TO: The Academic Senate  
FROM: Committee on Instruction and Curriculum (CIC)  
SUBJECT: 16-17 CIC 21: Revision request for B.S. Mathematics  
PURPOSE: Information to the Academic Senate  
ACTION REQUESTED: That the Senate accept the information that the revision request for B.S. Mathematics has been approved by CIC.

BACKGROUND INFORMATION:  
The Senate process for approving transformed degree programs for the semester calendar is defined by 14-15 CIC 36. The Committee discussed the B.S. Mathematics program at its October 24 meeting, which was attended by the Chair of the Department, Julie Glass. It was approved by CIC unanimously with the acknowledgement that some non-substantive changes may occur in the Catalog copy. The proposal may be viewed within Curriculog; the summary is attached as a PDF document per ExCom’s request.
B.S. Mathematics

2. Semester Conversion Request for Approval of Revision of the Undergraduate Degree Program/Major

General Catalog Information

***READ BEFORE YOU BEGIN***

Use this form to request a revision to your Undergraduate Degree Program/Major and its concentration(s).

To change the title of your degree program, a narrative will need to be submitted to APGS for review by CIC and the state chancellor's office. Click here to submit your narrative.

To move an existing degree to online, complete form #7. Semester Conversion Request for Online/Hybrid Program Modification.

To elevate an option to a degree or change the degree type, a narrative will need to be submitted to APGS for review by CIC and the state chancellor's office, Click here to submit your narrative.

Turn on Help Text by clicking the Show Help Text icon above this section of the form.

Effective Term: Fall 2018

Catalog: 2018-2019

Select Shared Core unless otherwise instructed by APGS

Select Shared Core

Notes: If you want to move an existing degree program to online (i.e. 50% or more of the program can be completed online (a hybrid course counts as .50 online), elevate an option to a degree, or change the degree type, please e-mail Donna Wiley, Interim Associate Vice President, Academic Programs and Graduate Studies; and copy Sarah Aubert, Catalog and
Curriculum Specialist, Academic Programs and Graduate Studies, for additional instructions as soon as possible.

<table>
<thead>
<tr>
<th>Department:*</th>
<th>Department of Mathematics</th>
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<tbody>
<tr>
<td>Full and exact title of Major including degree earned:*</td>
<td>B.S. Mathematics</td>
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Has your program received transformation funding?*  
- [ ] Yes  
- [ ] No

If the program received transformation funding, please summarize the transformative changes made:
Summary of Transformative Changes made

The Bachelor of Science degree in mathematics has significantly transformed with the move to semesters.

Program transformation included changes in content and cognitive goals as well as changes in the overall structure of the major. These changes are reflected in new program learning outcomes and new processes and procedures in the department including strategic planning and robust and relevant actionable assessment. The goals of these changes are to modernize the major; to improve recruitment and retention of mathematics majors; to incorporate innovative pedagogy; to make the curriculum more relevant to STEM careers; and to incorporate tools, strategies, and skills needed in STEM fields and for a more informed citizenry.

Structural change: The major now includes a set of “core” courses required for all majors and sequences and electives more clearly connected. Scheduling will be more transparent allowing for better planning and facilitating graduation. Additionally, students will complete a capstone experience modeled on the High Impact Practice advocated by the AAC&U.

Content and cognitive change: The major now more clearly includes the transformed outcomes and objectives described below which will be introduced, developed and mastered according to a new curriculum map. These outcomes and objectives will be clearly communicated to students via departmental syllabi and through other department guides and publicity materials.

Transformed Outcomes and Objectives

1) The use of technology for exploration, computation, motivation and visualization. Students will be introduced to and asked to use a variety of technological tools: e.g., Matlab, Mathematica, Maple, Geogebra, etc. Knowledge and facility with technology enhances teaching and learning and has significant benefits after college and beyond the classroom.

2) A focus on applications to other fields and within mathematical fields to explore, motivate and illustrate the theory and practice of mathematics and other mathematically-intensive fields. The application of mathematics to
ideas and problems in a variety of areas will serve to deepen students’ understanding and appreciation of mathematical theory and also better prepare them for careers after graduation.

3) A capstone experience and other course work will help students develop the ability to work collaboratively, think independently, make connections and think beyond the standard course curriculum. Students will be guided to write and present complex mathematical ideas to an audience of peers.

The elements of transformation described above are strongly in line with the Mathematical Association of America's Committee on the Undergraduate Major Curriculum Guide (2015 edition). This guide describes cognitive and content goals that span the breadth of undergraduate programs in mathematics and reflect ongoing comprehensive conversations and research by leaders in mathematics in higher education. The department will continue to use and adapt the recommendations in this guide while keeping a sharp focus on CSU East Bay’s unique students and their needs as it develops a transformed program.
Program Description

Mathematics is an intriguing, interesting and beautiful subject. It is also challenging and rigorous. Students are drawn to mathematics because of its clarity and the joy of discovering solutions to difficult problems. The Department of Mathematics offers a strong Bachelor of Science degree that includes a variety of courses intended to prepare students for a career in any mathematics related field or other areas that value quantitative and problem-solving skills. The program allows flexibility in breadth and depth where students can choose among courses with applied and pure emphases. The faculty are committed to creating a welcoming environment and providing opportunities for undergraduates to explore mathematics within and beyond the classroom. There are a number of scholarships available for math majors to support their studies while at CSU East Bay.

An undergraduate major in mathematics is one of the best preparations not only for studying advanced Mathematics, but also for graduate work in Computer Science, Statistics, Operations Research, Actuarial Science, and the Natural Sciences. Math majors are encouraged to pursue a minor or double major in another discipline that supports their goals or interests.

Information for those considering a career as a high school teacher

Making specific choices within the Math BS leads to a certification for students applying for a credential program to teach high school mathematics. This single subject certification is approved by the State Board of Education and offers a great opportunity for Math Majors at CSU East Bay. The certification allows a student to waive taking the three required math California Subject Examinations for Teachers (CSETs). The mathematics teaching pathway in the major is indicated throughout by asterisks (*) for each required course. See the Single Subject Advisor when you are ready to plan your upper division courses.

Career Opportunities

Mathematics opens the doors to many promising careers. Mathematician is consistently listed among the top ranked jobs in Jobs Rated Almanac from CareerCast and many of the highest earning careers require strong mathematical skills. Many positions such as engineer, doctor, nurse, computer scientist, actuarial scientist, etc. require knowledge of mathematics. The analytical and problem-solving skills students learn in mathematics can apply to many other disciplines as well. In particular, math majors score among the highest on the LSAT and GMAT for entry into law school or for advanced study in business. A math major will prepare you for careers in academic, education, actuarial science
prepare you for careers in academia, education, actuarial science, business, computing, engineering, law, medicine, physical and life sciences and public service. Profiles of successful math majors can be found on the Mathematical Association of America’s Career Profiles webpage.

### Program Learning Outcomes

PLO #1: Apply the definitions, techniques and theorems of mathematics.

PLO #2: Use mathematics to understand, explain and/or solve problems beyond a particular course.

PLO #3: Creatively conjecture and rigorously write, analyze and critique proofs.

PLO #4: Communicate mathematics effectively.

STOP Click here to see instructions before completing the following Major Requirements field.

<table>
<thead>
<tr>
<th>Major Requirements:*</th>
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<tbody>
<tr>
<td><strong>Lower Division (13 units)</strong></td>
</tr>
<tr>
<td>MATH 130 Calculus I (4)</td>
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<tr>
<td>MATH 131 Calculus II (3)</td>
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<tr>
<td>MATH 230 Calculus III (3)</td>
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<tr>
<td>MATH 210 Linear Algebra with Differential Equations (3)</td>
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<tr>
<td><strong>Upper Division Core (18 units)</strong></td>
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<tr>
<td>MATH 300 Introduction to Mathematical Proof (3)</td>
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<tr>
<td>MATH 305 Mathematical Software (3)</td>
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<tr>
<td>MATH 310 Linear Algebra Theory (3)</td>
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<tr>
<td>MATH 320 Abstract Algebra I (3)</td>
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MATH 330 Analysis I (3)
MATH 489 Senior Seminar (3)

**Upper Division Theoretical Mathematics (6 units)**

Choose two courses from list I (6 units)

- MATH 321 Abstract Algebra II* (3)
- MATH 331 Analysis II (3)
- MATH 340 Modern Geometry* (3)

**Upper Division Applied Mathematics (6 units)**

Choose two courses from list II (6 units)

- MATH 370 Numerical Analysis I (3)
- MATH 375 Differential Equations I* (3)
- MATH 380 Linear Programming (3)

**Electives (6 units)**

Choose two elective courses (6 units)

- MATH 360 Number Theory* (3)
- MATH 440 Topics in Geometry (3)
- MATH 450 Combinatorics (3)
- MATH 470 Numerical Analysis II (3)
- MATH 475 Differential Equations II (3)
- MATH 497 Topics in Advanced Mathematics (3)
- STAT 316 Statistics and Probability for Science and Engineering* (3)

OR

Any upper division mathematics course not used to fulfill above requirements, except 318, 319, 402, 403 or 406.

OR

Any graduate level Math course

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**Total Units Required**

| Quarter Based Program:* | 72 | Semester Based Program:* | 49 |
Total Units should not exceed **120 Semester Units** unless previously approved by Chancellor’s Office for exemption.

**B.A. Programs**: Major requirements are a minimum of 24 units with at least 12 upper division units.

**B.S. Programs**: Major requirements are a minimum of 36 units with at least 18 upper division units.

See [Unit Calculator](https://csueastbay.curriculog.com/proposal:2665/print) for assistance.

Additional Notes/Information

Making specific choices within the Math BS leads to a certification for students applying for a credential program to teach high school mathematics. The certification allows a student to waive taking the three required math California Subject Examinations for Teachers (CSETs). This major pathway is indicated throughout by asterisks (*) for each required course. See the Single Subject Advisor when you are ready to plan your upper division courses.

If the program has a [similar transfer model curriculum (TMC)](https://csueastbay.curriculog.com/proposal:2665/print), please e-mail Kyle Burch, Articulation Officer, Academic Programs and Graduate Studies, to verify that the revised program meets the TMC requirements prior to submitting the program revision request form.

**Is the major approved as a "similar" degree under the STAR Act (SB 1440)?**

- [ ] Yes
- [ ] No
- [ ] I’m not sure (Articulation Office will contact you)

**If yes, explain how this modification will affect the "similar" degree agreement**

Modification is still under the similar degree guidelines.

**Were any concentrations (options) discontinued?**

- [ ] Yes
- [ ] No
The quarter based options in Pure, Applied, and Teaching Mathematics were all very similar. We found a way to combine them into one major, students are allowed to choose courses that match their interests.

Is this major approved as an online degree program?*  
☐ Yes  ☐ No

If no, is there any pathway in the revised degree that is more than 50% online?  
☐ Yes  ☐ No

Resource implications of the proposed revision, if any:  
n/a

Relationship of Revised Program to requirements for teaching credentials, accreditation, and/or licensing, if any:  
Making specific choices within the Math BS leads to a certification for students applying for a credential program to teach high school mathematics. The certification allows a student to waive taking the three required math California Subject Examinations for Teachers (CSETs). This major pathway is indicated throughout by asterisks (*) for each required course. See the Single Subject Advisor when you are ready to plan your upper division courses.

Consultation with other affected departments and programs:

The following department(s) has (have) been consulted and

The following department(s) has (have) been
No objections raised from consulted departments.

Attachments

Please scroll to the top of this form and select the Files icon to attach the following documents to your proposal:

- Bachelor's Degree Roadmap
- Curriculum Map 1 - PLOs to Courses
- Curriculum Map 2 - PLOs to ILOs
- Five Year Assessment Plan

Did you attach your Curriculum Maps, Five Year Assessment Plan or other supporting documents to this proposal?*  
- Yes
- No

Catalog Item Types

- Degree Type*  
  - Bachelor of Science

- Program Type*  
  - Bachelor
Attachments for B.S. Mathematics

**Math-bacc-degree-roadmap - Roadmap with GE.pdf** (uploaded by Kathy Hann, 5/10/2016 4:56 pm)

**Math BS Curriculum Map 1.pdf** (uploaded by Kathy Hann, 5/10/2016 4:56 pm)

**Math BS Curriculum Map 2.pdf** (uploaded by Kathy Hann, 5/10/2016 4:57 pm)

**mathbs5yearassessmentplan.pdf** (uploaded by Kathy Hann, 5/10/2016 4:57 pm)