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# MATHEMATICS: MATHEMATICS FOR PROGRAMMING AND COMPUTING

# REQUIREMENTS

The Mathematics for Programming and Computing 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, 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 C	redits
Core Math Requirement (minimum of six distinct MATH courses for at least 18 credits)		
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	
Intermediate Mathem one)	atics Requirement (complete at least	0-6
MATH 321 & MATH 322	Applied Mathematical Analysis and Applied Mathematical Analysis	
MATH 341	Linear Algebra	
MATH 375	Topics in Multi-Variable Calculus and Linear Algebra	
MATH 421	The Theory of Single Variable Calculus	
MATH 467	Introduction to Number Theory	
Advanced Mathematics Requirement (complete one) 3		
MATH/ COMP SCI 514	Numerical Analysis	
MATH 521	Analysis I	
MATH 531	Probability Theory	
MATH 535	Mathematical Methods in Data Science	
MATH 540	Linear Algebra II	
MATH 541	Modern Algebra	
MATH/ PHILOS 571	Mathematical Logic	
MATH Elective to read at least 18 credits	ch required minimum of six courses for	6-12

MATH/ Numerical Linear Algebra COMP SCI 513 MATH/ Numerical Analysis COMP SCI 514 MATH 521 Analysis I Analysis II MATH 522 Linear Optimization MATH/ COMP SCI/I SY E/ STAT 525 MATH 531 **Probability Theory** Mathematical Methods in Data MATH 535 Science **MATH 540** Linear Algebra II MATH 541 Modern Algebra **MATH 542** Modern Algebra MATH 567 Modern Number Theory MATH 570 Fundamentals of Set Theory MATH/ Mathematical Logic PHILOS 571 **MATH 605** Stochastic Methods for Biology MATH 619 Analysis of Partial Differential Equations **MATH 627** Introduction to Fourier Analysis Introduction to Measure and MATH 629 Integration MATH/I SY E/ Introduction to Stochastic OTM/STAT 632 Processes MATH 635 An Introduction to Brownian Motion and Stochastic Calculus Select remaining courses from: MATH/STAT 310 Introduction to Probability and Mathematical Statistics II **MATH 319** Techniques in Ordinary Differential Equations or MATH 376 Topics in Multi-Variable Calculus and Differential Equations MATH 321 **Applied Mathematical Analysis** Applied Mathematical Analysis **MATH 322** MATH 415 Applied Dynamical Systems, Chaos and Modeling **MATH 421** The Theory of Single Variable Calculus MATH/ Introduction to Combinatorial COMP SCI/ Optimization ISYE 425 MATH/STAT 431 Introduction to the Theory of Probability or MATH/ Introduction to Probability and Mathematical STAT 309 Statistics I MATH/ Introduction to Cryptography COMP SCI/ ECE 435 MATH 443 Applied Linear Algebra **MATH 467** Introduction to Number Theory

At least one course must be from:

MATH/ Introduction to Combinatorics COMP SCI/ STAT 475 **Programming and Computations Requirement** (Four Courses distinct from the above for at least 12 credits)<sup>2</sup> COMP SCI 300 Programming II 3 COMP SCI 400 Programming III 3 Elective <sup>3</sup> 6-8 COMP SCI 412 Introduction to Numerical Methods COMP SCI/I SY E/ Introduction to Combinatorial MATH 425 Optimization COMP SCI/E C E/ Introduction to Cryptography MATH 435 COMP SCI/ Introduction to Computational STAT 471 Statistics COMP SCI/ Introduction to Combinatorics MATH/STAT 475 COMP SCI/ Numerical Linear Algebra MATH 513 COMP SCI/ Numerical Analysis MATH 514 COMP SCI 520 Introduction to Theory of Computing COMP SCI/E C E/ Introduction to Optimization ISYE 524 COMP SCI/I SY E/ Linear Optimization MATH/STAT 525 COMP SCI/ Advanced Linear Programming ISYE 526 COMP SCI/E C E/ Matrix Methods in Machine Learning ME 532 COMP SCI/ Image Processing ECE 533 COMP SCI 534 **Computational Photography** COMP SCI 538 Introduction to the Theory and Design of Programming Languages COMP SCI/E C E/ Introduction to Artificial Neural ME 539 Networks COMP SCI 540 Introduction to Artificial Intelligence COMP SCI 545 Natural Language and Computing COMP SCI/I SY E/ Introduction to Computational ME 558 Geometry COMP SCI 559 **Computer Graphics** COMP SCI/ Medical Image Analysis BMI 567 COMP SCI/ Introduction to Bioinformatics BMI 576 COMP SCI 577 Introduction to Algorithms COMP SCI/ Tools and Environments for ISYE 635 Optimization COMP SCI 642 Introduction to Information Security **Total Credits** 30

# RESIDENCE AND QUALITY OF WORK

• 2.000 GPA on all MATH courses and courses eligible for the major.<sup>4</sup>

- 2.000 GPA on at least 15 credits of upper level credit in the major.<sup>5</sup>
- 15 credits in MATH in the major taken on the UW-Madison campus.<sup>6</sup>

# FOOTNOTES

#### 1

This course must be distinct from the advanced mathematics requirement. **2** 

Courses below may have prerequisites outside of the requirements for this named option.

## 3

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

### 4

This includes any course with a MATH prefix (including those cross-listed with MATH) regardless of major program as well as only those non-MATH course explicitly listed in the tables above.

## 5

This includes any course with a MATH prefix (including those cross-listed with MATH) numbered 307 and above as well as only those non-MATH courses which appear in the tables above and carry the advanced LAS designation.

### 6

This includes only those courses with a MATH prefix (or crosslisted with MATH).