEAM 6200	Advanced Robotics	1	MSE 5360	Electronic Properties of Materials	1
MEAM 6300	Advanced Continuum Mechanics	1	MSE 5370	Nanotribology	1
MEAM 6320	Plasticity	1	MSE 5400	Kinetics of Materials	1
MEAM 6330	Mechanics of Adhesion and Fracture	1	MSE 5500	Elasticity and Micromechanics of Materials	1
MEAM 6340	Rods and Shells	1	MSE 5550	Electrochemical Engineering of Materials	1
MEAM 6350	Composite Materials	1	MSE 5610	Atomic Modeling in Materials Science	1
MEAM 6420	Advanced Fluid Mechanics	1	MSE 5650	Fabrication and Characterization of Micro and Nanostructured Materials	1
MEAM 6460	Computational Mechanics	1	MSE 5700	Physics of Materials I	1
MEAM 6500	Mechanics of Soft and Biomaterials	1	MSE 5750	Statistical Mechanics	1
MEAM 6620	Advanced Molecular Thermodynamics	1	MSE 5760	Machine Learning and Its Applications in Materials Science	1
MEAM 6630	Mechanics of Macromolecules	1	MSE 5800	Introduction to Polymers	1
MEAM 6900	Advanced Topics in Thermal Fluid Science or Energy	1	MSE 5850	Materials for Bioelectronics	1
MEAM 6910	Special Topics in Mechanics of Materials	1	MSE 6100	Transmission Electron Microscopy	1
MEAM 6990	MEAM Seminar	0	MSE 6110	Advanced Synchrotron and Electron Characterization of Materials	1
MEAM 8950	Teaching Practicum	0.5	MSE 6500	Mechanics of Soft and Biomaterials	1
MEAM 8990	Independent Study	1-4	MSE 7900	Selected Topics in Materials Science and Engineering	1
MEAM 9950	Dissertation	0	MTR 5350	Introduction to Bioinformatics	1
MEAM 9990	Thesis/Dissertation Research	1-4	NETS 1120	Networked Life	1
MPHY 6090	Biomedical Image Analysis	1	NETS 1500	Market and Social Systems on the Internet	1
MSE 2010	Materials Lab I	.5	NETS 2120	Scalable and Cloud Computing	1
MSE 2020	Materials Lab II	.5	NETS 3120	Theory of Networks	1
MSE 2150	Introduction to Functional Materials: From Macro to Nanoscale	1	NETS 4120	Algorithmic Game Theory	1
MSE 2200	Introduction to Materials Science and Engineering	1	NGG 5940	Theoretical and Computational Neuroscience	1
MSE 2210	Quantum Physics of Materials	1	NRSC 1110	Introduction to Brain and Behavior	1
MSE 2600	Energetics of Macro and Nano-scale Materials	1	NRSC 2110	Molecular and Cellular Neurobiology	1
MSE 3010	Materials Lab III	.5	NRSC 2140	Evolution of Behavior: Animal Behavior	1
MSE 3300	Self-Assembly of Soft Materials	1	NRSC 2233	Neuroethology	1
MSE 3600	Structure at the Nanoscale	1	NRSC 2240	Chronobiology and Sleep	1
MSE 3930	Materials Selection	1	NRSC 2260	Neuroendocrinology	1
MSE 4050	Mechanical Properties of Macro/Nanoscale Materials	1	NRSC 2269	Autonomic Physiology	1
MSE 4300	Introduction to Polymers	1	NRSC 2270	Drugs, Brain and Mind	1
MSE 4400	Phase Transformations	1	NRSC 2350	Developmental Neurobiology	1
MSE 4550	Electrochemical Engineering of Materials	1	NRSC 3310	Functional Neuroanatomy	1
MSE 4600	Computational Materials Science	1	NRSC 3492	Experimental Methods in Synaptic Physiology	1
MSE 4650	Fabrication and Characterization of Micro and Nanostructured Materials	1	NRSC 3999	Independent Research	1
MSE 4950	Senior Design	1	NRSC 4110	Neural Systems and Behavior	1
MSE 4960	Senior Design	1	NRSC 4420	Smell and Taste	1
MSE 5000	Experimental Methods in Materials Science	1			

NRSC 4421	Functional Imaging of the Human Brain	1	PHYS 4421	Modern Optics	1
NRSC 4430	The Cognitive Neuroscience of Autism	1	PHYS 4498	Senior Honor Thesis	1
NRSC 4442	Neurobiology of Learning and Memory	1	PHYS 5500	Mathematical Methods of Physics	1
NRSC 4460	Neuroendocrinology Seminar	1	PHYS 5503	General Relativity	1
NRSC 4475	A Neural Systems Approach to Brain Disorders	1	PHYS 5505	Introduction to Cosmology	1
NRSC 4480	Biological Basis of Psychiatric Disorders	1	PHYS 5516	Electromagnetic Phenomena	1
NRSC 4481	Behavioral Pharmacology	1	PHYS 5518	Introduction to Condensed Matter Physics	1
NRSC 4482	Clinical Psychopharmacology	1	PHYS 5521	Advanced Laboratory	1
NRSC 4999	Advanced Independent Research	1	PHYS 5522	Introduction to Elementary Particle Physics	1
NRSC 5585	Theoretical and Computational Neuroscience	1	PHYS 5526	Astrophysical Radiation	1
NSCI 3010	Engineering	1	PHYS 5530	Modern Optical Physics and Spectroscopy	1
OIDD 4150	Product Design	1	PHYS 5531	Quantum Mechanics I	1
OIDD 5150	Product Design	1	PHYS 5532	Quantum Mechanics II	1
OIDD 7610	Risk Analysis and Environmental Management	1	PHYS 5533	Topics in Cosmology	1
PHIL 1710	Introduction to Logic	1	PHYS 5561	Electromagnetism I	1
PHIL 4723	Introduction to Mathematical Logic	1	PHYS 5562	Electromagnetism II: Magnetism, Maxwell's Equations, and Electromagnetic Waves	1
PHIL 6721	Logic and Computability 1	1	PHYS 5580	Biological Physics	1
PHIL 6722	Logic and Computability 2	1	PHYS 5581	Thermodynamics	1
PHRM 5640	Drug Delivery Systems: Targeted Therapeutics and Translational Nanomedicine	1	PHYS 5585	Theoretical and Computational Neuroscience	1
PHYS 0140	Principles of Physics I (without laboratory)	1	PHYS 6601	Introduction to Field Theory	1
PHYS 0141	Principles of Physics II (without laboratory)	1	PHYS 6611	Statistical Mechanics	1
PHYS 0150	Principles of Physics I: Mechanics and Wave Motion	1.5	PHYS 6622	Introduction to Elementary Particle Physics	1
PHYS 0151	Principles of Physics II: Electromagnetism and Radiation	1.5	PHYS 6632	Relativistic Quantum Field Theory	1
PHYS 0170	Honors Physics I: Mechanics and Wave Motion	1.5	PHYS 6633	Relativistic Quantum Field Theory	1
PHYS 0171	Honors Physics II: Electromagnetism and Radiation	1.5	PHYS 6661	Solid State Theory I	1
PHYS 1230	Principles of Physics III: Vibrations and Waves, Special Relativity, and Thermal Physics	1	PHYS 6662	Solid State Theory II	1
PHYS 1240	Principles of Physics IV: Modern Physics (without laboratory)	1	PHYS 6696	Advanced Topics in Theoretical Physics	1
PHYS 1250	Principles of Physics IV: Modern Physics	1.5	PHYS 9900	Masters Thesis	0
PHYS 2260	Introduction to Computational Physics	1	PHYS 9950	Dissertation	0
PHYS 2280	Physical Models of Biological Systems	1	PHYS 9999	Independent Study	1-3
PHYS 2999	Independent Study	1	PSYC 1210	Introduction to Brain and Behavior	1
PHYS 3351	Analytical Mechanics	1	PSYC 2220	Evolution of Behavior: Animal Behavior	1
PHYS 3361	Electromagnetism I: Electricity and Potential Theory	1	PSYC 2250	Drugs, Brain and Mind	1
PHYS 3362	Electromagnetism II: Magnetism, Maxwell's Equations, and Electromagnetic Waves	1	PSYC 2260	Neuroendocrinology	1
PHYS 3364	Laboratory Electronics	1	PSYC 3220	Neural Systems and Behavior	1
PHYS 4401	Thermodynamics and the Introduction to Statistical Mechanics and Kinetic Theory	1	PSYC 3260	Neuroendocrinology Seminar	1
PHYS 4411	Introduction to Quantum Mechanics I	1	PSYC 3301	Neurobiology of Learning and Memory	1
PHYS 4412	Introduction to Quantum Mechanics II	1	PSYC 5390	Theoretical and Computational Neuroscience	1
PHYS 4414	Laboratory in Modern Physics	1	STAT 4300	Probability	1
			STAT 4310	Statistical Inference	1
			STAT 4320	Mathematical Statistics	1
			STAT 4330	Stochastic Processes	1
			STAT 9300	Probability Theory	1