APPROVED BY SENATE
12/06/2021

EP.22.048_FINAL
Approved by EP 11/29/2021

10KV3895BSLA: MATHEMATICS: APPLIED MATHEMATICS , BSLAS

In Workflow

1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu; mhazen@illinois.edu)
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9. Board of Trustees (none)
10. IBHE (none)
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Approval Path

1. Thu, 04 Nov 2021 21:45:59 GMT
   Deb Forgacs (dforgacs): Approved for U Program Review
2. Thu, 04 Nov 2021 22:29:06 GMT
   Vera Hur (verahur): Approved for 1257 Head
3. Fri, 05 Nov 2021 14:38:27 GMT
   Andrea Ray (aray): Approved for KV Dean
4. Fri, 05 Nov 2021 14:45:22 GMT
   John Wilkin (jpwilkin): Approved for University Librarian
5. Mon, 08 Nov 2021 17:25:51 GMT
   Kathy Martensen (kmartens): Approved for Provost

History

1. Jun 10, 2019 by Deb Forgacs (dforgacs)

Date Submitted:Thu, 04 Nov 2021 20:22:33 GMT

Viewing:10KV3895BSLA : Mathematics: Applied Mathematics , BSLAS

Changes proposed by: Andrea Ray

Proposal Type:

Concentration (ex. Dietetics)

This proposal is for a:

Revision

Administration Details

Official Program Name

Mathematics: Applied Mathematics , BSLAS

Sponsor College

Liberal Arts & Sciences

Sponsor Department

Mathematics

Sponsor Name

Randy McCarthy, Professor and Director of Undegraduate Studies

Sponsor Email

rmccrthy@illinois.edu

College Contact

Stephen R. Downie

College Contact Email

sdownie@illinois.edu

List the role for rollbacks (which role will edit the proposal on questions from EPC, e.g., Dept Head or Initiator) and/or any additional stakeholders.*Purpose: List here who will do the editing work if proposal needs rolled back. And any other stakeholders.*

Alison Champion

Does this program have inter-departmental administration?

No

Proposal Title

Effective Catalog Term

Fall 2022

Provide a brief, concise description (not justification) of your proposal.

Revision to the BSLAS, Major in Mathematics, Applied Mathematics concentration, College of Liberal Arts & Sciences. Includes revisions to five concentrations: General Mathematics (no concentration selected), Applied Mathematics, Operations Research, Graduate Preparatory, and Mathematics Teaching.

List here any related proposals/revisions and their keys.*Example: This BS proposal (key 567) is related to the Concentration A proposal (key 145) and the Concentration B proposal (key 203).*

This Mathematics BSLAS proposal (key 230) is related to the Applied Mathematics Concentration (key 731) and the Mathematics Data Optimization Concentration (key 730) and the Mathematics Teaching Option Concentration (key 729) and the Mathematics Doctoral Preparation Concentration (key 728)

Program Justification

Why are these changes necessary?

We propose that the 12 advanced on-campus hours required for this major should not be S/U-graded courses. This should apply also to the free-choice advanced MATH courses. This helps maintain the quality of a major which did not have S/U-graded courses available to fill requirements when created but now does.
Computer Science is in the process of discontinuing CS 125 with replacement CS 124. We add the new course while leaving CS 125 for cases of students with transfer credit.
The current supporting coursework requirement mention lists “any minor” as a possibility, but several campus minors may be completed almost entirely with coursework that is part of the major or offered through the Department of Mathematics, without meeting LAS requirements for supporting coursework. The restrictions on supporting coursework are stated more clearly in the revision.
This program provides a solid foundation in mathematics. Objectives include giving students technical proficiency in calculus and linear algebra; ability to construct proofs and recognize when proofs are complete; ability to use theorems in order to solve problems, and ability to translate real-world problems into mathematical problems and solve them. Careers range from programming to teaching to data analysis. Students pursue graduate studies in a variety of fields, including mathematics, statistics, computer science, and many fields in which mathematics is applied.

Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

No

Program Regulation and Assessment

Briefly describe the plan to assess and improve student learning, including the program’s learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student’s achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning. (Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable).

Learning objectives:

Students should be able to construct proofs and recognize when a proof is complete. Students should be able to use theorems in order to solve problems without going back to first principles. Students should have technical proficiency in calculus and linear algebra. Students should be able to translate real-world problems into mathematics to solve them.

These learning objectives are measured through annual surveys of students (senior survey for all graduating seniors in late spring; general math major surveys at approximately the same time for all others); annual reviews by the Math Undergraduate Office of performance of math majors in key classes; feedback from the Math Department Advisory Board (MDAB); and reviews of special initiatives.

Performance in specific courses demonstrates the first three objectives so long as our syllabus coverage and grading standards are upheld, with reviews both of specific grades and performance compared with non-majors enrolled in the same courses. Feedback from student surveys and the MDAB assists the review of the fourth. The student surveys and course reviews also help us to identify areas of special concern for specific subgroups of students or specific courses.
Results and recommendations are shared by the Math Undergraduate Office with the department’s Undergraduate Affairs Committee, which is tasked with overseeing and revising the undergraduate curriculum. Results are also shared with the full department faculty meeting once per semester.

Is the career/profession for graduates of this program regulated by the State of Illinois?

No

Program of Study

“Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses” (source: https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf). For proposals for new bachelor’s degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.

Revised programs

Applied Mathematics Concentration Academic Catalog.docx
Applied Mathematics Concentration Comparative Table.docx
Math Major Senate Curriculum Revision for LAS.docx

Attach a side-by-side comparison with the existing program AND, if the revision references or adds “chose-from” lists of courses students can select from to fulfill requirements, a listing of these courses, including the course rubric, number, title, and number of credit hours.

Catalog Page Text - Overview Tab

Statement for Programs of Study Catalog

General education:Students must complete the Campus General Education **(**https://courses.illinois.edu/gened/DEFAULT/DEFAULT/**)requirements including the campus general education language requirement.**
Minimum required major and supporting course work:Normally equates to 49-52 hours including 27-35 hours of mathematics beyond calculus, 3-4 hours of computer science, and 12 hours of supporting coursework.
Twelve hours of 300- and 400-level non-S/U-graded courses in the major must be taken on this campus.
Minimum hours required for graduation:120 hours.

Code	Title	Hours
Required Core Courses		
MATH 241	Calculus III (Students should have credit forMATH 220/MATH 221andMATH 231before enrolling inMATH 241)	4
MATH 347	Fundamental Mathematics	3-4
or MATH 348	Fundamental Mathematics-ACP	
MATH 416	Abstract Linear Algebra (Students may not receive credit for bothMATH 416and eitherASRM 406orMATH 415)	3
MATH 417	Intro to Abstract Algebra	3
or MATH 427	Honors Abstract Algebra	
MATH 424	Honors Real Analysis (IfMATH 424orMATH 447is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied)	3
or MATH 444	Elementary Real Analysis	
or MATH 447	Real Variables	
MATH 461	Probability Theory (IfSTAT 400is completed, a requirement for the Data Optimization concentration has been satisfied)	3-4
or STAT 400	Statistics and Probability I	
CS 101	Intro Computing: Engrg & Sci	3-4
or CS 124	Introduction to Computer Science I	
or CS 125	Introduction to Computer Science	

Approved supporting coursework outside Mathematics (Supporting coursework may be completed with 12 advisor-approved hours of a single math-related area outside of MATH/ASRM not used for a major requirement and must include at least one advanced course; ANY minor which is fulfilled with at least 12 hours of courses, including one advanced course, not used for the major nor cross-listed with MATH/ASRM; or any double major or dual degree)		12
Applied Mathematics Courses		
MATH 441	Differential Equations	3
MATH 446	Applied Complex Variables	3
or MATH 448	Complex Variables	
CS 357	Numerical Methods I	3
or MATH 442	Intro Partial Diff Equations	
or MATH 489	Dynamics & Differential Eqns	
MATH 412	Graph Theory	3
or MATH 413	Intro to Combinatorics	
or MATH 482	Linear Programming	
One additional 400-level or approved 500-level mathematics course not graded with S/U grading (Courses awarded S/U grades may not be used to fill this requirement)		3
Total Hours		49-52

Program Relationships

Corresponding Program(s):

Corresponding Program(s)
Mathematics, BSLAS

Program Features

Academic Level

Undergraduate

Is This a Teacher Certification Program?

No

Will specialized accreditation be sought for this program?

No

Additional concentration notes (e.g., estimated enrollment, advising plans, etc.)

No change to current admission requirements: Freshmen must meet LAS Admissions requirements. On-campus transfer students must complete Math 241 and Math 347 and have an on-campus major GPA of at least 2.50. Off-campus transfer students must meet LAS transfer requirements and complete at least Calculus II (sophomore transfer) or Calculus III and computer programming (junior transfer) with grades of B or higher in each math course taken. Admission to the Teaching concentration is via the application used for all LAS Secondary Education minor applicants.
Admissions is handled by the Office of Undergraduate Admissions for freshmen and off-campus transfers. On-campus transfers are managed through the LAS Student Academic Affairs Office with approval from the Math Undergraduate Director. Admission to the Secondary Education minor and Teaching concentration is handled by the College of Education in cooperation with Mathematics. Academic advising is provided by the Math Undergraduate Office with assistance from faculty on the Undergraduate Advising Committee. Supplemental academic advising for the Secondary Education minor is provided by the College of Education, but primary advising for Teaching concentration students is provided by Mathematics.

Delivery Method

This program is available:

On Campus - Students are required to be on campus, they may take some online courses.

Enrollment

Describe how this revision will impact enrollment and degrees awarded.

No change anticipated.

Budget

Are there budgetary implications for this revision?

No

Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?

No

Financial Resources

How does the unit intend to financially support this proposal?

We anticipate the same resources will be devoted to the revised program as are devoted to the program in its current form.

Will the unit need to seek campus or other external resources?

No

Resource Implications

Facilities

Will the program require new or additional facilities or significant improvements to already existing facilities?

No

Technology

Will the program need additional technology beyond what is currently available for the unit?

No

Non-Technical Resources

Will the program require additional supplies, services or equipment (non-technical)?

No

Resources

For each of these items, be sure to include in the response if the proposed new program or change will result in replacement of another program(s). If so, which program(s), what is the anticipated impact on faculty, students, and instructional resources? Please attach any letters of support/ acknowledgement from faculty, students, and/or other impacted units as appropriate.

Faculty Resources

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

No change anticipated.

Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

Current collections and services are adequate for the proposed program.

EP Documentation

EP Control Number

EP.22.048

This proposal requires HLC inquiry

No

DMI Documentation

Banner/Codebook Name

BSLAS:Math:Applied Math-UIUC

Program Code:

10KV3895BSLA

Conc Code

3895

Degree Code

BSLAS

Major Code

0439

Program Reviewer Comments

Deb Forgacs (dforgacs) (Thu, 04 Nov 2021 20:06:01 GMT): Rollback: requested

Key: 731

Proposal for revised curricula (degree, major, concentration, minor)

Submit completed proposals via email to Associate Dean Stephen R. Downie (sdownie@illinois.edu). Please obtain Executive Officer and School Director (if applicable) approval via email and forward with the proposal to LAS.

Proposal Title:

Revision to the Bachelor of Science in Liberal Arts & Sciences, Major in Mathematics, College of Liberal Arts & Sciences. Includes revisions to five concentrations: General Mathematics (no concentration selected), Applied Mathematics, Operations Research, Graduate Preparation, and Mathematics Teaching.

For proposals with concentrations- will you admit to the concentration(s) directly? Is a concentration required for graduation?

No; no

Proposed effective date: *(Proposals may not be implemented until they go through all necessary levels of approval. Proposed changes may not be publicized as final on any web sites, printed documents, etc. until written confirmation of final approval is issued. For LAS units, a fall semester effective term for all curricula will be requested, please indicate the proposed year).*

Fall 2022

Sponsor(s): Randy McCarthy, Professor and Director of Undergraduate Studies, Department of Mathematics, rmccrthy@illinois.edu

College contact: Stephen Downie, Associate Dean for Curricula and Academic Policy, College of Liberal Arts and Sciences, sdownie@illinois.edu

PROGRAM DESCRIPTION and JUSTIFICATION

1) **Provide a brief description but concise description of your proposal.** For example, if proposing revisions to a curriculum, state specifically what is changing. Where applicable, note whether stated program changes include additional requirements in the form of prerequisite courses. Requests for curriculum revisions must be accompanied by a table which clearly outlines the current requirements and the proposed revisions. This information may be submitted as an appendix. See Appendix A for an example. Please provide pertinent information only.

We propose that the 12 advanced on-campus hours required for this major should not be S/U-graded courses. This should apply also to the free-choice advanced MATH courses. This helps maintain the

quality of a major which did not have S/U-graded courses available to fill requirements when created but now does.

Computer Science is in the process of discontinuing CS 125 with replacement CS 124. We add the new course while leaving CS 125 for cases of students with transfer credit.

The Operations Research concentration will be renamed to Data Optimization. The new name gives a more meaningful and modern description of the coursework.

The Graduate Preparation concentration will be renamed to Math Doctoral Preparation. The new name better describes the purpose of this concentration and should reduce student confusion regarding the fact that all concentrations are suitable as preparation for Mathematics master's programs or graduate work in other fields of study.

We reduce by one the number of required MATH courses in the Mathematics Teaching concentration. This concentration is typically completed in 7 terms instead of 8, due to student teaching. Removing one elective course significantly decreases the likelihood that a student will drop out of the concentration or need more than 4 years to graduate, while still providing a strong mathematical background that will prepare for teaching and for passing state tests. With the steep drop in enrollment in this program, often due to students dropping out of it or removing it from consideration after giving it serious thought, we anticipate that this change will make the program more attractive to students.

The current supporting coursework requirement mentions lists "any minor" as a possibility, but several campus minors may be completed almost entirely with coursework that is part of the major or offered through the Department of Mathematics, without meeting LAS requirements for supporting coursework. The restrictions on supporting coursework are stated more clearly in the revision.

In addition, there will be minor changes to accepted courses within concentrations.

2) **Provide a justification of the program**, including how your unit decided to create this program, highlights of the program objectives, and the careers, occupations, or further educational opportunities for which the program will prepare graduates, when appropriate.

This program provides a solid foundation in mathematics. Objectives include giving students technical proficiency in calculus and linear algebra; ability to construct proofs and recognize when proofs are complete; ability to use theorems in order to solve problems, and ability to translate real-world problems into mathematical problems and solve them. Careers range from programming to teaching to data analysis. Students pursue graduate studies in a variety of fields, including mathematics, statistics, computer science, and many fields in which mathematics is applied.

3) In addition, please provide an answer as to how your undergraduate degree (120 hours of coursework) will satisfy this requirement: IBHE requires that all degree programs contain at least 40 credit hours in upper division courses. Upper division courses have been described as 300- and 400-level coursework and some 200-level courses in which multiple prerequisites are required.

Major requirements include a minimum of 9-11 300-level and 400-level courses for a total of 27-34 credits. Math 241, 4 credits, is a requirement with multiple prerequisites. Supporting coursework

includes at least 1-2 advanced courses for 3-8 credits. A student's Advanced Composition course adds another 3-4 credits, and between language other than English, electives, supporting coursework, and additional major courses, we expect a student to have at least 3 more hours of upper division coursework, for a minimum of 40 upper division hours.

Is this program interdisciplinary? No

If a proposal for a concentration-

will you admit to the concentration directly? No

is a concentration required for graduation? No

Will specialized accreditation be sought for this program? No

ADMISSION REQUIREMENTS

1) Desired admissions term: *For LAS units, a fall semester effective term for all curricula will be requested, please indicate the proposed year*

Fall, 2022
Is this revision a change to the admission status of the program? *No.*

2) Provide a brief narrative description of the admission requirements for this program. Where relevant, include information about licensure requirements, student background checks, GRE and TOEFL scores, and admission requirements for transfer students. (degrees, majors, concentrations ONLY)

No change to current admission requirements: Freshmen must meet LAS Admissions requirements. On-campus transfer students must complete Math 241 and Math 347 and have an on-campus major GPA of at least 2.50. Off-campus transfer students must meet LAS transfer requirements and complete at least Calculus II (sophomore transfer) or Calculus III and computer programming (junior transfer) with grades of B or higher in each math course taken. Admission to the Teaching concentration is via the application used for all LAS Secondary Education minor applicants.

3) Describe how critical academic functions such as admissions and student advising are managed.

Admissions is handled by the Office of Undergraduate Admissions for freshmen and off-campus transfers. On-campus transfers are managed through the LAS Student Academic Affairs Office with approval from the Math Undergraduate Director. Admission to the Secondary Education minor and Teaching concentration is handled by the College of Education in cooperation with Mathematics. Academic advising is provided by the Math Undergraduate Office with assistance from faculty on the Undergraduate Advising Committee. Supplemental academic advising for the Secondary Education minor is provided by the College of Education, but primary advising for Teaching concentration students is provided by Mathematics.

ENROLLMENT

1) Describe how this revision will impact enrollment and degrees awarded.

For the Teaching concentration, it is hoped that this revision will revitalize this shrinking program. Otherwise, no changes are expected.

2) Estimated Annual Number of Degrees Awarded **(degrees, majors, concentrations ONLY)**

Year 1: 150

Year 5 (or when fully implemented): 150

3) What is the matriculation term for this program? Fall

4) What is the typical time to completion of this program?

4 years

5) What are the minimum Total Credit Hours required for this program?

120

6) Delivery Method, what is the program's primary delivery method?

Face to Face

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5) MINORS ONLY:

Will the department limit enrollment in the minor?

Describe how the department will monitor admission to/enrollment in the minor.

Are there any prerequisites for the proposed minor? If yes, please list the courses and whether or not these course count in the total hours for the minor.

Other than certification via the students' degree audits, is there any additional planned mechanism to award/honor successful completion of the minor? If yes, please describe.

N/A; not a minor

BUDGET

1) Please describe any budgetary implications for this revision- addressing applicable personnel, facilities, technology and supply costs.

None

2) Will the revision require staffing (faculty, advisors, etc.) beyond what is currently available? If yes, please describe.

No

3) Please provide any additional budget information needed to effectively evaluate the proposal.

N/A

RESOURCE IMPLICATIONS

1) Facilities- Will the program require new or additional facilities or significant improvements to already existing facilities? If yes, please outline the specific need and Year 1 and Year 5 cost.

No

2) Technology- Will the program need additional technology beyond what is currently available for the unit? If yes, please outline the specific need and Year 1 and Year 5 cost.

No

3) Non-Technical Resources- Will the program require additional supplies, services or equipment (non-technical)? If yes, please outline the specific need and Year 1 and Year 5 cost.

No

RESOURCES

1) Faculty Resources: Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

Mathematics Teaching Concentration: This will have minimal impact on faculty, as a small decrease in required courses is offset by a small increase in students staying with this program.

Otherwise, no impact.

2) Library Resources: Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

Current collections and services are adequate for the proposed program.

3) Instructional Resources: Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change? If yes, please describe.

No

4) Does this new program/proposed change result in the replacement of another program? If yes, please specify the program.

No

5) Does the program include any required or recommended subjects that are offered by other departments? If yes, please list the courses. Explain how these additional courses will be used by the program and provide letters of support from the departments.

No

FINANCIAL RESOURCES

1) How does the unit intend to financially support this proposal?
We anticipate the same resources will be devoted to the revised program as are devoted to the program in its current form.

2) Will the unit need to seek campus or other external resources? If yes, please provide a summary of the sources and an indication of the approved support.

No

3) Are you seeking a change in the tuition rate or differential for this program? (degrees, majors, concentrations ONLY) *If this program requires a tuition or differential change, initiate a discussion with the LAS curricula contact, LAS budget officer, and LAS Associate Dean.*

No

4) Is this program requesting self-supporting status? (degrees, majors and concentrations ONLY)? If yes, please explain.

No

PROGRAM REGULATION & ASSESSMENT

1) **Briefly describe the plan to assess and improve student learning, including the program's learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student's achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning**. Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable.

Learning objectives:

Students should be able to construct proofs and recognize when a proof is complete. Students should be able to use theorems in order to solve problems without going back to first principles. Students should have technical proficiency in calculus and linear algebra. Students should be able to translate real-world problems into mathematics to solve them.

These learning objectives are measured through annual surveys of students (senior survey for all graduating seniors in late spring; general math major surveys at approximately the same time for all others); annual reviews by the Math Undergraduate Office of performance of math majors in key classes; feedback from the Math Department Advisory Board (MDAB); and reviews of special initiatives.

Performance in specific courses demonstrates the first three objectives so long as our syllabus coverage and grading standards are upheld, with reviews both of specific grades and performance compared with non-majors enrolled in the same courses. Feedback from student surveys and the MDAB assists the

review of the fourth. The student surveys and course reviews also help us to identify areas of special concern for specific subgroups of students or specific courses.
Results and recommendations are shared by the Math Undergraduate Office with the department's Undergraduate Affairs Committee, which is tasked with overseeing and revising the undergraduate curriculum. Results are also shared with the full department faculty meeting once per semester.

2) Is the career/profession for graduates of this program regulated by the State of Illinois? If yes, please describe.

Yes, only for the Mathematics Teaching concentration. This is a teacher licensure program with oversight from Council on Teacher Education for the Illinois State Board of Education.

ACADEMIC CATALOG ENTRY

1) All proposals must submit the major requirements (courses, hours) for the proposed curricula. Please see the University of Illinois Academic Catalog- http://catalog.illinois.edu/ for your unit for an example of the entry.

General Mathematics

General education: Students must complete the Campus General Education requirements including the campus general education language requirement.

Minimum required major and supporting course work: Normally equates to 46-57 hours including 27-35 hours of mathematics beyond calculus, 3-4 hours of computer science, and 12 hours of supporting coursework. Twelve hours of 300- and 400-level non-S/U-graded courses in the major must be taken on this campus.

Minimum hours required for graduation: 120 hours.

Required Core Courses		
MATH 241	Calculus III [1]	4
MATH 347	Fundamental Mathematics	3-4
or MATH 348	Fundamental Mathematics-ACP	
MATH 416	Abstract Linear Algebra [2]	3
MATH 417	Intro to Abstract Algebra	3
or MATH 427	Honors Abstract Algebra	
MATH 424	Honors Real Analysis [3]	3
or MATH 444	Elementary Real Analysis	

or MATH 447	Real Variables	
MATH 461	Probability Theory [4]	3-4
or STAT 400	Statistics and Probability I	
CS 101	Intro Computing: Engrg & Sci	3-4
or CS 124	Intro to Computer Science I	
or CS 125	Intro to Computer Science	
Approved supporting coursework outside Mathematics[5]		12
Mathematics Courses		
Select a total of two courses from two of the following three lists:		6
Geometry		
MATH 402	Non Euclidean Geometry	
MATH 403	Euclidean Geometry	
MATH 423	Differential Geometry	
MATH 481	Vector and Tensor Analysis	
Differential Equations and Complex Analysis		
MATH 441	Differential Equations	
MATH 446	Applied Complex Variables	
MATH 448	Complex Variables	
Number Theory		
MATH 453	Elementary Theory of Numbers	
Two additional 400-level or approved 500-level mathematics courses [6]		6
Total Hours		**46-49**

1. *Students should have credit for MATH 220/MATH 221 and MATH 231 before enrolling in MATH 241.*
2. *Students may not receive credit for both MATH 416 and either ASRM 406 or MATH 415.*
3. *If MATH 424 or MATH 447 is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied.*
4. *If STAT 400 is completed, a requirement for the Data Optimization concentration has been satisfied.*
5. *Supporting coursework may be completed with 12 advisor-approved hours of a single math-related area*

outside of MATH/ASRM not used for a major requirement and must include at least one advanced course; ANY minor which is fulfilled with at least 12 hours of courses, including one advanced course, not used for the major nor cross-listed with MATH/ASRM; or any double major or dual degree.

6. *Courses awarded S/U grades may not be used to fill this requirement.*

Mathematics Teaching Concentration

General education: Students must complete the Campus General Education requirements including the campus general education language requirement.

Minimum required major and supporting course work: Normally equates to 80-84 hours including 27-29 hours of mathematics beyond calculus, 3-4 hours of computer science, and 39 hours for the Teacher Education Minor in Secondary School Teaching.
Twelve hours of 300- and 400-level non-S/U graded coursework in the major must be taken on this campus.

Minimum hours required for graduation: 120 hours.
Students in this concentration must complete the Teacher Education Minor in Secondary School Teaching (39 hours).

Code	Title	Hours
Foundation Courses		
The following courses must be completed or in progress when students apply to the Secondary Education minor.		
MATH 220	Calculus	4-5
or MATH 221	Calculus I	
MATH 231	Calculus II	3
MATH 241	Calculus III	4
Three advanced mathematics courses, including		
MATH 347	Fundamental Mathematics	3-4
or MATH 348	Fundamental Mathematics-ACP	
Required Core Courses		
MATH 416	Abstract Linear Algebra [1]	3
MATH 417	Intro to Abstract Algebra	3

or MATH 427	Honors Abstract Algebra	
MATH 424	Honors Real Analysis [2]	3
or MATH 444	Elementary Real Analysis	
or MATH 447	Real Variables	
MATH 461	Probability Theory [3]	3-4
or STAT 400	Statistics and Probability I	
CS 101	Intro Computing: Engrg & Sci	3-4
or CS 124	Intro to Computer Science I	
or CS 125	Intro to Computer Science	
Teacher Education Minor in Secondary School Teaching		39
Mathematics Teaching Courses		
MATH 402	Non Euclidean Geometry	3
or MATH 403	Euclidean Geometry	
MATH 453	Elementary Theory of Numbers	3
One additional 400-level or approved 500-level mathematics course [4]		3
Total Hours		**77-81**

1. Students may not receive credit for both MATH 416 and either ASRM 406 or MATH 415..

2.If MATH 424 or MATH 447 is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied.

3..If STAT 400 is completed, a requirement for the Data Optimization concentration has been satisfied.

4. Courses awarded S/U grades may not be used to fill this requirement.

Applied Mathematics Concentration

Required Core Courses
General education: Students must complete the Campus General Education requirements including the campus general education language requirement. Minimum required major and supporting course work: Normally equates to 46-57 hours including 27-35 hours of mathematics beyond calculus, 3-4 hours of computer science, and 12 hours of supporting coursework. Twelve hours of 300- and 400-level non-S/U-graded courses in the major must be taken on this campus.

Minimum hours required for graduation: 120 hours.

MATH 241	Calculus III [1]	4
MATH 347	Fundamental Mathematics	3-4
or MATH 348	Fundamental Mathematics-ACP	
MATH 416	Abstract Linear Algebra [2]	3
MATH 417	Intro to Abstract Algebra	3
or MATH 427	Honors Abstract Algebra	
MATH 424	Honors Real Analysis [3]	3
or MATH 444	Elementary Real Analysis	
or MATH 447	Real Variables	
MATH 461	Probability Theory [4]	3-4
or STAT 400	Statistics and Probability I	
CS 101	Intro Computing: Engrg & Sci	3-4
or CS 124	Intro to Computer Science I	
or CS 125	Intro to Computer Science	
Approved supporting coursework outside Mathematics [5]		12
Applied Mathematics Courses		
MATH 441	Differential Equations	3
MATH 446	Applied Complex Variables	3
or MATH 448	Complex Variables	
CS 357	Numerical Methods I	3
or MATH 442	Intro Partial Diff Equations	
or MATH 489	Dynamics & Differential Eqns	
MATH 412	Graph Theory	3
or MATH 413	Intro to Combinatorics	
or MATH 482	Linear Programming	
One additional 400-level or approved 500-level mathematics course [6]		3
Total Hours		**49-52**

1. *Students should have credit for MATH 220/MATH 221 and MATH 231 before enrolling in MATH 241.*
2. *Students may not receive credit for both MATH 416 and either ASRM 406 or MATH 415.*
3. *If MATH 424 or MATH 447 is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied.*
4. *If STAT 400 is completed, a requirement for the Data Optimization concentration has been satisfied.*

5. *Supporting coursework may be completed with 12 advisor-approved hours of a single math-related area outside of MATH/ASRM not used for a major requirement and must include at least one advanced course; ANY minor which is fulfilled with at least 12 hours of courses, including one advanced course, not used for the major nor cross-listed with MATH/ASRM; or any double major or dual degree.*
6. *Courses awarded S/U grades may not be used to fill this requirement.*

Data Optimization Concentration

Required Core Courses		
General education: Students must complete the Campus General Education requirements including the campus general education language requirement. Minimum required major and supporting course work: Normally equates to 46-57 hours including 27-35 hours of mathematics beyond calculus, 3-4 hours of computer science, and 12 hours of supporting coursework. Twelve hours of 300- and 400-level non-S/U-graded courses in the major must be taken on this campus. Minimum hours required for graduation: 120 hours.		
MATH 241	Calculus III [1]	4
MATH 347 or MATH 348	Fundamental Mathematics Fundamental Mathematics-ACP	3-4
MATH 416	Abstract Linear Algebra [2]	3
MATH 417 or MATH 427	Intro to Abstract Algebra Honors Abstract Algebra	3
MATH 424 or MATH 444 or MATH 447	Honors Real Analysis [3] Elementary Real Analysis Real Variables	3
MATH 461 or STAT 400	Probability Theory [4] Statistics and Probability I	3-4
CS 101 or CS 124 or CS 125	Intro Computing: Engrg & Sci Intro to Computer Science I Intro to Computer Science	3-4
Approved supporting coursework outside Mathematics [5]		12

Data Optimization Courses		
CS 357	Numerical Methods I	3

MATH 412 or MATH 484	Graph Theory Nonlinear Programming	3
STAT 410 or STAT 420	Statistics and Probability II Methods of Applied Statistics	3
MATH 482	Linear Programming	3
Total Hours		**47-49**

1.Students should have credit for MATH 220/MATH 221 and MATH 231 before enrolling in MATH 241.

2. Students may not receive credit for both MATH 416 and either ASRM 406 or MATH 415.

3.If MATH 424 or MATH 447 is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied.

4.If STAT 400 is completed, a requirement for the Data Optimization concentration has been satisfied.

5.Supporting coursework may be completed with 12 advisor-approved hours of a single math-related area outside of MATH/ASRM not used for a major requirement and must include at least one advanced course; ANY minor which is fulfilled with at least 12 hours of courses, including one advanced course, not used for the major nor cross-listed with MATH/ASRM; or any double major or dual degree.

Math Doctoral Preparation Concentration

Required Core Courses		
General education: Students must complete the Campus General Education requirements including the campus general education language requirement. Minimum required major and supporting course work: Normally equates to 46-57 hours including 27-35 hours of mathematics beyond calculus, 3-4 hours of computer science, and 12 hours of supporting coursework. Twelve hours of 300- and 400-level non-S/U-graded courses in the major must be taken on this campus. Minimum hours required for graduation: 120 hours.		
MATH 241	Calculus III [1]	4
MATH 347 or MATH 348	Fundamental Mathematics Fundamental Mathematics-ACP	3-4
MATH 416	Abstract Linear Algebra [2]	3
MATH 417 or MATH 427	Intro to Abstract Algebra Honors Abstract Algebra	3

MATH 424 or MATH 444 or MATH 447	Honors Real Analysis [2] Elementary Real Analysis Real Variables	3
MATH 461 or STAT 400	Probability Theory [4] Statistics and Probability I	3-4
CS 101 or CS 124 or CS 125	Intro Computing: Engrg & Sci Intro to Computer Science I Intro to Computer Science	3-4
Approved supporting coursework outside Mathematics [5]		12
Math Doctoral Preparation Courses		
The courses chosen from the core and the Math Doctoral Preparation concentration must include at least two of honors MATH 416, MATH 424, MATH 425, MATH 427, MATH 428.		
MATH 418 or MATH 428	Intro to Abstract Algebra II Honors Topics in Mathematics	
MATH 448 MATH 423 or MATH 425	Complex Variables Differential Geometry Honors Advanced Analysis	
or MATH 432 or MATH 481 MATH 441	Set Theory and Topology Vector and Tensor Analysis Differential Equations	
Two additional 400-level or approved 500-level mathematics courses [6]		6
Total Hours		**52-56**

1. *Students should have credit for MATH 220/MATH 221 and MATH 231 before enrolling in MATH 241.*
2. *Students may not receive credit for both MATH 416 and either ASRM 406 or MATH 415.*
3. *If MATH 424 or MATH 447 is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied.*
4. *If STAT 400 is completed, a requirement for the Data Optimization concentration has been satisfied.*
5. *Supporting coursework may be completed with 12 advisor-approved hours of a single math-related area outside of MATH/ASRM not used for a major requirement and must include at least one advanced course; ANY minor which is fulfilled with at least 12 hours of courses, including one advanced course, not used for the major nor cross-listed with MATH/ASRM; or any double major or dual degree.*
6. *Courses awarded S/U grades may not be used to fill this requirement.*

2) Include a comparative table of the current and proposed requirements.

General Mathematics:

Mathematics Major revisions, 10KV0439BSLA

Current requirements	Proposed revisions
General education: Students must complete the Campus General Education requirements including the campus general education language requirement.	General education: Students must complete the Campus General Education requirements including the campus general education language requirement.
Minimum required major and supporting course work: Normally equates to 46-57 hours including 27-35 hours of mathematics beyond calculus, 3-4 hours of computer science, and 12 hours of supporting coursework. Twelve hours of 300- and 400-level courses in the major must be taken on this campus.	Minimum required major and supporting course work: Normally equates to 46-57 hours including 27-35 hours of mathematics beyond calculus, 3-4 hours of computer science, and 12 hours of supporting coursework. Twelve hours of 300- and 400-level non-S/U-graded courses in the major must be taken on this campus.
Minimum hours required for graduation: 120 hours.	Minimum hours required for graduation: 120 hours.

Required Core Courses			Required Core Courses		
MATH 241	Calculus III [1]	4	MATH 241	Calculus III [1]	4
MATH 347 or MATH 348	Fundamental Mathematics Fundamental Mathematics-ACP	3-4	MATH 347 or MATH 348	Fundamental Mathematics Fundamental Mathematics-ACP	3-4
MATH 416	Abstract Linear Algebra [2]	3	MATH 416	Abstract Linear Algebra[2]	3
MATH 417 or MATH 427	Intro to Abstract Algebra Honors Abstract Algebra	3	MATH 417 or MATH 427	Intro to Abstract Algebra Honors Abstract Algebra	3
MATH 424 or MATH 444 or MATH 447	Honors Real Analysis [3] Elementary Real Analysis Real Variables	3	MATH 424 or MATH 444 or MATH 447	Honors Real Analysis [3] Elementary Real Analysis Real Variables	3
MATH 461 or STAT 400	Probability Theory [4] Statistics and Probability I	3-4	MATH 461 or STAT 400	Probability Theory [4] Statistics and Probability I	3-4
CS 101	Intro Computing: Engrg & Sci	3-4	CS 101 or CS 124	Intro Computing: Engrg & Sci Intro to Computer Science I	3-4

or CS 125	Intro to Computer Science		or CS 125	Intro to Computer Science	
Approved supporting coursework or any minor		12	Approved supporting coursework outside Mathematics [5]		12
Mathematics Courses			**Mathematics Courses**		
Select a total of two courses from two of the following three lists:		6	Select a total of two courses from two of the following three lists:		6
Geometry			**Geometry**		
MATH 402	Non Euclidean Geometry		MATH 402	Non Euclidean Geometry	
MATH 403	Euclidean Geometry		MATH 403	Euclidean Geometry	
MATH 423	Differential Geometry		MATH 423	Differential Geometry	
MATH 481	Vector and Tensor Analysis		MATH 481	Vector and Tensor Analysis	
Differential Equations and Complex Analysis			**Differential Equations and Complex Analysis**		
MATH 441	Differential Equations		MATH 441	Differential Equations	
MATH 446	Applied Complex Variables		MATH 446	Applied Complex Variables	
MATH 448	Complex Variables		MATH 448	Complex Variables	
Number Theory			**Number Theory**		
MATH 453	Elementary Theory of Numbers		MATH 453	Elementary Theory of Numbers	
Two additional 400- or 500-level Math courses		6	Two additional 400-level or approved 500-level mathematics courses. [6]		6
Total Hours		**46-49**	**Total Hours**		**46-49**

[1] *Students should have credit for MATH 220/MATH 221 and MATH 231 before enrolling in MATH 241.*

[1] *Students should have credit for MATH 220/MATH 221 and MATH 231 before enrolling in MATH 241.*

[2] *Beginning in Fall 2012, students may not receive credit for both MATH 416 and either ASRM 406(formerly MATH 410) or MATH 415. However, if one course is taken prior to Fall 2012, credit may be earned for both MATH 416 and either of ASRM 406 (formerly MATH 410) or MATH 415.*

[2] *Students may not receive credit for both MATH 416 and either ASRM 406 or MATH 415.*

3 *If MATH 424 or MATH 447 is completed, a requirement for the Graduate Preparatory concentration has been satisfied.*

4 If STAT 400 is completed, a requirement for the Operations Research concentration has been satisfied.

3 *If MATH 424 or MATH 447 is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied.*

4 If STAT 400 is completed, a requirement for the Data Optimization concentration has been satisfied.

5 *Supporting coursework may be completed with 12 advisor-approved hours of a single math-related area outside of MATH/ASRM not used for a major requirement and must include at least one advanced course; ANY minor which is fulfilled with at least 12 hours of courses, including one advanced course, not used for the major nor cross-listed with MATH/ASRM; or any double major or dual degree.*

6 *Coursework awarded S/U grades may not be used to fill this requirement.*

Mathematics Teaching:

Mathematics Teaching Concentration

Current requirements			Proposed Revisions		
Code	**Title**	**Hours**	**Code**	**Title**	**Hours**
Foundation Courses			**Foundation Courses**		
The following courses must be completed or in progress when students apply to the Secondary Education minor.			The following courses must be completed or in progress when students apply to the Secondary Education minor.		
MATH 220 or MATH 221	Calculus Calculus I	4-5	MATH 220 or MATH 221	Calculus Calculus I	4-5

MATH 231	Calculus II	3	MATH 231	Calculus II	3
MATH 241	Calculus III [1]	4	MATH 241	Calculus III [1]	4
Three advanced mathematics courses, including			Three advanced mathematics courses, including		
MATH 347	Fundamental Mathematics	3-4	MATH 347	Fundamental Mathematics	3-4
or MATH 348	Fundamental Mathematics-ACP		or MATH 348	Fundamental Mathematics-ACP	
Required Core Courses			**Required Core Courses**		
MATH 416	Abstract Linear Algebra [2]	3	MATH 416	Abstract Linear Algebra [2]	3
MATH 417	Intro to Abstract Algebra	3	MATH 417	Intro to Abstract Algebra	3
or MATH 427	Honors Abstract Algebra		or MATH 427	Honors Abstract Algebra	
MATH 424	Honors Real Analysis [3]	3	MATH 424	Honors Real Analysis [3]	3
or MATH 444	Elementary Real Analysis		or MATH 444	Elementary Real Analysis	
or MATH 447	Real Variables		or MATH 447	Real Variables	
MATH 461	Probability Theory [4]	3-4	MATH 461	Probability Theory [4]	3-4
or STAT 400	Statistics and Probability I		or STAT 400	Statistics and Probability I	
CS 101	Intro Computing: Engrg & Sci	3-4	CS 101	Intro Computing: Engrg & Sci	3-4
			or CS 124	Intro to Computer Science I	
or CS 125	Intro to Computer Science		or CS 125	Intro to Computer Science	
Teacher Education Minor in Secondary School Teaching		39	Teacher Education Minor in Secondary School Teaching		39
Mathematics Teaching Courses			**Mathematics Teaching Courses**		
MATH 402	Non Euclidean Geometry	3	MATH 402	Non Euclidean Geometry	3
or MATH 403	Euclidean Geometry		or MATH 403	Euclidean Geometry	
MATH 453	Elementary Theory of Numbers	3	MATH 453	Elementary Theory of Numbers	3
Two additional 400- or 500-level mathematics courses		6	One additional 400-level or approved 500-level mathematics course.[5]		3
Total Hours		**80-84**	**Total Hours**		**77-81**

[1] *Students should have credit for MATH 220/MATH 221 and MATH 231 before enrolling in MATH 241.*

[2] *Students may not receive credit for both MATH 416 and either ASRM 406 (formerly MATH 410) or MATH 415.*

[3] *If MATH 424 or MATH 447 is completed, a requirement for the Graduate Preparatory concentration has been satisfied.*

[4] If STAT 400 is completed, a group requirement for the Operations Research concentration has been satisfied.

[1] *Students may not receive credit for both MATH 416and either ASRM 406 or MAT H 415.*

[2] *If MATH 424 or MATH 4 47 is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied.*

[3] If STAT 400 is completed, a group requirement for the Data Optimization concentration has been satisfied.

[4] *Coursework awarded S/U grades may not be used to fill this requirement.*

Applied Math

Applied Math Concentration

Current requirements			**Proposed revisions**	
Core courses: see Mathematics major			**Core courses: see Mathematics major**	
Applied Mathematics Courses			**Applied Mathematics Courses**	
MATH 441	Differential Equations	3	MATH 441	Differential Equations
MATH 446	Applied Complex Variables	3	MATH 446	Applied Complex Variables
or MATH 448	Complex Variables		or MATH 448	Complex Variables
CS 357	Numerical Methods I	3	CS 357	Numerical Methods I
or MATH 442	Intro Partial Diff Equations		or MATH 442	Intro Partial Diff Equations
or MATH 489	Dynamics & Differential Eqns		or MATH 489	Dynamics & Differential Eqns
MATH 412	Graph Theory	3	MATH 412	Graph Theory

or MATH 413	Intro to Combinatorics		or MATH 413	Intro to Combinatorics	
or MATH 482	Linear Programming		or MATH 482	Linear Programming	
One additional 400- or 500-level Math course		3	One additional 400-level or approved 500-level mathematics course not graded with S/U grading		
Total Hours		**49 - 52**	**Total Hours**		

Data Optimization

Current name: Operations Research

Proposed name: Data Optimization

Current requirements			Proposed revisions		
Core courses: see Mathematics major			**Core courses: see Mathematics major**		
Operations Research Courses			**Data Optimization Courses**		
CS 357	Numerical Methods I	3	CS 357	Numerical Methods I	3
MATH 412	Graph Theory	3	MATH 412	Graph Theory	3
or MATH 484	Nonlinear Programming		or MATH 484	Nonlinear Programming	
STAT 410	Statistics and Probability II	3	STAT 410	Statistics and Probability II	3
or STAT 420	Methods of Applied Statistics		or STAT 420	Methods of Applied Statistics	
MATH 482	Linear Programming	3	MATH 482	Linear Programming	3
Total Hours		**47-49**	**Total Hours**		**47-49**

Math Doctoral Preparation

Name: Graduate Preparation

Proposed name: Math Doctoral Preparation

Current requirements			Proposed revisions		
Core courses: see Mathematics major			**Core courses: see Mathematics major**		
Graduate Preparation Courses			**Math Doctoral Preparation Courses**		
The courses chosen from the core and the Graduate Preparation concentration must include at least two of MATH 424, MATH 425, MATH 427, MATH 428.			The courses chosen from the core and the Math Doctoral Preparation concentration must include at least two of honors MATH 416, MATH 424, MATH 425, MATH 427, MATH 428.		
MATH 418	Intro to Abstract Algebra II	3	MATH 418	Intro to Abstract Algebra II	3

or MATH 428	Honors Topics in Mathematics		or MATH 428	Honors Topics in Mathematics	
MATH 448	Complex Variables	3	MATH 448	Complex Variables	3
MATH 423 or MATH 425 or MATH 432	Differential Geometry Honors Advanced Analysis Set Theory and Topology	3	MATH 423 or MATH 425 or MATH 432	Differential Geometry Honors Advanced Analysis Set Theory and Topology	3
			or MATH 481	Vector and Tensor Analysis	
MATH 441	Differential Equations	3 or 4	MATH 441	Differential Equations	3 or 4
Two additional 400- or 500-level Math courses		6	Two additional 400-level or approved 500-level mathematics courses not graded with S/U grading		6
Total Hours		**52-56**	**Total Hours**		**52-56**

Comparative Table
Applied Mathematics Concentration

Applied Math

Applied Math Concentration

Current requirements			Proposed revisions	
Core courses: see Mathematics major			**Core courses: see Mathematics major**	
Applied Mathematics Courses			**Applied Mathematics Courses**	
MATH 441	Differential Equations	3	MATH 441	Differential Equations
MATH 446	Applied Complex Variables	3	MATH 446	Applied Complex Variables
or MATH 448	Complex Variables		or MATH 448	Complex Variables
CS 357	Numerical Methods I	3	CS 357	Numerical Methods I
or MATH 442	Intro Partial Diff Equations		or MATH 442	Intro Partial Diff Equations
or MATH 489	Dynamics & Differential Eqns		or MATH 489	Dynamics & Differential Eqns
MATH 412	Graph Theory	3	MATH 412	Graph Theory
or MATH 413	Intro to Combinatorics		or MATH 413	Intro to Combinatorics
or MATH 482	Linear Programming		or MATH 482	Linear Programming
One additional 400- or 500-level Math course		3	One additional 400-level or approved 500-level mathematics course not graded with S/U grading	
Total Hours		**49 - 52**	**Total Hours**	

Applied Mathematics Concentration

Required Core Courses		
General education: Students must complete the Campus General Education requirements including the campus general education language requirement.		
Minimum required major and supporting course work: Normally equates to equates to 46-57 hours including 27-35 hours of mathematics beyond calculus, 3-4 hours of computer science, and 12 hours of supporting coursework. Twelve hours of 300- and 400-level non-S/U-graded courses in the major must be taken on this campus.		
Minimum hours required for graduation: 120 hours.		
MATH 241	Calculus III [1]	4
MATH 347	Fundamental Mathematics	3-4
or MATH 348	Fundamental Mathematics-ACP	
MATH 416	Abstract Linear Algebra [2]	3
MATH 417	Intro to Abstract Algebra	3
or MATH 427	Honors Abstract Algebra	
MATH 424	Honors Real Analysis [3]	3
or MATH 444	Elementary Real Analysis	
or MATH 447	Real Variables	
MATH 461	Probability Theory [4]	3-4
or STAT 400	Statistics and Probability I	
CS 101	Intro Computing: Engrg & Sci	3-4
or CS 124	Intro to Computer Science I	
or CS 125	Intro to Computer Science	
Approved supporting coursework outside Mathematics [5]		12
Applied Mathematics Courses		
MATH 441	Differential Equations	3
MATH 446	Applied Complex Variables	3
or MATH 448	Complex Variables	
CS 357	Numerical Methods I	3
or MATH 442	Intro Partial Diff Equations	
or MATH 489	Dynamics & Differential Eqns	
MATH 412	Graph Theory	3
or MATH 413	Intro to Combinatorics	
or MATH 482	Linear Programming	

One additional 400-level or approved 500-level mathematics course [6]	3
Total Hours	**49-52**

1. *Students should have credit for MATH 220/MATH 221 and MATH 231 before enrolling in MATH 241.*
2. *Students may not receive credit for both MATH 416 and either ASRM 406 or MATH 415.*
3. *If MATH 424 or MATH 447 is completed, a requirement for the Math Doctoral Preparation concentration has been satisfied.*
4. *If STAT 400 is completed, a requirement for the Data Optimization concentration has been satisfied.*
5. *Supporting coursework may be completed with 12 advisor-approved hours of a single math-related area outside of MATH/ASRM not used for a major requirement and must include at least one advanced course; ANY minor which is fulfilled with at least 12 hours of courses, including one advanced course, not used for the major nor cross-listed with MATH/ASRM; or any double major or dual degree.*
6. *Courses awarded S/U grades may not be used to fill this requirement.*