MATHEMATICS: MATHEMATICS FOR THE PHYSICAL AND BIOLOGICAL SCIENCES

The mathematics named option programs allow students to develop a deep understanding of how the subject relates to other areas of human inquiry. The requirements for these programs feature mathematics courses with topics inspired by and commonly applied to problems in these associated fields. Though often paired with a second major in a related area, these programs function well alone and are suited to any mathematics student with a variety of interests. Students interested in a named option program are recommended to meet with an advisor to navigate the various plans and courses available to them. Advising information can be found on the BA or BS pages (http://guide.wisc.edu/undergraduate/letters-science/mathematics/mathematics-ba/#advisingandcareerstext).

The named options do not support honors in the major.

REQUIREMENTS

The Mathematics for the Physical and Biological Sciences program requires 10 distinct courses for at least 30 credits as described below. While a single courses may be used to fulfill more than one requirement, it will only contribute once to the total course count. Finally, only one course from each of the following groupings may be used to fulfill course and credit requirements: 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]		
Linear Algebra		*3-5*
MATH 320	Linear Algebra and Differential Equations	
or MATH 340	Elementary Matrix and Linear Algebra	
or MATH 341	Linear Algebra	
or MATH 375	Topics in Multi-Variable Calculus and Linear Algebra	
Differential Equations		*0-5*
MATH 319	Techniques in Ordinary Differential Equations	
or MATH 320	Linear Algebra and Differential Equations	
or MATH 376	Topics in Multi-Variable Calculus and Differential Equations	
Intermediate Mathematics Requirement (complete at one)		*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	
Advanced Mathematics Requirement (complete one)		*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	
MATH Elective to reach six courses and 18 credits		*3-9*
At least one from: [1]		
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/ I SY 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 619	Analysis of Partial Differential Equations	
MATH 623	Complex Analysis	
MATH 627	Introduction to Fourier Analysis	
MATH 629	Introduction to Measure and Integration	
MATH/I SY E/ OTM/STAT 632	Introduction to Stochastic Processes	
MATH 635	An Introduction to Brownian Motion and Stochastic Calculus	

Remaining courses/credits may be from:

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
MATH 421	The Theory of Single Variable Calculus
MATH/COMP SCI/ I SY E 425	Introduction to Combinatorial Optimization
MATH/STAT 431	Introduction to the Theory of Probability
or MATH/ STAT 309	Introduction to Probability and Mathematical Statistics I
MATH 443	Applied Linear Algebra
MATH/COMP SCI/ STAT 475	Introduction to Combinatorics

Natural/Biological Sciences Requirement (Four courses distinct from the above for at least 12 credits) [1] **12-16**

PHYSICS 247	A Modern Introduction to Physics
or PHYSICS 207	General Physics
or PHYSICS 201	General Physics
or E M A 201	Statics
PHYSICS 248	A Modern Introduction to Physics
or PHYSICS 208	General Physics
or PHYSICS 202	General Physics

Two additional courses from the following: [2]

ASTRON 310	Stellar Astrophysics
ASTRON 320	The Interstellar Medium
ATM OCN 310	Dynamics of the Atmosphere and Ocean I
ATM OCN 311	Dynamics of the Atmosphere and Ocean II
ATM OCN/ GEOG 323	Science of Climate Change
ATM OCN 330	Physics of the Atmosphere and Ocean I
ATM OCN 340	Physics of the Atmosphere and Ocean II
BIOCORE 383	Cellular Biology
CHEM 561	Physical Chemistry
or CHEM 565	Biophysical Chemistry
CHEM 562	Physical Chemistry
COMP SCI 300	Programming II
COMP SCI 310	Problem Solving Using Computers
COMP SCI 320	Data Programming II
COMP SCI 400	Programming III
COMP SCI/I SY E/ MATH 425	Introduction to Combinatorial Optimization
COMP SCI/MATH/ STAT 475	Introduction to Combinatorics
COMP SCI/ MATH 513	Numerical Linear Algebra
COMP SCI/ MATH 514	Numerical Analysis
COMP SCI/I SY E/ MATH/STAT 525	Linear Optimization
GEOSCI/G L E 350	Introduction to Geophysics: The Dynamic Earth
GEOSCI/ CIV ENGR/ ENVIR ST/ G L E 444	Practical Applications of GPS Surveying
GEOSCI/G L E 537	Quantitative Methods for Geoscience
GEOSCI/G L E 594	Introduction to Applied Geophysics
GEOSCI/G L E 627	Hydrogeology
PHYSICS 249	A Modern Introduction to Physics
or PHYSICS 241	Introduction to Modern Physics
or PHYSICS 205	Modern Physics for Engineers
PHYSICS 311	Mechanics
PHYSICS 321	Electric Circuits and Electronics
PHYSICS 322	Electromagnetic Fields
PHYSICS 323	Electromagnetic Fields
PHYSICS 325	Optics
PHYSICS/ ENVIR ST 472	Scientific Background to Global Environmental Problems
PHYSICS/B M E/ H ONCOL/ MED PHYS 501	Radiation Physics and Dosimetry
PHYSICS/E C E/ N E 525	Introduction to Plasmas
PHYSICS 551	Solid State Physics
PHYSICS/ MED PHYS 563	Radionuclides in Medicine and Biology
PHYSICS 623	Electronic Aids to Measurement
PHYSICS 625	Applied Optics
STAT/MATH 310	Introduction to Probability and Mathematical Statistics II
or STAT 312	Introduction to Theory and Methods of Mathematical Statistics II
STAT 333	Applied Regression Analysis
STAT 349	Introduction to Time Series
STAT 351	Introductory Nonparametric Statistics
STAT 411	An Introduction to Sample Survey Theory and Methods
STAT 421	Applied Categorical Data Analysis
STAT/M E 424	Statistical Experimental Design
STAT/MATH 431	Introduction to the Theory of Probability
or STAT/ MATH 309	Introduction to Probability and Mathematical Statistics I
or STAT 311	Introduction to Theory and Methods of Mathematical Statistics I
STAT 456	Applied Multivariate Analysis
STAT 461	Financial Statistics

STAT/ COMP SCI 471	Introduction to Computational Statistics
STAT/COMP SCI/ MATH 475	Introduction to Combinatorics
STAT/COMP SCI/ I SY E/MATH 525	Linear Optimization
STAT/I SY E/ MATH/OTM 632	Introduction to Stochastic Processes
BIOCHEM 570	Computational Modeling of Biological Systems
BIOCHEM/B M I/ BMOLCHEM/ MATH 606	Mathematical Methods for Structural Biology
BIOCHEM/B M I/ BMOLCHEM/ MATH 609	Mathematical Methods for Systems Biology
BIOCHEM/ BOTANY 621	Plant Biochemistry
BIOCHEM 624	Mechanisms of Enzyme Action
BIOCHEM/ PHMCOL-M/ ZOOLOGY 630	Cellular Signal Transduction Mechanisms
BSE 249	Engineering Principles for Biological Systems
BSE 349	Quantitative Techniques for Biological Systems
BSE 351	Structural Design for Agricultural Facilities
BSE 364	Engineering Properties of Food and Biological Materials
BSE 365	Measurements and Instrumentation for Biological Systems
BSE/FOOD SCI/ M E 441	Rheology of Foods and Biomaterials
BSE/M E 475	Engineering Principles of Agricultural Machinery
B M E 310	Bioinstrumentation
B M E 315	Biomechanics
B M E/CBE 320	Introductory Transport Phenomena
B M E 325	Applied Statistics for Biomedical Engineers
B M E/CBE 330	Engineering Principles of Molecules, Cells, and Tissues
B M E/H ONCOL/ MED PHYS/ PHYSICS 501	Radiation Physics and Dosimetry
B M E/M E 505	Biofluidics
B M E/CBE 520	Stem Cell Bioengineering
B M E/ MED PHYS 530	Medical Imaging Systems
B M E/ MED PHYS 535	Introduction to Energy-Tissue Interactions
B M E 556	Systems Biology: Mammalian Signaling Networks
B M E/CBE 560	Biochemical Engineering
B M E/ MED PHYS 566	Physics of Radiotherapy
B M E/ MED PHYS 567	The Physics of Diagnostic Radiology
B M E/ MED PHYS 573	Medical Image Science: Mathematical and Conceptual Foundations
B M E/M E 615	Tissue Mechanics
CBE 255	Introduction to Chemical Process Modeling
CBE 310	Chemical Process Thermodynamics
CBE/B M E 320	Introductory Transport Phenomena
CBE 326	Momentum and Heat Transfer Operations
CBE/B M E 330	Engineering Principles of Molecules, Cells, and Tissues
CIV ENGR 310	Fluid Mechanics
CIV ENGR 311	Hydroscience
CIV ENGR 322	Environmental Engineering Processes
CIV ENGR 340	Structural Analysis I
CIV ENGR 370	Transportation Engineering
CIV ENGR/I SY E/ N E 460	Uncertainty Analysis for Engineers
E C E 220	Electrodynamics I
E C E 230	Circuit Analysis
E C E/ PHYSICS 235	Introduction to Solid State Electronics
E C E 320	Electrodynamics II
E C E 330	Signals and Systems
E C E/COMP SCI/ MATH 435	Introduction to Cryptography
E C E/MATH 641	Introduction to Error-Correcting Codes
E M A 202	Dynamics
or M E 240	Dynamics
E M A 303	Mechanics of Materials
or M E 306	Mechanics of Materials
E M A 405	Practicum in Finite Elements
E M A/E P 471	Intermediate Problem Solving for Engineers
E M A/E P 547	Engineering Analysis I
E M A/E P 548	Engineering Analysis II
E M A/ ASTRON 550	Astrodynamics
I SY E 320	Simulation and Probabilistic Modeling
I SY E 323	Operations Research-Deterministic Modeling
I SY E/CIV ENGR/ N E 460	Uncertainty Analysis for Engineers
I SY E 516	Introduction to Decision Analysis
I SY E/COMP SCI/ E C E 524	Introduction to Optimization

I SY E/COMP SCI/ MATH/STAT 525	Linear Optimization
I SY E/ COMP SCI 526	Advanced Linear Programming
M S & E 330	Thermodynamics of Materials
M S & E 331	Transport Phenomena in Materials
M S & E 332	Macroprocessing of Materials
M S & E 434	Introduction to Thin-Film Deposition Processes
M S & E 460	Introduction to Computational Materials Science and Engineering
M E 331	Computer-Aided Engineering
M E 340	Dynamic Systems
M E 346	Introduction to Feedback Control for Mechanical Engineers
M E 361	Thermodynamics
M E/STAT 424	Statistical Experimental 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/ B M E/H ONCOL/ PHYSICS 501	Radiation Physics and Dosimetry
MED PHYS/ B M E 530	Medical Imaging Systems
MED PHYS/ B M E 535	Introduction to Energy-Tissue Interactions
MED PHYS/ PHYSICS 563	Radionuclides in Medicine and Biology
MED PHYS/ B M E 567	The Physics of Diagnostic Radiology
MED PHYS/ N E 569	Health Physics and Biological Effects
Total Credits	30

RESIDENCY 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.

FOUR-YEAR PLAN

SAMPLE FOUR-YEAR PLAN

This Sample Four-Year Plan is a tool to assist students and their advisor(s). Students should use it—along with their DARS report, the Degree Planner, and Course Search & Enroll tools—to make their own four-year plan based on their placement scores, credit for transferred courses and approved examinations, and individual interests. As students become involved in athletics, honors, research, student organizations, study abroad, volunteer experiences, and/or work, they might adjust the order of their courses to accommodate these experiences. Students will likely revise their own four-year plan several times during college.

In general, your four year plan in mathematics should be organized along the following sequence: 1) Calculus, 2) Linear Algebra, 3) Required Intermediate level course, 4) Additional intermediate level courses as needed, 5) Required advanced level course, 6) Additional advanced level courses.

Freshman

Fall	Credits	Spring	Credits
MATH 221	5	MATH 222	4
Literature Breadth	3	Literature Breadth	3
Communication A	3	Ethnic Studies	3
Foreign Language if required	4	Foreign Language (if required)	4
	15		14

Sophomore

Fall	Credits	Spring	Credits
MATH 234[1]	4	MATH 321	3
MATH 320	3	Humanities Breadth	3
Humanities Breadth	3	Elective	6
Communication B	3		
Elective	3		
	16		12

Junior

Fall	Credits	Spring	Credits
MATH 322	3	Intermediate MATH elective	3
PHYSICS 247, 207, 201, or E M A 201	5	PHYSICS 248, 208, or 202	5
Social Sciences Breadth	3	Social Science Breadth	3
Biological Sciences Breadth	3	Biological Sciences Breadth	3
Elective	3	Elective	3
	17		17

Senior

Fall	Credits	Spring	Credits
Required Advanced MATH	3	Advanced MATH	3
Natural/Biological requirement elective	3	Natural/Biological requirement elective	3

Social Science Breadth	3	Social Science Breadth	3
Elective	6	Elective	5
	15		14

Total Credits 120

FOOTNOTES

[1] Students should declare their major upon the successful completion of this course