15BA, 15BS
Mathematics

Department of
Mathematical
Sciences

McMicken College of
Arts & Sciences

2014

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I. Program Overview

The BA and BS Mathematics programs provide students with a solid broad-based foundation in the fundamentals of mathematics (core courses). Both programs include more advanced elective courses in specialized areas of mathematics, chosen depending on the student's interest. Electives may be chosen from “pure” (theoretical) or applied mathematics. Fewer elective courses are required for the BA program than for the BS. These degrees culminate in a capstone experience, which is either an independent research or expository project, or participation in the capstone Seminar.

The requirements of both programs meet the standards necessary for admission to graduate school in mathematics, economics, business, finance, secondary education, or other quantitative fields. At the same time, students graduating from this program are prepared to pursue jobs requiring a strong mathematical background.

For the BS degree, students are required to gain exposure to another scientific discipline that uses mathematics and/or statistics for modeling or other applications via a two-semester sequence.
II. Program Outcomes

Current PLO (from P-1):
Students completing the undergraduate program in Mathematics with a concentration in Mathematics will be able to demonstrate understanding of core mathematical subjects by being able to correctly state and prove basic results and apply these results to solve mathematical problems.

Students will have developed additional depth in mathematics courses. Students will have gained skills in understanding and writing mathematical proofs and applying mathematical methods to solve real-world problems, and be able to communicate this knowledge effectively.

Students will be able to analyze mathematical problems and be able to formulate appropriate strategies for their solutions, demonstrating knowledge of what mathematical methods would need to be applied. Students will be able to understand academic mathematical writing in order to continue their learning.

ONLY for BS (not for BA): Students will have gained exposure to another scientific discipline that uses mathematics and/or statistics for modeling or other applications. Students will be able to demonstrate knowledge of introductory principles in this secondary discipline and the role mathematical sciences can play in furthering the objectives of this discipline.

At the completion of the BS (or BA) Mathematics Program, students will be able to:

1. State problems carefully, modify problems when necessary to make them tractable, articulate assumptions, appreciate the value of precise definition, reason logically to conclusions, and interpret results intelligently;

2. Read mathematics with understanding and communicate mathematical ideas with clarity and coherence through writing and speaking;

3. Use core (i.e. from the required math courses) knowledge & techniques in higher-level courses and real-life applications;

4. Analyze and create mathematical arguments leading to a written and an oral report.
III. Curriculum/Program Map

Curriculum

1. Required (Core) Courses for both BS & BA in Mathematics:
   - Math 1061 Calculus I;
   - Math 1062 Calculus II;
   - Math 2063 Multivariable Calculus;
   - Math 2073 Differential Equations OR Math 2074 Dynamical Systems;
   - Math 2076 Linear Algebra;
   - Math 3001 Intro to Abstract Math;
   - Math 3002 Intro to Analysis
   - Stat 2037 Probability & Stat I

2. Electives (a total of 6 math/stats electives at 3000 level or higher for BS; a total of 4 math/stats electives at 3000 level or higher for BA);


4. A sequence of 2 science courses for BS (the BA does not have this requirement).
Curriculum Mapping

<table>
<thead>
<tr>
<th>Key</th>
<th>Calculus I, II and Multivariable</th>
<th>Differential Eq OR Dynamical Systems</th>
<th>Linear Algebra</th>
<th>Intro Abstract Math</th>
<th>Probability &amp; Statistics I</th>
<th>Intro Analysis</th>
<th>Electives</th>
<th>Capstone</th>
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<tbody>
<tr>
<td>1. State problems carefully, reason logically, and interpret results intelligently;</td>
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<tr>
<td>2. Read and communicate mathematical ideas through writing and speaking</td>
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<tr>
<td>3. Use core knowledge and techniques</td>
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<td>E</td>
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<tr>
<td>4. Analyze and create mathematical arguments</td>
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Faculty in the Department of Mathematical Sciences use a wide range of assessment approaches. Different approaches have been adopted as a function of class type (lecture, laboratory or research), class size (large, introductory versus smaller upper division courses) and to some degree instructor style. These include:

Exams
Quizzes
Homework (online or written)
Oral presentations, individual
Group presentations
Capstone Paper & Exit survey

More in detail, we plan to work as follows:

1. Multi-section courses with uniform exams:

   Include specific types of items (e.g. free-response multiple-choice) or topics on common exams. Course coordinators tabulate points on these items and send info to Assistant Department Head or UPD

   **Note:** The Calculus courses are taken by many students who are not math majors (mostly engineers) and that the data collected in these courses is not crucial in the Program Assessment (it is just informative).

2. Multi-section courses w/o common exams:

   Syllabus contains a statement of a specific goal we want assessed. Instructors agree to use certain activities or assignments and to include assessment of these in course grade. AsstDept Head or UPD obtains course grades.

3. Small courses with 1-2 sections (Intro to Abstract... Intro Analysis...some Electives):

   Syllabus contains statement of specific goal and required assignments. Instructors report to Assist Dept Head UPD on student's performance on these assignments.

4. Capstone project/ Capstone seminar:

   Syllabus requires written and/or oral presentation of student work. Advisor/instructor reports to UPD on each student's performance.
<table>
<thead>
<tr>
<th>Program</th>
<th>Assessment Tools</th>
<th>Course/ Experience</th>
<th>Time Line</th>
<th>Responsible Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>State problems carefully, reason logically, and interpret results intelligently</td>
<td>Syllabus contains a statement of a specific goal we want assessed. Instructors agree to use certain activities or assignments and/or rubrics and to include assessment of these in course grade. AsstDept Head or UPD obtains course grades.</td>
<td>Linear Algebra; Intro Abstract Math Probability &amp; Stats I Capstone</td>
<td>Sophomore year Senior year</td>
<td>Instructors; Course Coordinators; Assistant Department Head; Undergrad Program Director (UPD)</td>
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<tr>
<td>Read and communicate mathematical ideas through writing and speaking</td>
<td>Syllabus contains statement of specific goal and required assignments. Instructors report to AsstDept Head UPD on student's performance on these assignments. Rubric for assessing capstone paper/presentation</td>
<td>Diff Eq/Dynamical Systems; Linear Algebra; Intro Abstract Math; Intro Analysis</td>
<td>Years 2 and 3</td>
<td>Instructors; Course Coordinators; Assistant Department Head; Undergrad Program Director (UPD)</td>
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<tr>
<td>Use core knowledge &amp; techniques in higher-level courses and real-life applications</td>
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<td>Prob &amp; Stat I, Intro to Abstract Math; Intro to Analysis Electives Capstone project/ Capstone seminar</td>
<td>Last 2-3 years of College</td>
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IV. Assessment Infrastructure

The Undergraduate Affairs Committee will be charged with handling assessment of the BA/BS programs. The UAC is chaired by the Undergraduate Program Director with three to four other faculty appointed by the head of department; there will also be input from the Undergraduate Advisors (5-6 faculty members, also appointed by the Department Head). The UAC will put in place a plan to gather and organize the data and to produce an annual report. The Undergraduate Program Director will participate in the gathering and organization of the data. The UAC will conduct its annual assessment in the autumn and will disseminate the report to the faculty by the end of fall semester. This report may contain specific recommendations for changes in the program which will be considered for implementation by the full faculty at subsequent faculty meetings.