Courses Within the Mathematics Department

Upper Division Electives for ALL Math Majors and Math Minor

*Used to fulfill Enrichment requirements for majors

Note: Quarters offered and prerequisites are subject to change.

Course	Units	Qtr(s) Offered	Prerequisites
MAT 108 — Intro to Abstract Math	4	F, W, S, SSI, SSII	MAT 021B (but not recommended until you complete 21C)
MAT 111 — History of Math	4	W	MAT 127A or MAT 067 or MAT 108 or MAT 114 or MAT 115A or MAT 141 or MAT 145; 8 units of upper division Mathematics
MAT 114 — Convex Geometry	4	W (even years)	MAT 021C; (MAT 022A or MAT 067)
MAT 115A — Number Theory	4	F, SSI	MAT 021B
MAT 115B — Number Theory	4	W (odd years)	MAT 115A; (MAT 022A or MAT 027A or MAT 067 or BIS 027A)
MAT 116 — Differential Geometry	4	S	MAT 021D; (MAT 022A or MAT 027A or MAT 067 or BIS 027A); (MAT 022B or MAT 027B or BIS 027B)
MAT 118A — Partial Differential Equations	4	F	MAT 021D; (MAT 022A or MAT 027A or MAT 067 or BIS 027A); (MAT 022B or MAT 027B or BIS 027B)
MAT 118B — Partial Differential Equations	4	W	MAT 118A
MAT 118C — Partial Differential Equations	4	S	MAT 118B
MAT 119A — Ordinary Differential Equations	4	F, W	MAT 021D; (MAT 022A or MAT 027A or MAT 067 or BIS 027A); (MAT 022B or MAT 027B or BIS 027B)
MAT 119B — Ordinary Differential Equations	4	S	MAT 119A

MAT 124 — Mathematical Biology	4	S (even years)	(MAT 022A or MAT 027A or MAT 067 or BIS 027A); (MAT 022B or MAT 027B or BIS 027B)
MAT 127A — Real Analysis	4	F, W, S, SSII	(MAT 021C or MAT 021CH); (MAT 067 or (MAT 022A or MAT 027A or BIS 027A), MAT 108)
MAT 127B — Real Analysis	4	F, W, S	MAT 127A
MAT 127C — Real Analysis	4	W, S	MAT 127B
MAT 128A — Numerical Analysis	4	F, SSII	MAT 021C; (ECS 032A or ENG 006 or EME 005 or ECS 030)
MAT 128B — Numerical Analysis	4	W	(ECS 032A or ENG 006 or EME 005 or ECS 030); (MAT 022A or MAT 027A or MAT 067 or BIS 027A)
MAT 128C — Numerical Analysis	4	S	(MAT 022A or MAT 067); MAT 022B; (ECS 032A or ENG 006 or EME 005 or ECS 030)
MAT 129 — Fourier Analysis	4	F	MAT 021D; MAT 127A; (MAT 022A or MAT 027A or MAT 067 or BIS 027A); (MAT 022B or MAT 027B or BIS 027B)
MAT 133 — Mathematical Finance	4	S	(MAT 067 or MAT 022A or MAT 027A or BIS 027A); MAT 108; MAT 135A
MAT 135A — Probability	4	F, W, S	MAT 021C; (MAT 108 or MAT 067)
MAT 135B — Stochastic Processes	4	S	MAT 135A; (MAT 022A or MAT 027A or MAT 067 or BIS 027A)
MAT 141 — Euclidean Geometry	4	W, S	MAT 021B; (MAT 022A or MAT 027A or MAT 067 or BIS 027A)
MAT 145 — Combinatorics	4	F, W, S, SSI, SSII	MAT 021C

MAT 146 — Algebraic Combinatorics	4	S	((MAT 022A or MAT 027A or BIS 027A, MAT 108) or MAT 067)); MAT 145
MAT 147 — Topology	4	F	MAT 127A
MAT 148 — Discrete Mathematics	4	W	MAT 067 or (MAT 022A or MAT 027A or BIS 027A, MAT 108)
MAT 150A — Modern Algebra	4	F, W, SSII	MAT 067 or (MAT 022A or MAT 027A or BIS 027A, MAT 108)
MAT 150B — Modern Algebra	4	W	MAT 150A
MAT 150C — Modern Algebra	4	S	MAT 150B
MAT 165 — Mathematics and Computers	4	F (even years)	(MAT 127A or MAT 108 or MAT 114 or MAT 115A or MAT 145); (MAT 022A or MAT 027A or MAT 067 or BIS 027A)
MAT 167 — Applied Linear Algebra	4	F, W, SSI	MAT 022A or MAT 027A or MAT 067 or BIS 027A
MAT 168 — Optimization	4	F, W	MAT 021C; ((MAT 022A or MAT 027A or BIS 027A, MAT 108) or MAT 067))
MAT 170 — Math for Data Analytics	4	S	MAT 167 or MAT 128B or ECS 130
MAT 180 — Special Topics	3	F, W, S	(MAT 067 or (MAT 022A or MAT 027A or BIS 027A, MAT 108)), MAT 127A
MAT 185A — Complex Analysis	4	F, W	MAT 067 or (MAT 022A or MAT 027A or BIS 027A, MAT 108)), MAT 127B
MAT 185B — Complex Analysis	4	S (odd years)	MAT 185A
MAT 189 — Advanced Problem Solving	3	S	((MAT 022A or MAT 027A or BIS 027A, MAT 108) or MAT 067)); MAT 127A

Courses Outside the Mathematics Department

Upper Division Electives for BS Mathematics (Plan 1 & 2) Majors

*Can be used to fill 1 out of 4 Enrichment classes

Course	Units	Prerequisites
ATM 120 — Atmospheric Thermodynamics & Cloud Physics	4	MAT 021C; PHY 009B; ATM 060 (can be concurrent)
ATM 121A — Atmospheric Dynamics	4	ATM 120; MAT 021D; PHY 009B
ATM 121B — Atmospheric Dynamics	4	ATM 121A
CHE 110A — Physical Chemistry: Introduction to Quantum Mechanics	4	(PHY 007C or PHY 009C or PHY 009HC); (CHE 002C or CHE 002CH); (MAT 016C or MAT 017C or MAT 021C); completion of MAT 021D, MAT 022A, MAT 022AL; PHY 009C or PHY 009HC, strongly recommended
CHE 110B — Physical Chemistry: Properties of Atoms & Molecules	4	CHE 110A
CHE 110C — Physical Chemistry: Thermodynamics, Equilibria & Kinetics	4	CHE 110B
EEC 130A — Electromagnetics I	4	MAT 021D; (PHY 009C or PHY 009HD); ENG 017
EEC 130B — Introductory Electromagnetics II	4	EEC 130A
ECI 114 — Probabilistic Systems Analysis for Civil Engineers	4	MAT 021C C- or better
ECI 153 — Deterministic Optimization & Design	4	MAT 021C; (MAT 022A or MAT 027A); computer programming course

ECN 122 — Theory of Games & Strategic Behavior	4	(MAT 016A, MAT 016B) or (MAT 021A, MAT 021B) or (MAT 017A, MAT 017B); or Consent of Instructor
ECN 140 — Econometrics	4	(ECN 100 or ECN 100A or ARE 100A); (ECN 102 or STA 108); or Consent of Instructor
ECS 120 — Theory of Computation	4	(ECS 020 or MAT 108); (ECS 32B or ECS 36C Recommended)
ECS 122A — Algorithm Design & Analysis	4	ECS 020; (ECS 060 or ECS 032B or ECS 036C)
ECS 127 — Cryptography	4	(ECS 020 or MAT 108); (ECS 010 or ECS 032A or ECS 030 or ECS 036A)
EME 115 — Introduction to Numerical Analysis & Methods	4	ENG 006 C- or better or EME 005 C- or better or ECS 030 C- or better or ECS 032A C- or better or ECS 036A C- or better or ECH 060 C- or better or ECM 006 C- or better); ((MAT 021A C- or better, MAT 021B C- or better, MAT 021C C- or better, MAT 021D C- or better, (MAT 022A C- or better or MAT 027A C- or better), (MAT 022B C- or better or MAT 027B C- or better)), (PHY 009A C- or better, PHY 009B C- or better, PHY 009C C- or better)
ESP 150A — Physical & Chemical Oceanography	4	(ESP 116N or GEL 116N); (PHY 007B or PHY 009B); (MAT 016C or MAT 017C or MAT 021C); (CHE 002C or GEL 055); and Consent of Instructor
GEL 150A — Physical & Chemical Oceanography	4	(ESP 116N or GEL 116N); (PHY 007B or PHY 009B); (MAT 016C or MAT 017C or MAT 021C); (CHE 002C or GEL 055); and Consent of Instructor
LIN 177 — Computational Linguistics	4	Consent of Instructor. LIN 001 recommended.
PHY 104A — Introductory Methods of Mathematical Physics	4	(PHY 009B C- or better, PHY 009C C- or better, PHY 009D C- or better) or (PHY 009HB C- or better, PHY 009HC C- or better, PHY 009HD C- or better, PHY 009HE C- or better)); (MAT 021D C- or better, (MAT 022A C- or better or MAT 027A C- or better), (MAT 022B C- or better or MAT 027B C- or better)); or Consent of Instructor
PHY 104B — Computational Methods of Mathematical Physics	4	PHY 104A C- or better; PHY 105AL; or Consent of Instructor

PHY 104C — Intermediate Methods of Mathematical Physics	4	PHY 104A C- or better; or Consent of Instructor
PHY 105A — Analytical Mechanics	4	PHY 009B C or better, PHY 009C C or better, PHY 009D C or better) or (PHY 009HB C or better, PHY 009HC C or better, PHY 009HD C or better, PHY 009HE C or better); (MAT 021D C or better, (MAT 022A C or better or MAT 027A C or better), (MAT 022B C or better or MAT 027B C or better)); or Consent of Instructor
PHY 105B — Analytical Mechanics	4	PHY 104A C or better; PHY 105A C or better; Or consent of department for any of the courses
PHY 108 — Optics	3	((PHY 009A, PHY 009B, PHY 009C, PHY 009D) or (PHY 007A, PHY 007B, PHY 007C) or (PHY 009HA, PHY 009HB, PHY 009HC, PHY 009HD, PHY 009HE)); (MAT 021A, MAT 021B, MAT 021C, MAT 021D); or Consent of Instructor
PHY 110A — Electricity & Magnetism	4	(PHY 009B C- or better, PHY 009C C- or better, PHY 009D C- or better) or (PHY 009HB C- or better, PHY 009HC C- or better, PHY 009HD C- or better, PHY 009HE C- or better); MAT 021D C- or better; (MAT 022A C- or better or MAT 027A C- or better); (MAT 022B C- or better or MAT 027B C- or better); PHY 104A; PHY 105A; or consent of department
PHY 110B — Electricity & Magnetism	4	PHY 110A C- or better; PHY 104A C- or better; Or consent of department
PHY 110C — Electricity & Magnetism	4	PHY 110B C- or better; Or consent of department
PHY 112 — Thermodynamics & Statistical Mechanics	4	PHY 115A; Or the equivalent
PHY 115A — Foundation of Quantum Mechanics	4	PHY 104A C- or better; PHY 105A C- or better; Or consent of department
PHY 115B — Applications of Quantum Mechanics	4	PHY 115A C- or better; Or consent of department
PHY 116A — Electronic Instrumentation	4	(PHY 009C or PHY 009HD); (MAT 022B or MAT 027B); or Consent of Instructor

PHY 116B — Electronic Instrumentation	4	PHY 009C or PHY 009HD; or Consent of Instructor
PHY 154 — Astrophysical Applications of Physics	4	PHY 105A; PHY 105B; PHY 110B (can be concurrent); PHY 115A (can be concurrent); PHY 112; PHY 112 or consent of instructor; PHY 110B and PHY 115A required concurrently
STA 131B — Introduction to Mathematical Statistics	4	STA 131A C- or better or MAT 135A C- or better; Consent of Instructor
STA 131C — Introduction to Mathematical Statistics	4	STA 131B C- or better
STA 141A — Fundamentals of Statistical Data Science	4	STA 108 C- or better or STA 106 C- or better
STA 141B — Data & Web Technologies for Data Analysis	4	STA 141A C- or better
STA 141C — Big Data & High Performance Statistical Computing	4	STA 141B C- or better or (STA 141A C- or better, (ECS 010 C- or better or ECS 032A C- or better))

Courses Outside the Mathematics Department

Upper Division Electives for Applied Math Majors

*Used to fulfill requirement for upper division non-math class

Course	Units	Prerequisites
ARE 106 — Econometric Theory & Applications	4	ARE 100A C- or better; (STA 013 C- or better or STA 013Y C- or better); STA 103 C- or better; (PLS 021 C- or better or PLS 021V C- or better or ECS 032A C- or better)
ATM 120 — Atmospheric Thermodynamics & Cloud Physics	4	MAT 021C; PHY 009B; ATM 060 (can be concurrent)
ATM 121A — Atmospheric Dynamics	4	ATM 120; MAT 021D; PHY 009B
ATM 121B — Atmospheric Dynamics	4	ATM 121A
ATM 128 — Radiation & Satellite Meteorology	4	ATM 060; PHY 009B; MAT 022B; MAT 021D
CHE 110A — Physical Chemistry: Introduction to Quantum Mechanics	4	(PHY 007C or PHY 009C or PHY 009HC); (CHE 002C or CHE 002CH); (MAT 016C or MAT 017C or MAT 021C); completion of MAT 021D, MAT 022A, MAT 022AL; PHY 009C or PHY 009HC, strongly recommended
CHE 110B — Physical Chemistry: Properties of Atoms & Molecules	4	CHE 110A
CHE 110C — Physical Chemistry: Thermodynamics, Equilibria & Kinetics	4	CHE 110B
EEC 130A — Electromagnetics I	4	MAT 021D; (PHY 009C or PHY 009HD); ENG 017
EEC 130B — Introductory Electromagnetics II	4	EEC 130A

ECH 140 — Mathematical Methods in Biochemical & Chemical Engineering	4	MAT 022B; (ECH 060 or ENG 006); or equivalents of ECH 060 or ENG 00G
ECI 114 — Probabilistic Systems Analysis for Civil Engineers	4	MAT 021C C- or better
ECI 153 — Deterministic Optimization & Design	4	MAT 021C; (MAT 022A or MAT 027A); computer programming course
ECN 122 — Theory of Games & Strategic Behavior	4	(MAT 016A, MAT 016B) or (MAT 021A, MAT 021B) or (MAT 017A, MAT 017B); or Consent of Instructor
ECN 140 — Econometrics	4	(ECN 100 or ECN 100A or ARE 100A); (ECN 102 or STA 108); or Consent of Instructor
ECS 120 — Theory of Computation	4	(ECS 020 or MAT 108); (ECS 32B or ECS 36C Recommended)
ECS 122A — Algorithm Design & Analysis	4	ECS 020; (ECS 060 or ECS 032B or ECS 036C)
ECS 127 — Cryptography	4	(ECS 020 or MAT 108); (ECS 010 or ECS 032A or ECS 030 or ECS 036A)
EME 115 — Introduction to Numerical Analysis & Methods	4	ENG 006 C- or better or EME 005 C- or better or ECS 030 C- or better or ECS 032A C- or better or ECS 036A C- or better or ECH 060 C- or better or ECM 006 C- or better); ((MAT 021A C- or better, MAT 021B C- or better, MAT 021C C- or better, MAT 021D C- or better, (MAT 022A C- or better or MAT 027A C- or better), (MAT 022B C- or better or MAT 027B C- or better)), (PHY 009A C- or better, PHY 009B C- or better, PHY 009C C- or better)
ESP 150A — Physical & Chemical Oceanography	4	(ESP 116N or GEL 116N); (PHY 007B or PHY 009B); (MAT 016C or MAT 017C or MAT 021C); (CHE 002C or GEL 055); and Consent of Instructor
EVE 102 — Population & Quantitative Genetics	4	BIS 101; (STA 100 or STA 102); EVE 100
GEL 150A — Physical & Chemical Oceanography	4	(ESP 116N or GEL 116N); (PHY 007B or PHY 009B); (MAT 016C or MAT 017C or MAT 021C); (CHE 002C or GEL 055); and Consent of Instructor

LIN 177 — Computational Linguistics	4	Consent of Instructor. LIN 001 recommended.
PHY 104A — Introductory Methods of Mathematical Physics	4	(PHY 009B C- or better, PHY 009C C- or better, PHY 009D C- or better) or (PHY 009HB C- or better, PHY 009HC C- or better, PHY 009HD C- or better, PHY 009HE C- or better)); (MAT 021D C- or better, (MAT 022A C- or better or MAT 027A C- or better), (MAT 022B C- or better or MAT 027B C- or better)); or Consent of Instructor
PHY 104B — Computational Methods of Mathematical Physics	4	PHY 104A C- or better; PHY 105AL; or Consent of Instructor
PHY 104C — Intermediate Methods of Mathematical Physics	4	PHY 104A C- or better; or Consent of Instructor
PHY 105A — Analytical Mechanics	4	PHY 009B C or better, PHY 009C C or better, PHY 009D C or better) or (PHY 009HB C or better, PHY 009HC C or better, PHY 009HD C or better, PHY 009HE C or better); (MAT 021D C or better, (MAT 022A C or better or MAT 027A C or better), (MAT 022B C or better or MAT 027B C or better)); or Consent of Instructor
PHY 105B — Analytical Mechanics	4	PHY 104A C or better; PHY 105A C or better; Or consent of department for any of the courses
PHY 108 — Optics	3	((PHY 009A, PHY 009B, PHY 009C, PHY 009D) or (PHY 007A, PHY 007B, PHY 007C) or (PHY 009HA, PHY 009HB, PHY 009HC, PHY 009HD, PHY 009HE)); (MAT 021A, MAT 021B, MAT 021C, MAT 021D); or Consent of Instructor
PHY 110A — Electricity & Magnetism	4	(PHY 009B C- or better, PHY 009C C- or better, PHY 009D C- or better) or (PHY 009HB C- or better, PHY 009HC C- or better, PHY 009HD C- or better, PHY 009HE C- or better); MAT 021D C- or better; (MAT 022A C- or better or MAT 027A C- or better); (MAT 022B C- or better or MAT 027B C- or better); PHY 104A; PHY 105A; or consent of department
PHY 110B — Electricity & Magnetism	4	PHY 110A C- or better; PHY 104A C- or better; Or consent of department
PHY 110C — Electricity & Magnetism	4	PHY 110B C- or better; Or consent of department

PHY 112 — Thermodynamics & Statistical Mechanics	4	PHY 115A; Or the equivalent
PHY 115A — Foundation of Quantum Mechanics	4	PHY 104A C- or better; PHY 105A C- or better; Or consent of department
PHY 115B — Applications of Quantum Mechanics	4	PHY 115A C- or better; Or consent of department
PHY 116A — Electronic Instrumentation	4	(PHY 009C or PHY 009HD); (MAT 022B or MAT 027B); or Consent of Instructor
PHY 116B — Electronic Instrumentation	4	PHY 009C or PHY 009HD; or Consent of Instructor
PHY 154 — Astrophysical Applications of Physics	4	PHY 105A; PHY 105B; PHY 110B (can be concurrent); PHY 115A (can be concurrent); PHY 112; PHY 112 or consent of instructor; PHY 110B and PHY 115A required concurrently
PSC 103A — Statistical Analysis of Psychological Data	5	PSC 001 or PSC 001Y); PSC 041; (STA 013 or STA 013Y or STA 102)
PSC 103B — Statistical Analysis of Psychological Data	5	PSC 103A; (STA 013 or STA 013Y or STA 102)
STA 131B — Introduction to Mathematical Statistics	4	STA 131A C- or better or MAT 135A C- or better; Consent of Instructor
STA 131C — Introduction to Mathematical Statistics	4	STA 131B C- or better
STA 141A — Fundamentals of Statistical Data Science	4	STA 108 C- or better or STA 106 C- or better
STA 141B — Data & Web Technologies for Data Analysis	4	STA 141A C- or better
STA 141C — Big Data & High Performance Statistical Computing	4	STA 141B C- or better or (STA 141A C- or better, (ECS 010 C- or better or ECS 032A C- or better))

Courses Outside the Mathematics Department

Upper Division Electives for Mathematical Analytics and Operations Research Major

* Used to fulfill Enrichment A requirement (upper division courses in statistics or math)

Course	Units	Prerequisites
STA131B — Introduction to Mathematical Statistics	4	STA 131A C- or better or MAT 135A C- or better
STA131C — Introduction to Mathematical Statistics	4	STA 131B C- or better
STA137 — Applied Time Series Analysis	4	STA 108 C- or better
STA141A — Fundamentals of Statistical Data Science	4	STA 106 C- or better or STA 108 C- or better
STA141B — Data & Web Technologies for Data Analysis	4	STA 141A C- or better
STA141C — Big Data & High Performance Statistical Computing	4	STA 141B C- or better or (STA 141A C- or better, (ECS 10 C- or better or ECS 32A C- or better))

*Used to fulfill Enrichment B requirement (upper division courses in economics)

Course	Units	Prerequisites
ECN 100A — Intermediate Micro Theory: Consumer & Producer Theory	4	(ECN 001A C- or better or ECN 001AV C- or better); ECN 001B C- or better; (MAT 016A C- or better or MAT 017A C- or better or MAT 021A C- or better); (MAT 016B C- or better or MAT 017B C- or better or MAT 021B C- or better)
ECN 100B — Intermediate Micro Theory: Imperfect Competition & Market Failure	4	ECN 100A
ECN 121A — Industrial Organization	4	(ECN 100 or ECN 100A or ARE 100A); (ECN 100B or ARE 100B)
ECN 121B — Industrial Organization	4	(ECN 100 or ECN 100A or ARE 100A); (ECN 100B or ARE 100B)

ECN 122 — Theory of Games & Strategic Behavior	4	(MAT 016A, MAT 016B) or (MAT 021A, MAT 021B) or (MAT 017A, MAT 017B); or Consent of Instructor
ECN 134 — Financial Economics	4	ECN 100 or ECN 100A or ARE 100A); (STA 013 or STA 013Y); (ECN 100B or ARE 100B)
ARE 100A — Intermediate Microeconomics: Imperfect Competition, Markets & Welfare Economics	4	((ECN 001A C- or better or ECN 001AV C- or better); ECN 001B C- or better); ((MAT 016A C- or better, MAT 016B C- or better, MAT 016C C- or better) or (MAT 017A C- or better, MAT 017B C- or better) or (MAT 021A C- or better, MAT 021B C- or better))
ARE 100B — Intermediate Microeconomics: Imperfect Competition, Markets & Welfare Economics	4	RE 100A C- or better; ((ECN 001A C- or better or ECN 001AV C- or better); ECN 001B C- or better); ((MAT 016A C- or better, MAT 016B C- or better, MAT 016C C- or better) or (MAT 017A C- or better, MAT 017B C- or better) or (MAT 021A C- or better, MAT 021B C- or better)); ARE 018 C- or better
ARE 155 — Operations Research & Management Science	4	ARE 100A C- or better; (STA 013 C- or better or STA 013Y C- or better); STA 103 C- or better
ARE 156 — Introduction to Mathematical Economics	4	ARE 100B; ARE 155; ARE 100A C- or better; (STA 013 C- or better or STA 013Y C- or better); STA 103 C- or better
ARE 157 — Analysis for Operations & Production Management	4	ARE 155 C- or better; ARE 100A C- or better; (STA 013 C- or better or STA 013Y C- or better); STA 103 C- or better

Courses Outside the Mathematics Department

Upper Division Electives for
Mathematical and Scientific Computation Majors (Biology Emphasis)

*Used to fulfill requirement for biology class

Course	Units	Prerequisites
ECS 124 — Theory & Practice of Bioinformatics	4	(ECS 010 or ECS 032A or ECS 030 or ECS 036A or ENG 006); (STA 012 or STA 013 or STA 013Y or STA 032 or STA 100 or STA 131A or MAT 135A or BIM 105); (BIS 002A or MCB 010)
ECS 129 — Computational Structural Bioinformatics	4	(BIS 002A or MCB 010); (ECS 010 or ECS 032A or ECS 036A)
ECS 170 — Introduction to Artificial Intelligence	4	ECS 060 or ECS 032B or ECS 036C
EVE 101 — Introduction to Ecology	4	(BIS 002A, BIS 002B, BIS 002C); (MAT 016A or MAT 017A or MAT 021A); (MAT 016B or MAT 017B or MAT 021B); Or the equivalent
EVE 102 — Population & Quantitative Genetics	4	BIS 101; (STA 100 or STA 102); EVE 100
EBS 130 — Modeling of Dynamic Processes in Biological Systems	4	(ENG 006 or ECS 032A); (MAT 022B C- or better or MAT 027B C- or better); EBS 075
ESP 121 — Population Ecology	4	BIS 002B; (MAT 016B or MAT 017B or MAT 021B or MAT 021BH)
MCB 121 — Advanced Molecular Biology	3	BIS 101; (BIS 102 (can be concurrent) or BIS 105 (can be concurrent) or ABI 102 (can be concurrent)); BIS 102 or BIS 105 or ABI 102 can be concurrent although prior completion is recommended
MCB 162 — Human Genetics & Genomics	3	BIS 101
NPB 163 — Systems Neuroscience	4	NPB 100 or NPB 110B; Or equivalent basic neuroscience training with consent of instructor

Courses Outside the Mathematics Department

Lower/Upper Division Electives for
Mathematical and Scientific Computation Majors (Math Emphasis)

*Used to fulfill requirement for computation class

Course	Units	Prerequisites
ATM 120 — Atmospheric Thermodynamics & Cloud Physics	4	MAT 021C; PHY 009B; ATM 060 (can be concurrent)
ECS 36C — Data Structures, Algorithms, & Programming	4	(ECS 040 C- or better or ECS 036B C- or better); ECS 020 C- or better
ECS 120 — Theory of Computation	4	(ECS 020 or MAT 108); (ECS 32B or ECS 36C Recommended)
ECS 122A — Algorithm Design & Analysis	4	ECS 020; (ECS 060 or ECS 032B or ECS 036C)
ECS 122B — Algorithm Design & Analysis	4	ECS 122A; (ECS 060 or ECS 034 or ECS 036C)
ECS 124 — Theory & Practice of Bioinformatics	4	(ECS 010 or ECS 032A or ECS 030 or ECS 036A or ENG 006); (STA 012 or STA 013 or STA 013Y or STA 032 or STA 100 or STA 131A or MAT 135A or BIM 105); (BIS 002A or MCB 010)
ECS 129 — Computational Structural Bioinformatics	4	(BIS 002A or MCB 010); (ECS 010 or ECS 032A or ECS 036A)
ECS 130 — Scientific Computation	4	(ECS 030 or ENG 006 or ECS 032A or ECS 010 or ECS 036A); (MAT 022A or MAT 027A or MAT 067)
ECS 170 — Introduction to Artificial Intelligence	4	ECS 060 or ECS 032B or ECS 036C
ECS 175 — Computer Graphics	4	(ECS 060 or ECS 034 or ECS 036C); (MAT 022A or MAT 027A or MAT 067).
NPB 163 — Systems Neuroscience	4	NPB 100 or NPB 110B; Or equivalent basic neuroscience training with consent of instructor.
STA 141A — Fundamentals of Statistical Data Science	4	STA 108 C- or better or STA 106 C- or better