

MATHEMATICS: MATHEMATICS FOR THE PHYSICAL AND BIOLOGICAL SCIENCES

REQUIREMENTS

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The Mathematics for the Physical and Biological Sciences program requires 10 distinct courses for at least 30 credits as described below. While a single course may be used to fulfill more than one requirement, it will only contribute once to the total course count. Finally, at most one course from each of the following groupings may be used to fulfill the minimum course and credit requirement (i.e.: minimum of ten courses and at least 30 credits): Intro Linear Algebra (MATH 320, MATH 340, MATH 341, MATH 375), Intro Differential Equations (MATH 319, MATH 320 or MATH 376), and Intro Probability (MATH/STAT 309 or MATH/STAT 431).

Code	Title	Credits
Core Math Requirement (minimum of six distinct MATH courses for at least 18 credits)¹		
<i>Linear Algebra</i>		3-5
MATH 341	Linear Algebra	
or MATH 320	Linear Algebra and Differential Equations	
or MATH 340	Elementary Matrix and Linear Algebra	
or MATH 375	Topics in Multi-Variable Calculus and Linear Algebra	
<i>Differential Equations</i>		0-5
MATH 319	Techniques in Ordinary Differential Equations	
or MATH 320	Linear Algebra and Differential Equations	
or MATH 322	Applied Mathematical Analysis	
or MATH 376	Topics in Multi-Variable Calculus and Differential Equations	
or MATH 415	Applied Dynamical Systems, Chaos and Modeling	
or MATH 519	Ordinary Differential Equations	
<i>Intermediate Mathematics Requirement (complete one)</i>		0-6
MATH 321 & MATH 322	Applied Mathematical Analysis and Applied Mathematical Analysis	
MATH 375	Topics in Multi-Variable Calculus and Linear Algebra	
MATH 341	Linear Algebra	
MATH 421	The Theory of Single Variable Calculus	
<i>Advanced Mathematics Requirement (complete one)</i>		3
MATH/COMP SCI 514	Numerical Analysis	
MATH 519	Ordinary Differential Equations	
MATH 521	Analysis I	
MATH 531	Probability Theory	

MATH 540	Linear Algebra II	
MATH 541	Modern Algebra	
MATH 551	Elementary Topology	
MATH 561	Differential Geometry	
MATH 619	Analysis of Partial Differential Equations	
MATH 623	Complex Analysis	
<i>MATH Elective to reach six courses and 18 credits</i>		3-9
<i>At least one from:¹</i>		
MATH/COMP SCI 513	Numerical Linear Algebra	
MATH/COMP SCI 514	Numerical Analysis	
MATH 519	Ordinary Differential Equations	
MATH 521	Analysis I	
MATH 522	Analysis II	
MATH/COMP SCI/ISY E/STAT 525	Linear Optimization	
MATH 531	Probability Theory	
MATH 535	Mathematical Methods in Data Science	
MATH 540	Linear Algebra II	
MATH 541	Modern Algebra	
MATH 542	Modern Algebra	
MATH 551	Elementary Topology	
MATH 552	Elementary Geometric and Algebraic Topology	
MATH 561	Differential Geometry	
MATH 567	Modern Number Theory	
MATH 570	Fundamentals of Set Theory	
MATH/PHILOS 571	Mathematical Logic	
MATH 605	Stochastic Methods for Biology	
MATH/B M I/ BIOCHEM/ BMOLCHEM 609	Mathematical Methods for Systems Biology	
MATH 616	Data-Driven Dynamical Systems, Stochastic Modeling and Prediction	
MATH 619	Analysis of Partial Differential Equations	
MATH 623	Complex Analysis	
MATH 627	Introduction to Fourier Analysis	
MATH 629	Introduction to Measure and Integration	
MATH/ISY E/OTM/STAT 632	Introduction to Stochastic Processes	
MATH 635	An Introduction to Brownian Motion and Stochastic Calculus	
<i>Remaining courses/credits may be from:</i>		
MATH/STAT 310	Introduction to Probability and Mathematical Statistics II	
MATH 321	Applied Mathematical Analysis	
MATH 322	Applied Mathematical Analysis	

MATH 415	Applied Dynamical Systems, Chaos and Modeling	COMP SCI/ MATH 514	Numerical Analysis
MATH 421	The Theory of Single Variable Calculus	COMP SCI/I SY E/ MATH/STAT 525	Linear Optimization
MATH/ COMP SCI/ I SY E 425	Introduction to Combinatorial Optimization	GEOSCI/ G L E 350	Introduction to Geophysics: The Dynamic Earth
MATH/STAT 431	Introduction to the Theory of Probability	GEOSCI/ CIV ENGR/ ENVIR ST/ G L E 444	Practical Applications of GPS Surveying
or MATH/ STAT 309	Introduction to Probability and Mathematical Statistics I	GEOSCI/ G L E 537	Quantitative Methods for Geoscience
MATH 443	Applied Linear Algebra	GEOSCI/ G L E 594	Introduction to Applied Geophysics
MATH 444	Graphs and Networks in Data Science	GEOSCI/ G L E 627	Hydrogeology
MATH/ COMP SCI/ STAT 475	Introduction to Combinatorics	PHYSICS 249	A Modern Introduction to Physics
Natural/Biological Sciences Requirement (Four courses distinct from the above for at least 12 credits)¹		or PHYSICS 241	Introduction to Modern Physics
PHYSICS 247	A Modern Introduction to Physics	or PHYSICS 205	Modern Physics for Engineers
or PHYSICS 207	General Physics	PHYSICS 311	Mechanics
or PHYSICS 201	General Physics	PHYSICS 321	Electric Circuits and Electronics
or E M A 201	Statics	PHYSICS 322	Electromagnetic Fields
PHYSICS 248	A Modern Introduction to Physics	PHYSICS 323	Electromagnetic Fields
or PHYSICS 208	General Physics	PHYSICS 325	Optics
or PHYSICS 202	General Physics	PHYSICS/ ENVIR ST 472	Scientific Background to Global Environmental Problems
<i>Two additional courses from the following:²</i>		PHYSICS/B M E/ H ONCOL/ MED PHYS 501	Radiation Physics and Dosimetry
ASTRON 310	Stellar Astrophysics	PHYSICS/E C E/ N E 525	Introduction to Plasmas
ASTRON 320	The Interstellar Medium	PHYSICS 551	Solid State Physics
ATM OCN 310	Dynamics of the Atmosphere and Ocean I	PHYSICS 623	Electronic Aids to Measurement
ATM OCN 311	Dynamics of the Atmosphere and Ocean II	PHYSICS 625	Applied Optics
ATM OCN/ GEOG 323	Science of Climate Change	STAT/MATH 310	Introduction to Probability and Mathematical Statistics II
ATM OCN 330	Physics of the Atmosphere and Ocean I	or STAT 312	Introduction to Theory and Methods of Mathematical Statistics II
ATM OCN 340	Physics of the Atmosphere and Ocean II	STAT 333	Applied Regression Analysis
BIOCORE 383	Cellular Biology	STAT 349	Introduction to Time Series
CHEM 561	Physical Chemistry	STAT 351	Introductory Nonparametric Statistics
or CHEM 565	Biophysical Chemistry	STAT 411	An Introduction to Sample Survey Theory and Methods
CHEM 562	Physical Chemistry	STAT 421	Applied Categorical Data Analysis
COMP SCI 300	Programming II	STAT/M E 424	Statistical Experimental Design
COMP SCI 310	Problem Solving Using Computers	STAT/MATH 431	Introduction to the Theory of Probability
COMP SCI 320	Data Science Programming II	or STAT/ MATH 309	Introduction to Probability and Mathematical Statistics I
COMP SCI 400	Programming III	or STAT 311	Introduction to Theory and Methods of Mathematical Statistics I
COMP SCI/I SY E/ MATH 425	Introduction to Combinatorial Optimization	STAT 456	Applied Multivariate Analysis
COMP SCI/ MATH/STAT 475	Introduction to Combinatorics	STAT 461	Financial Statistics
COMP SCI/ MATH 513	Numerical Linear Algebra		

STAT/ COMP SCI 471	Introduction to Computational Statistics	CIV ENGR 311	Hydroscience
STAT/COMP SCI/ MATH 475	Introduction to Combinatorics	CIV ENGR 322	Environmental Engineering Processes
STAT/COMP SCI/ I SY E/MATH 525	Linear Optimization	CIV ENGR 340	Structural Analysis I
STAT/I SY E/ MATH/OTM 632	Introduction to Stochastic Processes	CIV ENGR 370	Transportation Engineering
BIOCHEM 570	Computational Modeling of Biological Systems	E C E 220	Electrodynamics I
BIOCHEM/B M I/ BMOLCHEM/ MATH 609	Mathematical Methods for Systems Biology	E C E 230	Circuit Analysis
BIOCHEM/ BOTANY 621	Plant Biochemistry	E C E/ PHYSICS 235	Introduction to Solid State Electronics
BSE 249	Engineering Principles for Biological Systems	E C E 320	Electrodynamics II
BSE 349	Quantitative Techniques for Biological Systems	E C E 330	Signals and Systems
BSE 351	Structural Design for Agricultural Facilities	E C E/COMP SCI/ MATH 435	Introduction to Cryptography
BSE 364	Engineering Properties of Food and Biological Materials	E C E/MATH 641	Introduction to Error-Correcting Codes
BSE 365	Measurements and Instrumentation for Biological Systems	E M A 202 or M E 240	Dynamics Dynamics
BSE/M E 475	Engineering Principles of Agricultural Machinery	E M A 303 or M E 306	Mechanics of Materials Mechanics of Materials
B M E 310	Bioinstrumentation	E M A 405	Practicum in Finite Elements
B M E 315	Biomechanics	E M A/E P 471	Intermediate Problem Solving for Engineers
B M E 325	Applied Statistics for Biomedical Engineers	E M A/E P 547	Engineering Analysis I
B M E 330	Engineering Principles of Molecules, Cells, and Tissues	E M A/E P 548	Engineering Analysis II
B M E/H ONCOL/ MED PHYS/ PHYSICS 501	Radiation Physics and Dosimetry	E M A/ ASTRON 550	Astrodynamics
B M E/M E 505	Biofluidics	I SY E 320	Simulation and Probabilistic Modeling
B M E 520	Stem Cell Bioengineering	I SY E 323	Operations Research-Deterministic Modeling
B M E/ MED PHYS 535	Introduction to Energy-Tissue Interactions	I SY E 516	Introduction to Decision Analysis
B M E 556	Systems Biology: Mammalian Signaling Networks	I SY E/COMP SCI/ E C E 524	Introduction to Optimization
B M E/ MED PHYS 566	Physics of Radiotherapy	I SY E/COMP SCI/ MATH/STAT 525	Linear Optimization
B M E/ MED PHYS 567	The Physics of Diagnostic Radiology	I SY E/ COMP SCI 526	Advanced Linear Programming
B M E/ MED PHYS 573	Mathematical Methods in Medical Physics	M S & E 330	Thermodynamics of Materials
B M E/M E 615	Tissue Mechanics	M S & E 331	Transport Phenomena in Materials
CBE 255	Introduction to Chemical Process Modeling	M S & E 332	Macroprocessing of Materials
CBE 310	Chemical Process Thermodynamics	M S & E 434	Introduction to Thin-Film Deposition Processes
CBE 320	Introductory Transport Phenomena	M S & E 460	Introduction to Computational Materials Science and Engineering
CBE 326	Momentum and Heat Transfer Operations	M E 331	Computer-Aided Engineering
CIV ENGR 310	Fluid Mechanics	M E 340	Dynamic Systems
		M E 361	Thermodynamics
		M E/STAT 424	Statistical Experimental Design
		M E 536	Data Driven Engineering Design
		N E 305	Fundamentals of Nuclear Engineering
		N E/E C E/ PHYSICS 525	Introduction to Plasmas
		N E/I SY E 574	Methods for Probabilistic Risk Analysis of Nuclear Power Plants

MED PHYS/ Radiation Physics and Dosimetry
 B M E/H ONCOL/
 PHYSICS 501

MED PHYS/ Introduction to Energy-Tissue
 B M E 535 Interactions

MED PHYS 563 Radionuclides in Medicine and
 Biology

MED PHYS/ The Physics of Diagnostic Radiology
 B M E 567

MED PHYS/ Health Physics and Biological
 N E 569 Effects

Total Credits

30

RESIDENCE AND QUALITY OF WORK

- 2.000 GPA for all MATH courses and courses eligible for the major.³
- 2.000 GPA on at least 15 credits of upper level credit in the major.⁴
- 15 credits in MATH in the major taken on the UW-Madison campus.⁵

FOOTNOTES

¹ Courses listed in the tables below may have prerequisites outside of the program requirements.

² Any MATH course from the elective list above may be used in lieu of any of the following courses.

³ This includes any course with the MATH prefix (or cross-listed with MATH) regardless of appearing in the tables above as well as only those non-MATH courses which appear in the tables above.

⁴ This includes any MATH courses (or courses cross-listed with MATH) numbered 307 and above, regardless of appearing in the tables above, as well as any non-MATH course listed in the tables above which carries the advanced LAS designation.

⁵ This includes any course with the MATH prefix (or cross-listed with MATH) numbered 307 and above.