

# MATHEMATICS, MASTER OF SCIENCE (085)

## Program Coordinator

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The M.S. in Mathematics offers three concentrations: general mathematics, computational mathematics, and mathematical economics, but has a core set of courses in applied mathematics, discrete mathematics, and statistics required for all students. The general mathematics concentration is recommended for students who wish to obtain a Ph.D. degree, to teach in a community college, or to seek employment in industry with an emphasis on conceptual foundations. The computational mathematics concentration is designed for students seeking employment in industry with an emphasis on computational mathematics and/or computer science in addition to knowledge in traditional areas. The mathematical economics concentration is designed for students seeking employment in industry with an emphasis on economics in addition to knowledge in traditional areas. It is also designed for students who completed an undergraduate degree program in mathematical economics at WKU.

## Concentration(s)

- General Mathematics (MAGN)
- Computational Mathematics (MACM)
- Mathematical Economics (MAME)

## Joint Undergraduate Master's Program (JUMP)

This degree offers a Joint Undergraduate Master's Program (JUMP) which provides academically outstanding students the opportunity to complete both an undergraduate and graduate degree in an accelerated timeframe. Contact the graduate program coordinator for additional information.

## Program Admission

### General Mathematics Concentration

- One of the following:
  - A minimum GAP score of 575 [ $\text{GAP} = (\text{GRE-V} + \text{GRE-Q}) + (\text{Undergraduate GPA} \times 100)$ ];
  - A 2.75 cumulative GPA.
- Completion of the following undergraduate courses:
  - a calculus sequence through multivariable calculus;
  - linear algebra;
  - discrete mathematics;
  - an applied mathematics course (e.g. differential equations, probability, calculus-based statistics, numerical analysis);
  - abstract algebra, analysis, advanced calculus, or topology.
- A cumulative grade point average of 3.0 (on a 4.0 scale) in at least one of the following:
  - all mathematics and statistics courses that are applicable to the undergraduate mathematics major;
  - courses specified in (b) through (e) of Item 2 above.

## Computational Mathematics Concentration

- One of the following:
  - A minimum GAP score of 575 [ $\text{GAP} = (\text{GRE-V} + \text{GRE-Q}) + (\text{Undergraduate GPA} \times 100)$ ];
  - A 2.75 cumulative GPA.
- Completion of the following undergraduate courses:
  - two-semester single-variable calculus sequence;
  - linear algebra;
  - discrete mathematics;
  - one-year sequence of programming courses;
  - B.A. degree with a major in either Computer Science, Engineering, Mathematics or Physics.
- A cumulative grade point average of at least 3.0 (on a 4.0 scale) in at least one of the following:
  - all mathematics and computer science courses that are listed in (a) through (d) of Item 2 above; or
  - all courses in the major listed in (e) of Item 2 above. Students cannot enter the program if they have a deficiency in the courses listed in Item 2 above.

## Mathematical Economics Concentration

- One of the following:
  - A minimum GAP score of 600 [ $\text{GAP} = (\text{GRE-V} + \text{GRE-Q}) + (\text{Undergraduate GPA} \times 100)$ ];
  - A 3.0 cumulative GPA.
- An undergraduate degree majoring in economics, mathematics, mathematical economics, or other related majors with completion of the following undergraduate courses:
  - a calculus sequence through multivariable calculus
  - discrete mathematics
  - principles of microeconomics and macroeconomics
  - one semester of junior- or senior-level probability theory
  - differential equations

## Graduate Studies Admission

Please refer to the admission section (<http://catalog.wku.edu/graduate/admission/>) of this catalog for Graduate Studies admission requirements.

## Program Requirements (33 hours)

### General Mathematics Concentration

Code	Title	Hours
<b>Required Courses</b>		
MATH 431G	Intermediate Analysis I <sup>1</sup>	3
MATH 531	Advanced Differential Equations <sup>1</sup>	3
or MATH 535	Advanced Applied Mathematics- I	
MATH 541	Graph Theory <sup>1</sup>	3
or MATH 542	Advanced Topics in Discrete Mathematics	
STAT 549	Statistical Methods I <sup>1</sup>	3
MATH 598	Graduate Seminar: Communicating Mathematics and Technical Writing	3
MATH 599	Thesis/Research	6
<b>Electives</b>		
Select 3 hours from the following:		3
MATH 500	Readings in Mathematics	
MATH 517	Topics from Algebra	

MATH 529	Applied Probability	
MATH 531	Advanced Differential Equations	
MATH 532	Real Analysis	
MATH 535	Advanced Applied Mathematics- I	
MATH 536	Advanced Applied Mathematics- II	
MATH 539	Topology II	
MATH 540	Stochastic Processes	
MATH 541	Graph Theory	
MATH 542	Advanced Topics in Discrete Mathematics	
MATH 550	Complex Analysis	
MATH 570	Topics in Operations Research	
MATH 590	Special Topics in Mathematics	
STAT 550	Statistical Methods II	
Select 9 additional hours from the following:		9
MATH 405G	Numerical Analysis I	
MATH 406G	Numerical Analysis II	
MATH 415G	Algebra and Number Theory	
MATH 417G	Algebraic Systems	
MATH 435G	Partial Differential Equations	
MATH 439G	Topology I	
MATH 450G	Complex Variables	
MATH 470G	Introduction to Operations Research	
MATH 500	Readings in Mathematics	
MATH 517	Topics from Algebra	
MATH 529	Applied Probability	
MATH 531	Advanced Differential Equations	
MATH 532	Real Analysis	
MATH 535	Advanced Applied Mathematics- I	
MATH 536	Advanced Applied Mathematics- II	
MATH 539	Topology II	
MATH 540	Stochastic Processes	
MATH 541	Graph Theory	
MATH 542	Advanced Topics in Discrete Mathematics	
MATH 550	Complex Analysis	
MATH 570	Topics in Operations Research	
MATH 590	Special Topics in Mathematics <sup>2</sup>	
STAT 550	Statistical Methods II	
<b>Total Hours</b>		<b>33</b>

## Computational Mathematics Concentration

Students in the computational mathematics concentration must have a working knowledge of a high-level programming language.

Code	Title	Hours
<b>Required Courses</b>		
MATH 405G	Numerical Analysis I <sup>1</sup>	3
MATH 406G	Numerical Analysis II <sup>1</sup>	3
MATH 531	Advanced Differential Equations <sup>1</sup>	3
or MATH 535	Advanced Applied Mathematics- I	
MATH 541	Graph Theory <sup>1</sup>	3

or MATH 542	Advanced Topics in Discrete Mathematics	
STAT 549	Statistical Methods I <sup>1</sup>	3
MATH 598	Graduate Seminar: Communicating Mathematics and Technical Writing	3
MATH 599	Thesis/Research	6
<b>Electives</b>		
Select 6 hours from the following: <sup>1</sup>		6
CS 549	Analysis of Algorithms	
CS 555	Data Science	
CS 562	Parallel and Distributed Computing	
CS 565	Data Mining Techniques and Tools	
Select 3 additional hours from the following: <sup>1</sup>		3
MATH 431G	Intermediate Analysis I	
MATH 435G	Partial Differential Equations	
MATH 470G	Introduction to Operations Research	
MATH 531	Advanced Differential Equations	
MATH 535	Advanced Applied Mathematics- I	
MATH 536	Advanced Applied Mathematics- II	
MATH 540	Stochastic Processes	
MATH 541	Graph Theory	
MATH 542	Advanced Topics in Discrete Mathematics	
MATH 570	Topics in Operations Research	
MATH 590	Special Topics in Mathematics <sup>2</sup>	
STAT 550	Statistical Methods II	
<b>Total Hours</b>		<b>33</b>

## Mathematical Economics Concentration

Code	Title	Hours
<b>Required Courses</b>		
MATH 431G	Intermediate Analysis I <sup>1</sup>	3
or MATH 482G	Probability & Statistics II	
MATH 531	Advanced Differential Equations <sup>1</sup>	3
or MATH 535	Advanced Applied Mathematics- I	
MATH 541	Graph Theory <sup>1</sup>	3
or MATH 542	Advanced Topics in Discrete Mathematics	
STAT 549	Statistical Methods I <sup>1</sup>	3
ECON 465G	Regression and Econometric Analysis <sup>1</sup>	3
ECON 502	Applied Micro Economic Theory <sup>1</sup>	3
MATH 598	Graduate Seminar: Communicating Mathematics and Technical Writing	3
MATH 599	Thesis/Research	6
<b>Electives</b>		
Select 6 hours from the following: <sup>1</sup>		6
MATH 405G	Numerical Analysis I	
MATH 406G	Numerical Analysis II	
MATH 431G	Intermediate Analysis I	
MATH 435G	Partial Differential Equations	
MATH 470G	Introduction to Operations Research	
MATH 482G	Probability & Statistics II	

MATH 529	Applied Probability
MATH 531	Advanced Differential Equations
MATH 532	Real Analysis
MATH 535	Advanced Applied Mathematics- I
MATH 536	Advanced Applied Mathematics- II
MATH 540	Stochastic Processes
MATH 541	Graph Theory
MATH 542	Advanced Topics in Discrete Mathematics
MATH 570	Topics in Operations Research
MATH 590	Special Topics in Mathematics <sup>2</sup>
STAT 550	Statistical Methods II

**Total Hours** **33**

<sup>1</sup> If classes with similar course content were taken at the undergraduate level, then the student must substitute appropriate graduate courses selected in consultation with a Mathematics Department graduate advisor.

<sup>2</sup> With advisor approval.

### **Joint Undergraduate Master's Program (JUMP) in Mathematics**

The Department of Mathematics offers a Joint Undergraduate Master's Program (JUMP) which provides academically outstanding students the opportunity to complete both an undergraduate Bachelor of Arts degree and a graduate Master of Science degree in an accelerated timeframe. The MS in Mathematics prepares students to be competitive applicants for admission into a Ph.D. program and/or for positions where strong research skills are needed. Contact the graduate program coordinator for additional information, see <https://catalog.wku.edu/graduate/science-engineering/mathematics/mathematics-ms/>

This JUMP program allows students to start working toward their MS in Mathematics with a concentration in General Mathematics, Computational Mathematics, or Mathematical Economics (Ref: 085) while completing their Bachelor of Arts degree in Mathematics (Ref: 528 and 728) or a Bachelor of Science degree in Mathematical Economics (Ref: 731). Undergraduate students admitted into JUMP may take graduate courses that count toward both undergraduate and graduate degrees. Up to 12 credit hours can be double-counted toward both degrees, and up to 15 hours of graduate courses can be taken while a student is completing the undergraduate degree. The key benefit of the JUMP program is that it allows students to earn a bachelor's and a master's degree in an accelerated timeframe. For more information, see <https://www.wku.edu/math/>.

To be considered for admission to the JUMP program to earn a BA in Mathematics (or a BS in Mathematical Economics) and a MS in Mathematics in an accelerated timeframe, a student must meet the following requirements:

Be a Mathematics or a Mathematical Economics major (includes programs with reference numbers 528, 728, and 731);

Have completed at least 60 hours total, with at least 24 hours earned at WKU;

Have at least 15 or more credit hours remaining to complete the bachelor's degree;

Have completed or be enrolled in 15 credit hours in Mathematics;

Have a minimum cumulative undergraduate GPA of 3.25;

Have one of the following:

3.25 GPA in the Mathematics or Mathematical Economics major AND a grade of B or higher in at least one of the courses: MATH 307, MATH 310, MATH 317, MATH 337, MATH 439;

3.0 GPA in the Mathematics or Mathematical Economics major AND a grade of B or higher in at least two of the courses: MATH 307, MATH 310, MATH 317, MATH 337, MATH 439.