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MATHEMATICS: MATHEMATICS FOR PROGRAMMING AND COMPUTING

REQUIREMENTS

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).

| Core Math Requirement (minimum of six distinct MATH courses for at least 18 credits)Linear Algebra3-5MATH 341Linear Algebraor MATH 320Linear Algebra and Differential Equations or MATH 340or MATH 340Elementary Matrix and Linear Algebra or MATH 375Topics in Multi-Variable Calculus and Linear Algebra0-6one)MATH 321MATH 321Applied Mathematical Analysis & MATH 3220-6MATH 322and Applied Mathematical Analysis & MATH 3220-6MATH 321Applied Mathematical Analysis Linear Algebra0-6MATH 321Applied Mathematical Analysis & MATH 3250-6MATH 375Topics in Multi-Variable Calculus and Linear Algebra0-6MATH 375Topics in Multi-Variable Calculus and Linear Algebra0-6MATH 421The Theory of Single Variable Calculus0-6MATH 421Introduction to Number Theory3MATH 427Introduction to Number Theory3MATH 521Analysis I0-6MATH 521Analysis I0-6MATH 521Analysis I0-6MATH 535Mathematical Methods in Data Science0-6MATH 540Linear Algebra II0-6MATH 541Modern Algebra0-12MATH 541Modern Algebra0-12MATH 541Modern Algebra II0-12MATH 541Modern Algebra II0-12MATH 541Modern Algebra II0-12MATH 541Modern Algebra II0-12 | Code | Title | Credits |
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| one) MATH 321 Applied Mathematical Analysis & MATH 322 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/ Numerical Analysis COMP SCI 514 MATH 521 Analysis I MATH 531 Probability Theory MATH 535 Mathematical Methods in Data Science MATH 540 Linear Algebra II MATH 541 Modern Algebra II MATH 541 Mothematical Logic PHILOS 571 MATH Elective to reach required minimum of six courses for 6-12 | or MATH 375 | | |
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| Science MATH 540 Linear Algebra II MATH 541 Modern Algebra MATH/ Mathematical Logic PHILOS 571 MATH required minimum of six courses for 6-12 | MATH 531 | Probability Theory | |
| MATH 541 Modern Algebra MATH/ Mathematical Logic PHILOS 571 MATH Elective to reach required minimum of six courses for | MATH 535 | | |
| MATH/Mathematical LogicPHILOS 571MATH Elective to reach required minimum of six courses for6-12 | MATH 540 | Linear Algebra II | |
| PHILOS 571 MATH Elective to reach required minimum of six courses for 6-12 | MATH 541 | Modern Algebra | |
| | / | Mathematical Logic | |
| at least 18 credits | MATH Elective to rea at least 18 credits | ch required minimum of six courses for | 6-12 |

| MATH/ COMP SCI 513 | Numerical Linear Algebra |
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| MATH/ COMP SCI 514 | Numerical Analysis |
| 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 567 | Modern Number Theory |
| MATH 570 | Fundamentals of Set Theory |
| MATH/ PHILOS 571 | Mathematical Logic |
| MATH 605 | |
| MATH 616 | Data-Driven Dynamical Systems, Stochastic Modeling and Prediction |
| MATH 619 | Analysis of Partial Differential Equations |
| MATH 627 | Introduction to Fourier Analysis |
| MATH 629 | Introduction to Measure and Integration |
| | |
| MATH/I SY E/ OTM/STAT 632 | Introduction to Stochastic Processes |
| | |
| OTM/STAT 632 | Processes An Introduction to Brownian Motion and Stochastic Calculus |
| OTM/STAT 632 MATH 635 | Processes An Introduction to Brownian Motion and Stochastic Calculus burses from: |
| OTM/STAT 632 MATH 635 Select remaining co | Processes An Introduction to Brownian Motion and Stochastic Calculus ourses from: Introduction to Probability and |
| OTM/STAT 632 MATH 635 Select remaining cc MATH/STAT 310 | Processes An Introduction to Brownian Motion and Stochastic Calculus burses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential |
| OTM/STAT 632 MATH 635 Select remaining co MATH/STAT 310 MATH 319 | Processes An Introduction to Brownian Motion and Stochastic Calculus ourses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential Equations Topics in Multi-Variable Calculus and Differential |
| OTM/STAT 632 MATH 635 Select remaining co MATH/STAT 310 MATH 319 or MATH 376 | Processes An Introduction to Brownian Motion and Stochastic Calculus ourses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential Equations Topics in Multi-Variable Calculus and Differential Equations |
| OTM/STAT 632 MATH 635 Select remaining co MATH/STAT 310 MATH 319 or MATH 376 MATH 321 | Processes An Introduction to Brownian Motion and Stochastic Calculus aurses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential Equations Topics in Multi-Variable Calculus and Differential Equations Applied Mathematical Analysis |
| OTM/STAT 632 MATH 635 Select remaining co MATH/STAT 310 MATH 319 or MATH 376 MATH 321 MATH 322 | Processes An Introduction to Brownian Motion and Stochastic Calculus Durses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential Equations Topics in Multi-Variable Calculus and Differential Equations Applied Mathematical Analysis Applied Mathematical Analysis Applied Dynamical Systems, Chaos |
| OTM/STAT 632 MATH 635 Select remaining co MATH/STAT 310 MATH 319 or MATH 376 MATH 321 MATH 322 MATH 415 | Processes An Introduction to Brownian Motion and Stochastic Calculus Durses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential Equations Topics in Multi-Variable Calculus and Differential Equations Applied Mathematical Analysis Applied Mathematical Analysis Applied Dynamical Systems, Chaos and Modeling The Theory of Single Variable |
| OTM/STAT 632 MATH 635 Select remaining co MATH/STAT 310 MATH 319 or MATH 376 MATH 321 MATH 322 MATH 415 MATH 421 MATH/ COMP SCI/ | Processes An Introduction to Brownian Motion and Stochastic Calculus Durses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential Equations Topics in Multi-Variable Calculus and Differential Equations Applied Mathematical Analysis Applied Mathematical Analysis Applied Dynamical Systems, Chaos and Modeling The Theory of Single Variable Calculus Introduction to Combinatorial |
| OTM/STAT 632 MATH 635 Select remaining co MATH/STAT 310 MATH 319 or MATH 376 MATH 321 MATH 322 MATH 415 MATH 421 MATH/ COMP SCI/ I SY E 425 | Processes An Introduction to Brownian Motion and Stochastic Calculus Durses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential Equations Topics in Multi-Variable Calculus and Differential Equations Applied Mathematical Analysis Applied Mathematical Analysis Applied Dynamical Systems, Chaos and Modeling The Theory of Single Variable Calculus Introduction to Combinatorial Optimization |
| OTM/STAT 632 MATH 635 Select remaining co MATH/STAT 310 MATH 319 or MATH 376 MATH 321 MATH 322 MATH 415 MATH 415 MATH 421 MATH/ COMP SCI/ I SY E 425 MATH/STAT 431 or MATH/ | Processes An Introduction to Brownian Motion and Stochastic Calculus Durses from: Introduction to Probability and Mathematical Statistics II Techniques in Ordinary Differential Equations Topics in Multi-Variable Calculus and Differential Equations Applied Mathematical Analysis Applied Mathematical Analysis Applied Dynamical Systems, Chaos and Modeling The Theory of Single Variable Calculus Introduction to Combinatorial Optimization |
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At least one course must be from: ¹

| MATH 467 Introduction to Number Theory MATH/ COMP SCI/ STAT 475 Introduction to Combinatorics Programming and Computations Requirement (Four Courses distinct from the above for at least 12 credits) ³ 3 COMP SCI 300 Programming II 3 COMP SCI 400 Programming III 3 Elective ³ 6-8 COMP SCI 412 Introduction to Numerical Methods COMP SCI 412 Introduction to Combinatorial MATH 425 Optimization COMP SCI/ ISY E/ Introduction to Computational STAT 471 Statistics COMP SCI/ Introduction to Computational STAT 471 Statistics COMP SCI/ Introduction to Computational STAT 475 COMP SCI/ Introduction to Computational STAT 475 COMP SCI/ Introduction to Theory of Comp SCI/ Numerical Linear Algebra Statistics COMP SCI/ SE 20 Introduction to Optimization INST 525 COMP SCI/ SE 2/ Introduction to Optimization INST 524 Comp SCI/ SE 2/ Introduction to Optimization INST 525 COMP SCI/ SE 2/ Introduction to Computational INST 525 COMP SCI/ SE 2/ Introduction to Computational INST 525 COMP SCI 534 | MATH 444 | Graphs and Networks in Data Science | | | | |
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| COMP SCI/ STAT 475Programming and Computations Requirement (Four Courses distinct from the above for at least 12 credits) 2COMP SCI 300Programming II3COMP SCI 400Programming III3Elective 36-8COMP SCI 412Introduction to Numerical MethodsCOMP SCI 512Introduction to Combinatorial MATH 4256COMP SCI/ SV E/ Introduction to Computational STAT 4715COMP SCI/Introduction to Computational STAT 4715COMP SCI/Introduction to Computational STAT 4755COMP SCI/Introduction to Computational STAT 4755COMP SCI/Numerical Linear Algebra MATH 5136COMP SCI/Numerical Analysis MATH 5136COMP SCI/Numerical Analysis Computing6COMP SCI/Numerical Analysis6MATH 513COMP SCI/ Computing6COMP SCI/Numerical Analysis6MATH 513COMP SCI/ Computing6COMP SCI/ E C E/ Introduction to Optimization I SY E 5246COMP SCI/ E C E/ Introduction to Optimization MATH/STAT 5256COMP SCI/Mage Processing E C E 5336COMP SCI/ E C E/ | MATH 467 | Introduction to Number Theory | | | | |
| (Four Courses distinct from the above for at least 12 credity 2 3 COMP SCI 300 Programming II 3 COMP SCI 400 Programming III 3 Elective 3 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 Computational STAT 471 Statistics COMP SCI/ Introduction to Combinatorics MATH 435 COMP SCI/ COMP SCI/ Introduction to Combinatorics MATH/STAT 475 Numerical Linear Algebra MATH 513 COMP SCI/ COMP SCI/SCI Numerical Analysis Comp Sci 520 MATH 514 Computing COMP SCI/SCI C E/ Introduction to Theory of Computing COMP SCI/SCI C E/ Introduction to Optimization I SY E 524 COMP SCI/SCI Advanced Linear Programming I SY E 526 COMP SCI/ E C E/ Matrix Methods in Machine Learning ME 532 COMP SCI/E C E/ Introduction to Artificial Neural ME 539 ME 532 Introduction to Artificial Neural ME 539 COMP SCI/S A Computational Photography COMP SCI/S C Sign of Programming Languages COMP SCI | COMP SCI/ | Introduction to Combinatorics | | | | |
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| | | Introduction to Information Security | | | | |

RESIDENCE AND QUALITY OF WORK

- + 2.000 GPA on all MATH courses and courses eligible for the major. $^{\rm 4}$
- 2.000 GPA on at least 15 credits of upper level credit in the major.⁵
- 15 credits in MATH in the major taken on the UW-Madison campus.⁶

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 crosslisted 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).