Program Change Request

Date Submitted: 11/30/21 11:10 am

Viewing: SC-BS-MATH : Mathematics, BS

Last approved: 02/02/21 10:10 am

Last edit: 01/19/22 3:57 pm

Changes proposed by: jbazaz

Catalog Pages Using this Program <u>Mathematics, BS</u>

No Longer Accepting Students Anticipated closure date (i.e., calendar date students are Rationale for

2022-2023

Are you completing this form on someone else's behalf?

Yes

Requestor:

- 1. MATH Chair
- 2. SC Curriculum Committee
- 3. SC Associate Dean
- 4. SC CAT Editor
- 5. Assoc Provost-Undergraduate
- 6. Registrar-Programs

Approval Path

 12/01/21 3:17 pm Maria Emelianenko (memelian): Approved for MATH Chair

History

- 1. Nov 21, 2017 by clmig-jwehrheim
- 2. Nov 21, 2017 by clmig-jwehrheim
- 3. Jan 17, 2018 by rzachari
- 4. Feb 7, 2018 by rzachari
- 5. Mar 1, 2018 by Jennifer Bazaz Gettys (jbazaz)
- Feb 8, 2019 by Jennifer Bazaz Gettys (jbazaz)
- 7. Mar 27, 2019 by Tory Sarro (vsarro)
- 8. Jan 16, 2020 by Jennifer Bazaz

Gettys (jbazaz) 9. Mar 24, 2020 by Jennifer Bazaz Gettys (jbazaz) 10. Feb 2, 2021 by Johanna Riemen (jriemen)

		Name		Extension		Email
	Cather	rine Sausville		9688	csa	ausvil
E	ffective	Catalog:	2022-2023			
P	rogram	Level:	Undergraduate	e		
Ρ	rogram	Туре:	Bachelor's			
D	egree T	Гуре:	Bachelor of Sci	ience		
Ti	itle:		Mathematics,	BS		
B	anner T	Title:	Mathematics,	BS		
ls a	this a in existi	retitling of ng				
E	xisting I	Program				
R O St	egistrar only – So tatus	r/OAPI Use CHEV	Approved			
R U P	egistrar se Only rogram	r's Office / – Start Term				
R O Lo	egistrar only – So etter	r/OAPI Use CHEV				
R O Si	Registrar/OAPI Use Only – SACSCOC Status					
С	oncenti	ration(s):				
			Associated C	Concentrations	Regist	rar's Office Use Only: Concentration
1		Actuarial Ma	thematics		ACTM	
2		Applied Matl	hematics		AMT	
3		Mathematica	al Statistics		MTHS	

INTO Maior(s).

Registrar/IRR Use Only – Concentration CIP Code	
College/School:	College of Science
Department / Academic Unit:	Mathematical Sciences
Jointly Owned Program?	No
Participating	
Participating	

Justification

What: Expanding course options to include CDS 230, 301, CS 211, 310, 330, and 483 in each concentration's second year science requirement (not including the actuarial concentration).

Why: We would like to give our students the option to take computational sciences courses for their second year science requirement. Students would be required to take traditional lab science courses for their first year science requirement and would still have the option to take lab sciences for the second year. This would give more flexibility to students who want advanced knowledge in computational sciences while still satisfying degree requirements. This is important in the field of Mathematics as so many of our graduates will be going into industry and will be expected to have these skills.

What: Adding GEOL 104 and GEOL 103.

Why: We would like to update the wording in the catalog to reflect the decoupling of these lecture/lab courses.

What: Offering course range suggestions for the second year science requirements. Why: Offering students clearer guidance on acceptable courses.

What: Removing MATH 414, adding MATH 313 and adding the option of MATH 314, 414, 478 to the Applied Concentration

Why: We would like to have an updated focus in the courses for the applied concentration while allowing students some flexibility in the content that they learn. The addition of Math 313: Intro to Applied Analysis as a required course will give students a broader look at applied mathematics that was previously just an elective course. Moving Math 414: Modern Applied Math II into the "pick two" choice will allow students to continue with the 413/414 sequence if they choose or allow them to explore other topics from Math 314 and Math 478.

What: Creating a Data Science Concentration.

Why: In order to meet the demands of both our students and the ever-changing industry landscape, we are looking to create a Data Science concentration within the Mathematics BS.

We have notified and received approval from the Computational Data Sciences department,

the Computer Sciences department, and the Statistics department.

Catalog Published Information

Total CreditsTotal credits: minimum 120Required:

Registrar's Office Use Only - Program Code:

SC-BS-MATH

Registrar/IRR Use Only – Program CIP Code

Admission Requirements:

Admissions

University-wide admissions policies can be found in the <u>Undergraduate Admissions Policies</u> section of this catalog. To apply for this program, please complete the <u>George Mason University Admissions Application</u>.

Program-Specific Policies:

Policies

Students must fulfill all <u>Requirements for Bachelor's Degrees</u>, including the <u>Mason Core</u>. <u>MATH 300</u> Introduction to Advanced Mathematics meets the writing intensive requirement for this major. For policies governing all undergraduate programs, see <u>AP.5 Undergraduate Policies</u>. Graduating seniors are required to have an exit interview.

Language Proficiency Recommendation

The department recommends proficiency in French, German, or Russian.

Course Recommendations and Policies

A maximum of 6 credits of grades below 2.00 in coursework designated MATH or STAT may be applied toward the major.

Students intending to enter graduate school in mathematics are strongly advised to take <u>MATH 315</u> Advanced Calculus I and <u>MATH 321</u> Abstract Algebra.

Students may not receive credit for both <u>MATH 214</u> Elementary Differential Equations and <u>MATH 216</u> Theory of Differential Equations; both <u>MATH 213</u> Analytic Geometry and Calculus III and <u>MATH 215</u> Analytic Geometry and Calculus III (Honors); both <u>MATH 351</u> Probability and <u>STAT 344</u> Probability and Statistics for Engineers and Scientists I; and both <u>MATH 352</u> Statistics and <u>STAT 354</u> Probability and Statistics for Engineers and Scientists II.

After receiving a grade of 'C' or better in one of the courses listed below on the left, students may not receive credit for the corresponding course on the right:

1/19/22, 4:01 PM	SC-BS-MATH: Mathematics, BS
Course	May Not Receive Credit for
<u>MATH 113</u> or <u>MATH 123</u>	<u>MATH 105</u> or <u>MATH 108</u>
<u>MATH 351</u> or <u>STAT 344</u>	<u>MATH 110</u>
<u>MATH 441</u>	<u>MATH 111</u>
MATH 125	<u>MATH 112</u>

Degree Requirements:

Students should refer to the <u>Admissions & Policies</u> tab for specific policies related to this program. In addition to the mathematics core, science, and computational skills requirements, students may select an optional concentration in Actuarial Mathematics (ACTM), Applied **Mathematics (AMT)**, **Data Science (XXXX)**, <u>Mathematics (AMT)</u> or Mathematical Statistics (MTHS).

Mathematics Core

<u>MATH 113</u>	Analytic Geometry and Calculus I <u>(Mason Core)</u>	4
<u>MATH 114</u>	Analytic Geometry and Calculus II	4
<u>MATH 125</u>	Discrete Mathematics I <u>(Mason Core)</u>	3
<u>MATH 203</u>	Linear Algebra	3
<u>MATH 213</u>	Analytic Geometry and Calculus III	3
or <u>MATH 215</u>	Analytic Geometry and Calculus III (Honors)	
<u>MATH 214</u>	Elementary Differential Equations	3
or <u>MATH 216</u>	Theory of Differential Equations	
<u>MATH 300</u>	Introduction to Advanced Mathematics 1	3
<u>MATH 322</u>	Advanced Linear Algebra	3
Total Credits		26

1 Fulfills the writing intensive requirement.

Science

Select a one-year sequence of a laboratory science from the following courses: 8-9 **Biology Sequence:** BIOL 213 Cell Structure and Function (Mason Core) Choose one from the following: **BIOL 300** BioDiversity **BIOL 308** Foundations of Ecology and Evolution **General Genetics BIOL 311** Chemistry Sequence: CHEM 211 General Chemistry I (Mason Core) & <u>CHEM 213</u> and General Chemistry Laboratory I (Mason Core) **CHEM 212** General Chemistry II (Mason Core) & CHEM 214 and General Chemistry Laboratory II (Mason Core) **Geology Sequence: GEOL 101** Physical Geology (Mason Core) & GEOL 103 and Physical Geology Lab

<u>GEOL 102</u>	Historical Geology <u>(Mason Core)</u>	
& <u>GEOL 104</u>	and Historical Geology Laboratory <u>(Mason Core)</u>	
Physics Sequence:		
<u>PHYS 160</u>	University Physics I <u>(Mason Core)</u>	
& <u>PHYS 161</u>	and University Physics I Laboratory <u>(Mason Core)</u>	
<u>PHYS 260</u>	University Physics II <u>(Mason Core)</u>	
& <u>PHYS 261</u>	and University Physics II Laboratory <u>(Mason Core)</u>	
Total Credits		8-9

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Computational Skills

<u>CS 112</u>	Introduction to Computer Programming	4
Total Credits		4

BS without Concentration

In addition to the mathematics core, science, and computational skills requirements listed above, students who are not choosing a concentration must complete the following coursework: **Traditional Mathematics** Advanced Calculus I 3 **MATH 315** 3 MATH 316 Advanced Calculus II MATH 321 Abstract Algebra 3 or MATH 431 Topology Select 12 additional credits of MATH courses numbered above 300 1 12 Additional Science Select additional science credits from one of the following options: 4-9 1. A second sequence from the choices under "Science" above 2. 6 credits from more advanced courses in biology, chemistry, geology, or physics 2 3. The 4-credit option of PHYS 262 and PHYS 263 4. Choose two courses from the following: **CDS 230 Modeling and Simulation I Scientific Information and Data Visualization** CDS 301 CS 211 **Object-Oriented Programming CS 310 Data Structures Formal Methods and Models CS 330** CS 483 **Analysis of Algorithms** Total Credits 25-30

1 Excluding MATH 400 History of Math (Topic Varies) (Mason Core).

2Only refers to courses acceptable for credit toward a natural science major. Consider courses from the following: BIOL 300-499, CHEM 300-499, GEOL 300-499, PHYS 300-499.

Concentration in Actuarial Mathematics (ACTM)

SC-BS-MATH: Mathematics, BS

This concentration provides exciting opportunities for students interested in studying actuarial mathematics. Expertise in this field leads directly into a career as a practicing actuary with an insurance company, consulting firm, or in government employment.

ACTM Courses

<u>MATH 351</u>	Probability	3
<u>MATH 352</u>	Statistics	3
<u>MATH 551</u>	Regression and Time Series	3
<u>MATH 554</u>	Financial Mathematics	3
<u>MATH 555</u>	Actuarial Modeling I	3
<u>MATH 557</u>	Financial Derivatives	3
<u>ACCT 203</u>	Survey of Accounting	3
<u>ECON 103</u>	Contemporary Microeconomic Principles <u>(Mason Core)</u>	3
<u>ECON 306</u>	Intermediate Microeconomics 1	3
or <u>ECON 310</u>	Money and Banking	
or <u>FNAN 321</u>	Financial Institutions	
<u>STAT 362</u>	Introduction to Computer Statistical Packages	3
Select two from the following:		6
<u>MATH 441</u>	Deterministic Operations Research	
<u>MATH 442</u>	Stochastic Operations Research	
<u>MATH 446</u>	Numerical Analysis I	
<u>MATH 453</u>	Advanced Mathematical Statistics	
Total Credits		36

1For mathematics majors, the Department of Economics has agreed to waive the <u>ECON 104</u> Contemporary Macroeconomic Principles (<u>Mason Core</u>) prerequisite.

Concentration in Applied Mathematics (AMT)

This concentration provides exciting opportunities for students interested in taking additional classes on applied mathematics. The concentration prepares numerical analysts able to deal with real world applications in science and engineering.

AN	IT Courses		
MA	<u>TH 313</u>	Introduction to Applied Analysis	3
MA	<u>TH 315</u>	Advanced Calculus I	3
MA	<u>TH 351</u>	Probability	3
MA	<u>TH 413</u>	Modern Applied Mathematics I	3
MA	<u>TH 446</u>	Numerical Analysis I	3
Sel	ect 6 credits of	MATH courses numbered above 300 1	6
<u>Sel</u>	<u>ect 3 credits of</u>	MATH courses numbered above 300 1	3
Cho	Choose two courses from the following:		
	<u>MATH 314</u>	Introduction to Applied Mathematics	
	<u>MATH 414</u>	Modern Applied Mathematics II	
	<u>MATH 478</u>	Introduction to Partial Differential Equations with Numerical Methods	

Additional Science Courses

Select additional science credits from one of the following options:

- 1. A second sequence from the choices under "Science" above
- 2. 6 credits from more advanced courses in biology, chemistry, geology, or physics 2
- 3. The 4-credit option of PHYS 262 and PHYS 263

4. Choose two courses from the following:

- CDS 230 Modeling and Simulation I
- <u>CDS 301</u> Scientific Information and Data Visualization
- CS 211 Object-Oriented Programming
- CS 310 Data Structures
- CS 330 Formal Methods and Models
- CS 483 Analysis of Algorithms

Total Credits

1 Excluding MATH 400 History of Math (Topic Varies) (Mason Core).

2Only refers to courses acceptable for credit toward a natural science major. Consider courses from the following: BIOL 300-499, CHEM 300-499, GEOL 300-499, PHYS 300-499.

Concentration in Data Science (XXXX)

The data science concentration prepares math majors for careers in industry and academia with a focus on the rapidly developing area of the mathematics of data science. Students in this program will develop analytical and computational skills that will provide a deeper understanding of machine learning and data science concepts. By mastering the theoretical foundation underlying practical algorithms and uncovering inherent connections with several branches of modern mathematics, students will hone their creativity and independent thinking skills necessary to lead the data science revolution.

Data Science Courses

<u>MATH 315</u>	Advanced Calculus I	3
<u>MATH 351</u>	Probability	3
<u>MATH 446</u>	Numerical Analysis I	3
<u>MATH 464</u>	Linear Algebra with Data Applications	3
Choose two courses	from the following:	3-4
<u>MATH 447</u>	Numerical Analysis II	
<u>MATH 462</u>	Mathematics of Machine Learning and Industrial Applications I	
& <u>MATH 463</u>	and Mathematics of Machine Learning and Industrial Applications II	
<u>MATH 465</u>	Mathematics of Data Science	
Choose one course from the following:		3
<u>MATH 352</u>	Statistics	
<u>STAT 350</u>	Introductory Statistics II	
<u>STAT 360</u>	Introduction to Statistical Practice II	
<u>STAT 356</u>	Statistical Theory	
Choose one course f	rom the following:	3
<u>CDS 301</u>	Scientific Information and Data Visualization	
<u>CDS 302</u>	Scientific Data and Databases	
<u>CS 310</u>	Data Structures	

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	Additional	Science	Courses
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Select additional scie	ence credits from one of the following options:	3-4
1. Choose one fro		
BIOL 213	Cell Structure and Function (Mason Core)	
<u>CHEM 211</u>	General Chemistry I <u>(Mason Core)</u>	
& <u>CHEM 213</u>	and General Chemistry Laboratory I <u>(Mason Core)</u>	
GEOL 101	Physical Geology <u>(Mason Core)</u>	
& <u>GEOL 103</u>	and Physical Geology Lab	
<u>PHYS 160</u>	University Physics I <u>(Mason Core)</u>	
& <u>PHYS 161</u>	and University Physics I Laboratory <u>(Mason Core)</u>	
2. Choose 3 credits f	rom more advanced courses in biology, chemistry, geology, or physics 1	

3. Choose the 4 credit option of <u>PHYS 262</u> and <u>PHYS 263</u>

Total Credits

24-26

10nly refers to courses acceptable for credit toward a natural science major. Consider courses from the following: BIOL 300-499, CHEM 300-499, GEOL 300-499, PHYS 300-499.

Concentration in Mathematical Statistics (MTHS)

This concentration provides exciting opportunities for students interested in taking additional classes on statistics and data analysis. The concentration prepares data analysts able to deal with real world applications in science and engineering.

MTHS Courses

<u>MATH 315</u>	Advanced Calculus I	3
<u>MATH 351</u>	Probability	3
<u>MATH 352</u>	Statistics	3
<u>MATH 453</u>	Advanced Mathematical Statistics	3
<u>MATH 551</u>	Regression and Time Series	3
<u>STAT 362</u>	Introduction to Computer Statistical Packages	3
Select one from:		3
<u>STAT 260</u>	Introduction to Statistical Practice I	
<u>STAT 350</u>	Introductory Statistics II	
<u>STAT 360</u>	Introduction to Statistical Practice II	
Select two from the followin	ıg:	6
<u>STAT 455</u>	Experimental Design	
<u>STAT 460</u>	Introduction to Biostatistics	
<u>STAT 462</u>	Applied Multivariate Statistics	
<u>STAT 463</u>	Introduction to Exploratory Data Analysis	
<u>STAT 465</u>	Nonparametric Statistics and Categorical Data Analysis	
<u>STAT 472</u>	Introduction to Statistical Learning	
<u>STAT 474</u>	Introduction to Survey Sampling	
Additional Science Courses		

Select additional science credits from one of the following options:

1. Choose one from the following different lab sciences:

3-4

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	BIOL 213	Cell Structure and Function (<u>Mason Core)</u>
	<u>CHEM 211</u>	General Chemistry I <u>(Mason Core)</u>
	& <u>CHEM 213</u>	and General Chemistry Laboratory I <u>(Mason Core)</u>
	<u>GEOL 101</u>	Physical Geology <u>(Mason Core)</u>
	& <u>GEOL 103</u>	and Physical Geology Lab
	<u>PHYS 160</u>	University Physics I <u>(Mason Core)</u>
	& <u>PHYS 161</u>	and University Physics I Laboratory <u>(Mason Core)</u>
	2. Choose 3 credits from more advanced courses in biology, chemistry, geology, or physics 1	
	3. Choose the 4 credit option of <u>PHYS 262</u> and <u>PHYS 263</u>	
	4. Choose one course fro	m the following:
	<u>CDS 230</u>	Modeling and Simulation I
	<u>CDS 301</u>	Scientific Information and Data Visualization
	<u>CS 211</u>	Object-Oriented Programming
	<u>CS 310</u>	Data Structures
	<u>CS 330</u>	Formal Methods and Models
	<u>CS 483</u>	Analysis of Algorithms
Тс	30	
1	LOnly refers to courses acc	eptable for credit toward a natural science major. Consider courses from the following:
	BIOL 300-499, CHEM 300-	499, GEOL 300-499, PHYS 300-499.

Retroactive Requirements Updates:

Plan of Study:

Honors Information:

Honors in the Major

Eligibility

Mathematics majors who have maintained a GPA of at least 3.50 in mathematics courses and a GPA of 3.50 in all courses taken at George Mason University may apply to the departmental honors program upon completion of two MATH courses at the 300+ level (excluding <u>MATH 400</u> History of Math (Topic Varies) <u>(Mason Core)</u>), at least one of which has <u>MATH 300</u> Introduction to Advanced Mathematics as a prerequisite. Admission to the program will be monitored by the undergraduate committee.

Honors Requirements

To graduate with honors in mathematics, a student is required to maintain a minimum GPA of 3.50 in mathematics courses and successfully complete <u>MATH 405</u> Honors Thesis in Mathematics I and <u>MATH 406</u> RS: Honors Thesis in Mathematics II with an average GPA of at least 3.50 in these two courses.

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Accelerated Description/Dual Degree Description:

Description:

INTO-Mason Requirements:

College Requirements & Policies:

Department / Academic Unit Requirements & Policies:

Program Outcomes

Additional Program Information

This information is required by the Office of Accreditation and Program Integrity.

Courses offered via distance (if applicable): **Indicate whether** students are able What is the Face-to-Face Only primary delivery format for the program? Does any portion of this program occur off-campus? No **Off-campus details:** Are you working with a vendor / other collaborators to offer your program? No Please explain: Related Departments Could this program prepare students for any type of professional licensure, in Virginia or elsewhere? No Please explain: Are you adding or removing a licensure component? No Please explain:

Additional SCHEV & SACSCOC Information

Is the content of the new program closely related to that of an existing approved program at the same instructional level (i.e., baccalaureate, master's, doctoral)?

Which existing approved program(s)?

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Is this new program considered to be "advancing the degree level of a currently approved program (i.e. existing content is at lower degree level, new content is at the higher degree level)?

Which existing approved program(s)?

Is this new program considered to be "lowering the degree level of a currently approved program" (i.e. existing content is at higher degree level, new content is at the lower degree level)?

Which existing approved program(s)?

Is this a re-opening of a program that was closed to admission within the last five years?

Date of Program Closure

What are the methods of delivery for the program?

Does this program include a course/credit-based competency-based education delivery option?

Is this change a simple retitling of an existing program, with no other changes, to any existing program content, curriculum requirements, etc?

No

Does this change represent a repackaging of content in an existing approved degree/certificate program at the same instructional level (i.e., baccalaureate, master's, or doctoral)?

No

Which existing approved program(s)?

Percentage of total credits containing new course content. ("New course content" is defined by SACSCOC as content that is not currently included in an existing approved degree/certificate program at the same instructional level. Do not exclude gen ed credits in calculations for undergraduate programs.)

0%-24%

Does this change include the addition of a distance education or face-to-face method of delivery for this program?

No

What is the new method of delivery?

Does this change include the addition of a course/credit-based competency-based education delivery option?

No

Will any additional equipment/facilities be needed?

No

Description of institutional impact:

Will any additional faculty be required?

No

Description of institutional impact:

Will any additional financial resources be needed?

No

Description of institutional impact:

Additional library/learning resources needed?

No

Description of institutional impact:

OAPI Use Only – Determination of SACSCOC Impact

Comments or Notes

Green Leaf Program Designation

Is this a Green Leaf No program?

Green Leaf

Decignation

Sustainability-focused academic programs require at least one green leaf course. Either that course is itself sustainability-focused or else the program requires a set of sustainability-related courses with aggregated

Relationship to Evisting Courses Relationship to Evisting Programs List sustainabilityfocused courses currently required in the degree

Sustainability-related academic programs either require at least one sustainability-related course or else offer any green leaf course as an ontion or elective *

List sustainabilityrelated courses currently required https://workingcatalog.gmu.edu/courseleaf/approve/?role=SC Curriculum Committee in the degree

Does this program cover material which crosses into another department?		
	No	
Impacted Departments Additional Attachments	UGC-COS-Program Mod BS Math.pdf UGC-COS-Program-Mod-bsmath_001.pdf BS_in_math_modification_ProgramApprovalForm_COSCC- 2_ACTUARIAL.pdf	
SCHEV Proposal		
Executive Summary		
Reviewer Comments		
Additional Comments		

Is this course required of all students in this degree program?

%wi_required.eschtml%

Attached

Key: 587