May 15, 2013

MEMORANDUM

TO: Jayanth Banavar
Dean, College of Computer, Mathematical and Natural Sciences

FROM: Elizabeth Beise
Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to Modify the Curriculum of the Minor in Mathematics (PCC log no. 12044)

At its meeting on April 5, 2013, the Senate Committee on Programs, Curricula, and Courses approved your proposal to modify the curriculum of the Minor in Mathematics. A copy of the approved proposal is attached.

The change is effective Fall 2013. Please ensure that the change is fully described in the Undergraduate Catalog and in all relevant descriptive materials, including the program’s four-year plan (contact Lisa Kiely at lkiely@umd.edu for more information), and that all advisors are informed.

MDC/

Enclosure

cc: William Idsardi, Chair, Senate PCC Committee
Sarah Bauder, Office of Student Financial Aid
Reka Montfort, University Senate
Erin Howard, Division of Information Technology
Donna Williams, Institutional Research, Planning & Assessment
Anne Turkos, University Archives
Linda Yokoi, Office of the Registrar
Robert Gaines, Undergraduate Studies
Robert Infantino, College of Computer, Mathematical and Natural Sciences
James Yorke, Mathematics
THE UNIVERSITY OF MARYLAND, COLLEGE PARK
PROGRAM/CURRICULUM/UNIT PROPOSAL

• Please email the rest of the proposal as an MSWord attachment to pcc-submissions@umd.edu.

• Please submit the signed form to the Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus.

College/School: CMNS 01203000
Please also add College/School Unit Code-First 8 digits:
Unit Codes can be found at: https://hypprod.umd.edu/Html_Reports/units.htm

Department/Program: MATHEMATICS 1301901
Please also add Department/Program Unit Code-Last 7 digits:

Type of Action (choose one):

X Curriculum change (including informal specializations)  □ New academic degree/award program
□ Renaming of program or formal Area of Concentration  □ New Professional Studies award iteration
□ Addition/deletion of formal Area of Concentration  □ New Minor
□ Suspend/delete program  □ Other

Italics indicate that the proposed program action must be presented to the full University Senate for consideration.

Summary of Proposed Action:

Curriculum change in the Math Minor: Require MATH 310 (Introduction to Mathematical Proof) for the Traditional Track in the Math Minor. This proposal is submitted alongside with a similar proposal to add MATH 310 as a required course for all tracks in the Math Major. We are also submitted four related VPAC proposals: 1) changing the name of MATH 310 from “introduction to analysis” to “introduction to mathematical proof”; 2) amend the prerequisite requirements in the theoretical courses: MATH 403, MATH 405, and MATH 410, to C- in MATH 310 or equivalent.

====================================================================================

APPROVAL SIGNATURES - Please print name, sign, and date. Use additional lines for multi-unit programs.

1. Department Committee Chair  Darren Levy, 10/12/12
2. Department Chair  James A. Yorke, 10/14/12
3. College/School PCC Chair  Robert L. Bryant, 2/22/13
4. Dean  Joseph A. Burns, 2/22/13
5. Dean of the Graduate School (if required)
6. Chair, Senate PCC  Mwihizie, 4/5/13
7. University Senate Chair (if required)
8. Senior Vice President and Provost  May 16, 2013


PCC Proposal: Curriculum Change in the Math Minor.

Require MATH 310 for the traditional track in the Math Minor

Program: Mathematics
Degree Type: Bachelor of Science
Areas of Concentration: Traditional Math Minor
Requested Effective Date: FALL 2013.

Summary of proposed action:

- Add MATH 310, “Introduction to Mathematical Proof”, as a required course for the traditional track in the Math Minor.
- This proposal is submitted alongside
  i. A similar PCC proposal to add MATH 310 as a required course for all tracks in the Math Major.
  ii. A VPAC proposal to change the name of MATH 310 from “Introduction to Analysis” to “Introduction to Mathematical Proof”.
  iii. VPAC proposals to amend the prerequisite requirements in the theoretical courses: MATH 403, MATH 405, and MATH 410, to C- in MATH 310 or equivalent.

Rationale:

- Theoretical math courses are very different from lower level math courses, which are more applied and computational in nature. In order to do well in theoretical math courses, one needs to have mastered the skill of mathematical proof.
- During a recent study of MATH 410 (Advanced Calculus I), we found that the DWF rate over all sections taught over the past five year is approximately 30%. Since MATH 410 is a required course for the Major, many students have to retake it one or more times. A detailed examination suggested that the reason why so many students do not do well in theoretical courses like MATH 410, is due to the lack of sufficient preparation to handle mathematical proofs. Similar observations were made in our other entry-level theoretical math courses: MATH 403 (Introduction to Abstract Algebra) and MATH 405 (Linear Algebra).
- We are unable to teach the skill of mathematical proof in our lower level courses because our lower level courses are service courses for other departments and the course syllabi are unfortunately very full.
- As a result, many math minors who successfully complete our lower level math courses still lack the required skill of mathematical proof to do well in theoretical math courses. These students will benefit from a transitional course, MATH 310, before attempting theoretical math courses. In MATH 310 we teach
students the skill of mathematical proof in a way that prepares them for our theoretical 400-level courses.

Details of proposal:

1. **Proposed Action**
   - We propose to add MATH 310, "Introduction to Mathematical Proof", as a required course for all tracks in the Math Major.
   - This proposal is submitted alongside
     i. A similar PCC proposal to add MATH 310 as a required course for all tracks in the Math Major.
     ii. A VPAC proposal to change the name of MATH 310 from "Introduction to Analysis" to "Introduction to Mathematical Proof".
     iii. VPAC proposals to amend the prerequisite requirements in the theoretical courses: MATH 403, MATH 405, and MATH 410, to C- in MATH 310 or equivalent.

2. **Comments**
   - i. The current traditional track in the Math Minor requires students to take at least 19 credits. With the addition of MATH 310, the traditional track in the Math Minor will require students to take at least 22 credits.
   - ii. Attached to this proposal is a study plan for the traditional track in the Math Minor. MATH 310 is highlighted.
   - iii. We expect to allow exemptions for students who have mastered the concepts that would be needed for success in MATH 403, MATH 405, and MATH 410, as demonstrated by their coursework.

3. **Impact**
   - i. **Impact on Math Majors.** The list of mathematics courses that Math Minors in the traditional track will be required to take in order to satisfy the major requirement will increase by one. The increase in the number of courses for the major should have no impact on the averaged time to graduation. Taking MATH 310 should better prepare students for taking more theoretical, proof-based, courses that are an integral part of our degree program as it stands.
   - ii. **Impact on other Majors.** Adding MATH 310 as a prerequisite to MATH 403, MATH 405, and MATH 410, should not directly affect any other program.
   - iii. **Impact on General Education.** None. Since MATH 310 is an advanced Math course, this proposal has no impact on General Education.
   - iv. **Impact on the number of sections/seats in Math courses.** At present we are offering 3 sections of MATH 310 over the academic year. Given the current number of Math Majors (+Minors) that approaches 700, we expect to have to offer approximately 5-6 sections of MATH 310 every year. We also
expect that the increase in the number of sections of MATH 310 will be somewhat offset by a reduction in the number of sections of MATH 410 we will need to offer. All the extra sessions of MATH 310 will be taught by the Math Department without asking for any additional resources. The change will require no additional library resources.

4. Catalog Description

3 changes should be made in the catalog description of the Math Minor:

i. Add (as the third requirement, after MATH 240 or MATH 461):
   MATH 310, 3 Credits

ii. Change the text from “at least 19 credits” to “at least 22 credits”

iii. Change the text in the note from “to fulfill the 19-credit...” to “to fulfill the 22-credit...”

An annotated version of the present catalog description is attached to the proposal.
MINOR IN MATHEMATICS

IMPORTANT: Student must give one year advance notice and there must not be more than 6 shared credits with the major (if you have questions about the no-more-than-6-shared-credits rule, check with your major advisor). Student is responsible for making sure that all the pre-requisites are met prior to taking a course (see back page). No course may be used to satisfy more than one minor. A minimum grade of a “C-” is required for a course to count toward a minor. Student initials here --

Name of Student __________________________________________ University ID __________________________
Major__________________________________________ Estimated Date of Graduation ____________________

The requirements entail at least 22 credits (completed with a C or better):

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
<th>Grade</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>MATH 241 &amp; either MATH 240 or MATH 461</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>MATH 340 and MATH 341</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II.</td>
<td>MATH 310</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III.</td>
<td>At least one of the following core theoretical courses: MATH 403, 405, 410.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV.</td>
<td>At least one of the following algebra courses: MATH 401, 402, 403, 405, 406.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.</td>
<td>At least one of the following analysis courses: MATH 410, 414, 462, 463, 464.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI.</td>
<td>At least one of the following probability courses: STAT 400 or STAT 410.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If additional credits are needed to fulfill the 22-credit minimum, any 400-level MATH/STAT/AMSC courses except MATH 400, 477, 478, 480-484, 489, 498, and STAT 464 are acceptable.

 Total credits: at least 22
The Department of Mathematics offers a minor in Mathematics for students majoring in other disciplines. The goal of the minor in Mathematics is to provide the student with significant mathematical skills and a perspective on the discipline.

The requirements for the minor include at least 18 credits beyond first-year calculus and are outlined below:

- MATH241 4
- MATH240 or MATH451 (or MATH 340 and 341) 3-8
- At least one theoretical course from: MATH 403, 405, 410 3
- At least one algebra course from: MATH 401, 402, 403, 405, 406 3
- At least one analysis course from: MATH 410, 414, 462, 463, 464 3
- At least one probability course from: STAT400 or STAT410 3

Note: If additional credits are needed in order to fulfill the overall minimum, any 400-level MATH-STAT-AMSC courses except MATH 400, MATH 477-478, 480-484, 489, 498, and STAT 454 are acceptable.

Other issues related to the minor in Mathematics:

- The minor in Mathematics is NOT open to Mathematics majors.
- The student will need to achieve at least a C- (2.0) in each course to be applied to the minor in Mathematics.
- No more than 1 of the 400-level courses for the minor in Mathematics may be taken at an institution other than the University of Maryland, College Park.

The departmental advisor for this program is Ida Chan, Undergraduate Mathematics Advisor (ugadvisor@math.umd.edu).

Return to top