ACADEMIC PLANNING SELF-STUDY
2012

DEPARTMENT OF MATHEMATICS & STATISTICS
TASSO KAPER, CHAIR

OCTOBER 12, 2012

STEP I. THE CURRICULAR CONTEXT

A. Degrees and minors offered by the Department of Mathematics & Statistics

1. Undergraduate and Graduate Degrees

    a. BA concentration in Mathematics
        1. Specialty in Pure and Applied Mathematics
        2. Specialty in Statistics
    b. BA joint concentration in Mathematics and Philosophy
    c. BA joint concentration in Mathematics and Computer Science
    d. BA joint concentration in Economics and Mathematics
    -BA/MA in Economics
    e. Mathematics and Mathematics Education
    f. BA/MA in Mathematics and Cognitive and Neural Systems
    g. MA in Mathematics, including Statistics and Probability
    h. Post-bachelors PhD in Mathematics, including Statistics and Probability
    i. Post-MA PhD in Mathematics, including Statistics and Probability
    j. Biostatistics (Joint Program with School of Public Health)

2. Undergraduate Minors

    a. Minor in Mathematics
    b. Minor in Mathematical Statistics
    c. Minor in Statistical Methods

B. Undergraduate majors offered by other departments and programs that depend on coursework in your department

Majors	Pre-Requisites/ Required
Astronomy	MA 123 + MA 124,MA 225, MA 242
Astronomy and Physics	MA 123, +MA124, MA 225, MA226, MA242
Geophysics and Planetary Science	MA 123 + MA 124 or MA 127 or MA 129, MA 225
BA in Biochemistry and Molecular Biology	MA 121, MA 122 or MA 123, MA 124, or MA115, MA 213, 214 or one of MA 121-MA 129
Biology	MA 121, MA 122 or MA 123, MA 124, or one of MA 121-MA 129, MA 213, MA 214
Biology with Specialization in Ecology and Conservation Biology	MA 121, MA 122 or MA 123, MA 124, or one of MA 127,MA 129, MA !96, MA 115, MA 116, MA 213, MA 214
Biology with Specialization in Marine Science	MA 213 + one of MA 123, 124, 127, or MA129
Biology with Specialization in Neuroscience	MA 121, MA 122 or MA 123, MA 124 or MA 115 or MA 213

BA/MA Computer Science and Cognitive and Neural Systems	MA 123, MA 124, MA 242
BA/MA Mathematics and Cognitive and Neural Systems	MA 123, MA 124, MA 242 all requirements for BA in Math and Cognitive and Neural Systems required
BA/MA Psychology and Cognitive and Neural Systems	MA 123, MA 124, MA 242
Earth Science	MA 123, MA 124 or MA 127 or MA 129, MA 411, MA561, MA562
Environmental Earth Science	MA 123, MA 124 or MA 127 or MA 129
Concentration in Geophysics and Planetary Sciences	MA 123, MA 124 or MA 127 or MA 129, MA 225
Economics	MA 121 or MA 122 or MA 123, MA 124 or MA 127 or, MA 129, MA 213, MA 214
Geography with Specialization in Human Geography	MA 121, MA 122 or MA 123, MA 124 or MA 127 or MA 129, MA 213
Geography with Specialization in Physical Geography	MA 123, MA 124 or 127 or 129, MA 213
Environmental Science	MA 123, MA 127, MA 129, MA 213, MA 225, MA 226
Environmental Analysis and Policy	MA 121 or MA 123, MA 213
Philosophy and Physics	MA 123, MA 124, MA
Philosophy and Psychology	MA 115, MA 116
Philosophy and Mathematics	MA 123, MA 124 or 127 or MA 129, MA 225 or MA 230, MA 242, MA 293, MA 294 or MA 341, MA 411, MA 412, MA442, MA 511, MA 512, MA 531, MA 532, MA294 any course 400 and above
Physics Option I	MA 123, MA 124 or 127, MA 225 and MA 200+
Physics Option II	MA 123, MA 124 or MA 127 or MA 129, MA 225, MA 242, MA 411, MA 412, MA 561
BA/MA Physics	MA 123, MA 124 or 127, MA 225, MA 242, MA 200+, MA 411, MA 412, MA 531, MA 561
Psychology	MA 115, MA 116 or MA 214
Sociology	MA 113 or MA 115 or MA 213

2. Undergraduate majors and degrees outside CAS

Majors	**Pre-Requisites/ Required**
College of Communications	MA 113, MA 115
College of Engineering	MA 123, MA 124, MA 127, MA 225, MA 226
ENG BS Aerospace Engineering	MA 123, MA 124, MA 225, MA 226
ENG BS Biomedical Engineering	MA 123, MA 124, MA 142, MA 225, MA 226
ENG BS Computer Systems Engineering	MA 123, MA 124, MA 193, MA 225, MA 226
ENG BS Electrical Engineering	MA 123, MA 124, MA 225, MA 226
ENG BS Manufacturing Engineering	MA 123, MA 124, MA 225, MA 226
ENG BS Mechanical Engineering	MA 123, MA 124, MA 225, MA 226
MET BS in Computer Science	MA 118,MA123, MA124, MA 225, MA

	226, MA 242
MET BS in Mathematics	MA 226, MA 242
MET MS in Actuarial Science	MA 226
MET Certificate in Pre-Medical Studies	MA 575, MA 585
SAR Behavioral Science Sequence	MA 121, MA 122
SAR Behavioral Science Sequence	MA 118 or MA 121
SAR Nutritional Science Sequence	MA 121, MA 122
SAR Athletic Training Curriculum	MA 118 or MA 121
SAR Speech, Language, and Hearing Sciences	MA 113 or MA 115, MA 118 or MA 121
SAR Speech, Language, and Hearing Sciences BS/MS	MA 115, MA 118 or MA 121
SAR Health Science	MA 113
SAR Human Physiology	MA 113, MA 121, MA 122
SAR Nutritional Science	MA 115, MA 116, MA 121, MA 122
SAR Dietetics Sequence	MA 115, MA 116
SAR Physical Therapy	MA 118 or MA 121
SAR Physical Science Sequence	MA 121, MA 122
School of Education	One Mathematics Course MA 113, MA 115, MA 116, MA 120, MA 121, MA 121, MA 123, MA 124, MA 127, MA 129, MA 213, MA 214
School of Management	MA 121 or MA 123
SHA BS in Hospitality Administration	MA 113 or MA 115, MA 120

3. Undergraduate Minors

Minors	Pre-Requisites/ Required
Business Administration	MA 123, MA 124 or 127 or MA 129, MA 225 or MA 230
Psychology	MA 113 or MA 115 or MA 213
Public Health	MA 115 or MA 213
College of Engineering	MA 123, MA 124, MA 226

C. Graduate programs offered by other departments and schools that depend on coursework in your program

1. GRS Master Programs outside your department.

Department	Courses
Applied Linguistics Program	MA 613, MA 614
Bioinformatics	MA 555, MA 565, MA 614
Biostatistics (Joint Program with the department)	MA 575, MA 576, MA 578, MA 581, MA 582, MA 583, MA 584, MA 587, MA 684, MA 685, MA 751, MA 781, MA 782, MA 861, MA 882
Cognitive and Neural Systems	MA 123, MA 124, MA 242 *Prerequisites
Two Courses that can be taken outside of CNS	MA 561, MA 562, MA 563, MA 565, MA 570, MA 573, MA 574, MA 581, MA 583, MA 684, MA 685, MA 717, MA 718, MA 771, MA 775, MA 776, MA 781, MA 782, MA 785

Earth Sciences	MA 411, MA 561, MA 562, MA 575, MA 576
Energy and Environmental Studies	MA 569, MA 570
-MA in Energy and Environmental Analysis	MA 684
- Electives	MA 565, MA 569, MA 570
International Relations	MA 113, MA 115, MA 614, MA 684 *Statistics Requirement
Neuroscience	MA121or MA123, MA124, MA 113 and MA 115,MA 555, MA 565, MA 573, MA 574, MA 771
Psychology	MA 614
Sociology	MA 614, MA 684

2. GRS Doctoral Programs.

Same as shown in table for Master's Program above with additional PhD programs as listed.

Department	Courses
Psychology	MA 614, MA 684

3. Non-GRS Graduate Degrees

Department	Courses
ENG MS in Mechanical Engineering	MA 555, MA 556, MA 562, MA 713, MA 759, MA 761, MA 773
ENG LEAP Aerospace Engineering	MA 124, MA 225, MA 226
ENG LEAP Biomedical Engineering	MA 123, MA 124, MA 225, MA 226, MA 381
ENG LEAP Computer Systems Engineering	MA 124, MA 142, MA 193, MA 225, MA 226
ENG LEAP Electrical Engineering	MA 124, MA 142, MA 193, MA 225, MA 226
ENG LEAP Manufacturing Engineering	MA 123, MA 124, MA 225, MA 226
ENG LEAP Mechanical Engineering	MA 124, MA 225, MA 226
ENG LEAP Photonics	MA 123, MA 124, MA 225, MA 226
MET Master of Science in Actuarial Science	MA 123, MA 124, MA 225, MA 230 *Prerequisites MA 575, MA 581, MA 582, MA 585, MA 590
SAR Doctoral Program in Rehabilitation Sciences Psychology	MA 614, MA 684
SED Master of Mathematics for Teaching	MA 541, MA 547, MA 548, MA 549, MA 647, MA 648 and two math electives
Mathematical Finance	MA 123, MA 124, MA 225, MA 242, MA 226, MA 511, MA 512 *Prerequisites MA 569, MA 590, MA 711, MA 717, MA783

D. College Requirements and Programs: Writing, Foreign Language, Math, General Education (Core Curriculum, and Divisional Studies, Including Honors)

1. Core Curriculum

The department has contributed lecturers to the Core in the past. In recent years, the amount of mathematics and statistics in the Core has been minimized. In fact, the Core is sometimes advertised to students as a way to avoid the MCS divisional studies requirement. This is disappointing, given the importance of numeracy in our modern world.

Members of our department have been working with members of the Department of Computer Science to develop courses that give an introduction to our subjects. These courses introduce our fields as part of the liberal arts and address basic issues of numeracy. MA/CS 109 was offered for the first time in Spring '09 and it was offered again in Fall '09 and Spring '10, with high enrollments. It is currently being offered, and we plan to continue to offer it each semester for the foreseeable future.

2. College Honors Programs

The Department of Mathematics and Statistics has a sequence of four honors courses. These courses pre-date the College Honors Program by a number of years. Our goal is to provide to students who would like a more challenging introduction to mathematics an opportunity to pursue the subject more deeply during their freshman and sophomore years. Our honors courses are not restricted to our majors, and many students in the sciences and other disciplines take them.

The department considers these courses to be central to our program. Each is offered once per year and is available to CAS Honors Program students (HP section) and to students in CAS and other colleges (A1 section).

MA 129: Honors Calculus: This course is ideal for freshmen who have a very strong background in calculus from high school and who wish to study mathematics in general, and calculus in particular, at a more sophisticated level. The emphasis is on presenting both the calculus material they already know along with new material at a level more rigorous than the standard calculus sequence.

MA 230: Honors Multivariable Calculus: While covering the material of MA 225, this course emphasizes the relationship between the geometry of functions in three and more dimensions and the calculus. Additional topics are added and greater emphasis on vector analysis (which comes quickly at the end of MA 225) is given. This course does not assume familiarity with the topics of MA 129 and, therefore, is available to students who have done well in MA 127 or MA 124.

MA 231: Honors Differential Equations: The emphasis of this course is on applications of mathematics to the sciences. The material of MA 226 is covered with greater emphasis on

modeling. Students may take this course after MA 230 or MA 225.

MA 442: Honors Linear Algebra: While this course is an introduction to linear algebra, mathematical rigor (theorem/proof) is emphasized throughout. Both the topics and the approach are appropriate for mathematics and science students.

3. Teaching seminars toward fulfillment of the College Writing requirement.

Professor Emma Previato's new first-year seminar, MA 141, designed for the Honors College will also fulfill the writing requirement.

4. Implementation of the foreign language requirement

The department does not contribute to the implementation of the foreign language requirement.

5. Divisional Studies courses that also serve as gateways to the MA Majors

Currently, the department offers a range of introductory courses for MCS divisional studies credit:

MA 109, MA 113, MA 115, MA 116, MA 120, MA 121, MA122, MA 123, MA 124, MA 127, MA 129, MA 213, MA 214

This range of courses in mathematics and statistics allows students to choose courses appropriate to their background. Courses numbered MA 123 and above are considered introductory courses for majors. However, students sometimes choose to major or minor in mathematics or statistics after taking one of the courses numbered below MA 123.

6. Divisional Studies courses that *do not* also count toward majors in the department or division

As noted above, MA 113, MA 115, MA 116, MA 120, MA 121, MA 122 are considered introduction to statistics and mathematics courses for non-majors. However, students can continue in mathematics and statistics after these courses and, with careful advising, can continue without delaying their program or retaking higher numbered courses that cover similar topics.

7. Offering selected courses that are not important for fulfilling requirements for your major(s) or minor(s), but which are in very high demand by students because of their interests.

As noted in the data provided in Parts B and C above, our 100/200-level courses appear frequently in the requirements of other departments and other schools. We are also often asked to develop more courses to address specific areas for interdisciplinary study. Students complete their MCS Divisional Studies requirements with MA courses that are also requirements of their major. While we have a very healthy number of undergraduate majors, they are never in the majority in our 100-level courses and very seldom in the majority in our 200-level courses. There are also a number of statistics courses at the 400-

to 600-levels with sizeable enrollments (some rivaling or surpassing many of our 100/200-level courses) composed largely of non-majors. These include MA 416, MA 575, MA 581, MA 582, MA 614, and MA 684.

8. Any other aspects of the CAS curriculum you want to mention

Our faculty members have active interdisciplinary interests in both teaching and research at the undergraduate and graduate level. Our involvement in the development of the new quantitative biology major and the proposal to develop a neuroscience major are two examples. It is clear that mathematics and statistics will remain central to the development of many fields, and we are enthusiastic about helping this development.

This situation provides both opportunities and frustration for the department. Recently a number of mathematics and statistics courses have appeared in other schools and departments. We believe that these courses are unnecessary and an economic burden on the institution.

As one example of inefficiency, consider MA 142 and ENG EK 102. Both are two-credit courses in linear algebra. A linear algebra course has a natural home in mathematics. Having two courses in different schools covering the same material dilutes the student base in both schools.

A similar and particularly frustrating example is the history of the MA 381, an introductory undergraduate course in probability. This course was offered to a large contingent of engineering students and served a useful role for our majors and others in CAS wishing an introduction to the subject at the 300-level. It was regularly taught by Professor Murad Taqqu, a distinguished probabilist on our faculty.

Without consultation, the College of Engineering initiated its own course (EC 381). This course covers the same material as MA 381 and uses a mathematics text. Three years ago ENG even asked us if we knew of someone who could and would be willing to teach EC 381.

A similar example has occurred with CS 232. The course as originally proposed covered geometric topics in computer science. While teaching the course, it was found that students needed prerequisite material from linear algebra, and the syllabus was completely rewritten to cover this material. The result is a course in linear algebra with minimal applications to computer science. We have attempted to discuss this situation with the Department of Computer Science without success. It should also be noted that the new syllabus has never been submitted to the Natural Sciences Curriculum Committee for approval. In Spring '08 and Spring '09, it was taught by a graduate student in Computer Science.

Additional Comments:

The department works hard to provide a "students-to-seats" ratio that is as close to one as possible. Since so many departments require mathematics and statistics courses as prerequisites, it is our responsibility to make sure that students can take the courses they

need in a timely fashion. When required courses reach their enrollment limits, we definitely hear from other departments. Predicting future enrollments is challenging, particularly with freshmen classes.

While it is tempting to use a "just-in-time" approach, i.e., opening new sections as needed at the last minute, this approach is not optimal. Faculty are often fully committed to courses a year in advance by budget requirements and needs of the department. Seeking instructors at the last minute is particularly difficult. Experienced teachers at this level are in high demand in the Boston area. In order to keep a talented instructor, we must guarantee a certain number of courses well before the beginning of the semester.

Traditionally, many 100/200-level MA courses have been taught in large lecture sections (100 to 125 students) with teaching fellows holding four to five discussion sections of approximately 25 students each. Our ability to offer large sections is limited by the number of teaching fellows funded by GRS and by the availability of large lecture halls. In order to provide sufficient seats for multi-section classes, we offer smaller sections with enrollment limits in the 50-75 student range.

While many students are completely comfortable with (and often prefer) large lecture classes, there is a population of students that prefers these smaller sections, so even if we had an unlimited source of teaching fellows and large lecture halls, we would want to retain a few "small" sections of our large courses.

The department is continuing to develop new offerings that will be of interest to a wide range of undergraduates, especially those in their first year. Professor Emma Previato's new first-year seminar MA 141, Mathematics and Society through the Ages: Codes and Cryptosystems, was taught for the first time in Spring '10. Professor Steve Rosenberg has developed MA 150, Investigations in Geometry, which was offered as a seminar in the Honors College in Academic year 2011/2012, and Professor Glenn Stevens has developed MA 148, Investigations in Number Theory, also as a seminar for the Honors College which was offered in Spring '12.

STEP II: ASSESSMENT OF SPECIFIC COURSE NEEDS

A. Obligations toward undergraduate education.

1. Courses that must be taught every semester:

The following courses are currently taught every semester. They have consistently high enrollments and are taught in multiple sections. Ideally, faculty should teach these courses, but the size of our permanent faculty does not allow anything close to this. To fill this gap, we are working to make sure that as many of these courses as possible have at least one full time, tenured faculty member as one of the lecturers. This faculty member will serve as a resource for the instructors teaching the other sections. Unfortunately, even this modest requirement is impossible to meet with the size of our faculty. For those multi-section courses for which we are unable to staff even one section with a tenured faculty member, our Undergraduate Committee serves as advisor and mentor for instructors.

Course	Total Sections Fall '11	Fall '11 Total Enrollment	Total Sections Spring '12	Spring '12 Total Enrollment	Total Sections	Total Enrollment
MA 109	1	65	1	59	2	124
MA113	3	348	2	250	5	598
MA115	4	486	2	257	6	743
MA116	1	100	2	186	3	286
MA118	1	27	1	16	2	43
MA120	2	80	1	55	3	135
MA121	6	666	3	313	9	979
MA122	1	87	2	146	3	233
MA123	4	509	1	121	5	630
MA124	3	313	3	389	6	702
MA127	1	39	-	-	1	39
MA142	1	38	1	8	2	46
MA193	1	28	1	21	2	49
MA213	1	158	1	126	2	284
MA214	1	47	1	45	2	92
MA225	3	370	3	272	6	642
MA226	1	126	3	343	4	469
MA242	3	86	2	63	5	149
MA293	1	29	1	21	2	50

MA 109 The Art and Science of Quantitative Reasoning: A survey course on topics in Mathematics, Statistics and Computer Science providing an introduction to these disciplines as intellectual endeavors and emphasizing their interrelatedness. Satisfies MCS Divisional Studies credit.

MA 113 is designed to be a one-semester, terminal introduction to statistics for students with a minimal technical background. This course serves a number of majors in sociology and various SAR programs.

MA 115/MA 116 is designed to be a basic two-semester introduction to statistics. The student population includes students majoring in psychology, sociology, and certain of the SAR programs, as well as minors in statistical methods and minors in psychology and in public health.

MA 118 College Algebra and Trigonometry: We offer one section of this remedial course each semester.

MA 120 Applied Mathematics for Social and Management Sciences: This introductory course covers a number of techniques of particular use for business and management. It is a requirement for SMG students and is taken by many students in CGS.

MA 121 Calculus for Life and Social Sciences I: This course is the first half of a terminal sequence in calculus. It is satisfies the mathematics requirement for a number of majors including biology and economics.

MA 122 Calculus for Life and Social Sciences II: The continuation of MA 121.

MA 123 Calculus I: A traditional first semester course in calculus for students in engineering and science. It is required for all ENG students (without AP credit) and satisfies the requirement in calculus for many CAS majors.

MA 124 Calculus II: The continuation of MA 123.

MA 127 Enriched Calculus: Covers additional material from Calculus II on and prepares students for MA225.

MA 142 Introduction to Linear Algebra: This is a two-credit introduction to linear algebra which is offered as a service course for ENG students. Even though ENG offers EK 102, they still want us to offer this course.

MA 193 Discrete Mathematics for Engineering: This is a two-credit introduction to discrete mathematics which is offered as a service course for ENG students.

MA 213/MA 214 is a two-semester introductory sequence in statistics aimed at students likely to continue with additional courses in statistics. This course serves majors in various tracks of biology, economics, and in geography, as well as our own statistics majors.

MA 225 Multivariate Calculus: The third semester of calculus for engineering and physical science students. This course is required for all ENG students as well as astronomy and physics majors.

MA 226 Differential Equations: This is the fourth semester of the calculus sequence. This course is required for all ENG students. Over the last 15 years, we have revised this course so that it includes a significant modeling component.

MA 242 Linear Algebra: A traditional introduction to linear algebra. It is required for all astronomy, physics, and mathematics majors. In the past, we taught many ENG and CS students, but now most ENG students take ENG EK 102 and most CS students take CS 232.

MA 293 Discrete Mathematics: This is an introduction to topics of importance in mathematics and computer science.

2. Courses offered annually:

Our annual offerings include one remedial course, the honors courses, and the 200/300/400- and 500/600-level courses necessary for our majors and minors, majors in other departments and, for 500-level courses, beginning graduate students in mathematics, statistics, and other departments. The breadth of subject areas included in the department is considerable. To provide an intellectually viable program for our majors, we must provide introductory courses in most major areas of mathematics and statistics. Some of these courses have remarkably large audiences. One example is MA 581. It draws many students from economics. Other examples include MA 561/562, which draws graduate students from ENG, MA 565, a required course for the quantitative biology major, and MA 541, a central course in the Masters in the Art of Teaching program for students who want to become high school math teachers.

Overall, the enrollment in our 500-level courses is quite robust. Generally, our undergraduates are ready for most 500-level courses only in their senior year. Courses not offered yearly are therefore only available to every other graduating class. There will always be courses that do not have large enrollments, but if they were missing from our program, it would deprive the students of the opportunity to learn a large area of mathematics.

Class size becomes an issue for courses numbered above 226. These courses cover material of increasing mathematical rigor and require more intensive interaction with faculty. While there are a few upper level courses that are taught in the large lecture/discussion section format, this scheduling is due solely to the imbalance between demand for the course and the supply of faculty

MA 119: This unusual course is a “half semester” course that Professor Hall offers only to designated ENG students who need special attention so that they can succeed in MA 123. These students take MA 123 concurrently.

Honors Courses: MA 129, MA 230, MA 231, MA 442. These courses were described earlier in this document.

MA 127: This course is a difficult one to describe. It is intended for freshman who have taken calculus in high school and who are not quite ready for MA 225. Many of these students are our best math students, but they do not have the inclination to take MA 129.

Upper-level courses (detailed below): MA 294, MA 341, MA 411, MA 412, MA 416,

MA 471, MA 511, MA 512, MA 531, MA 532, MA 541, MA 542, MA 555, MA 556, MA 561, MA 562, MA 563, MA 564, MA 565, MA 569, MA 573, MA 581, MA 582, MA 583, MA 590, MA 614, MA 684, MA 685

MA 294 provides an introduction to combinatorics and abstract algebra for both mathematics and computer science students.

MA 341 is an introduction to number theory. This is a central area of mathematics with a rich history. Moreover, it has found many recent applications in coding and security. It is of interest to mathematics and computer science students and serves as an introduction to more rigorous courses at the 500 level.

MA 411/412 and MA 511/512: All pure and applied math majors are required to take one of these two sequences in analysis. These courses also draw students from physics, economics, and engineering.

MA 416 is an intermediate statistics course required of all statistics majors and all minors in statistical methods. It is also popular with students majoring in psychology and sociology.

MA 471 is an introduction to chaotic dynamics. It meets with MA 671, which is popular with SED graduate students. This course serves as an introduction to the upper-level course offerings in dynamical systems and ordinary differential equations.

All pure and applied mathematics majors are required to take one 500-level sequence in addition to the analysis sequence. These sequences include MA 531/532 (mathematical logic), MA 541/542 (algebra), MA 539/555/556 (numerical analysis), MA 561/562 (methods of applied mathematics including partial differential equations), MA 563/564 (geometry and topology), MA 573/565/574 (ordinary differential equations), and MA 581/582/583 (probability and statistics). Faculty in the associated research groups usually teach these courses.

MA 569 is a course in operations research. It is required for those in the joint concentration in economics and mathematics, and it is also popular with students who major in economics. For many years it was also a required course in the Program in Mathematical Finance, but SMG is now offering its own version, MF 769, of this course.

Statistics majors must take MA 575 (linear models), MA 581 (probability), and either MA 582 (mathematical statistics) or MA 583 (stochastic processes). MA 581 is also popular among a large number of outside majors, particularly economics.

MA 590 is a graduate level introduction to probability, which is slightly more advanced than MA 581. Registration is restricted to MA students in the Mathematical Finance Program

MA 614 is offered as a service course for other graduate departments whose students need an introduction to statistics.

MA 684 is required of all minors in statistical methods and is a popular choice among our statistics majors as one of their two required 500-level electives.

MA685 is also popular among our statistics majors in fulfillment of elective requirements and also among our minors in statistical methods for their one elective requirement.

3. Courses that are offered every other academic year (or as available staffing allows):

MA 539 Methods of Scientific Computing: As the name suggests, this course involves the use of the computer to help produce meaningful computational results. Professor Samuel Isaacson offered this course in Spring '10, and we plan to offer it again in AY 2011-2012.

MA 557 Mathematical Structures in Physics

MA 574 Applied Nonlinear Dynamics: Until two years ago, we offered this course every year for at least a decade. However, now that MA 565 has been revived for the quantitative biology track, we plan to offer this course less often.

The following statistics courses are among those that have been taught roughly every other year on average recently, although the actual frequency depends upon a combination of faculty availability and interests, as well as periodic requests from other departments: MA 568 (statistical analysis of point process data), MA 578 (Bayesian statistics), MA 584 (multivariate statistical analysis), MA 585 (time series), MA 587 (sampling design), MA588 (nonparametric statistics). Primarily our statistics majors take these courses in fulfillment of their requirement of two 500-level elective courses.

B. Obligations toward graduate education.

1. Which courses and course types should be offered every semester?

One 800-level seminar course in statistics (e.g., 881, 882, 884) is offered each semester. Instruction of such courses is rotated among the statistics faculty. These courses are currently the only PhD-level courses in statistics offered beyond the basic required sequences in the three areas of applied statistics, mathematical statistics, and probability (see below).

2. Which courses and course types should be offered annually?

Many of the 500-level courses in mathematics cited in Part A also play a role in our graduate program. Some beginning graduate students take them to fill gaps in their backgrounds.

At the 700-level, the core courses in mathematics are MA 711 (measure theory and Lebesgue integration), MA 721/722 (differential topology), MA 741/742 (graduate-level algebra), MA 771 (dynamical systems), MA 775 (ordinary differential equations).

MA575/576, supplying a classical foundation in applied statistics, are required of all MA students in statistics, and usually necessary for our PhD students in statistics. MA575 is also required of all MA students in biostatistics.

MA684/685, covering multivariable and multivariate statistics, have for years served as popular courses for graduate students in fields like psychology, sociology, and education.

MA779/780 and MA781/782, supplying foundations in probability and in mathematical statistics, respectively, are required of all of our PhD students in statistics. MA781/782 are also required of all PhD students in biostatistics.

3. Which courses and course types should be offered every other academic year?

MA 713 (graduate complex analysis) is a classic graduate course in mathematics which we offered each spring until Spring '08. However, after reviewing enrollment numbers, we have decided to experiment with offering it every other year.

MA 717 is a standard graduate course in functional analysis. It is also a required course for the PhD in Mathematical Finance.

MA 725 is a graduate-level introduction to differential geometry.

MA 727/728 is a one-year sequence in algebraic topology. We alternate offering MA 725 and MA 727/728.

MA 731 is a one-semester course in Lie Groups that is offered once every two or three years.

MA 750/751, covering post-classical applied statistics, are required of all PhD students in statistics.

MA 770 is a new course that involves mathematical and statistical methods in bioinformatics.

MA 831 is a topics course in mathematical physics.

MA 876 is the seminar in partial differential equations that Professor Wayne offers each spring in addition to his usual teaching load.

Over the last 10 years, we have also offered 700-level courses in algebraic number theory and algebraic geometry, and 800-level seminars in number theory and geometry. Our future offerings at this level have been a topic of considerable debate within the department. The schedule that we have drafted for next year contains a different mix of courses. These offerings are being proposed after significant discussion among the faculty and the advanced graduate students.

STEP III: PLANNING FOR EFFECTIVE, EFFICENT, EQUITABLE, and SUSTAINABLE COURSE STAFFING:

Our offerings are generally divided between mathematics and statistics courses (although there are courses that touch both fields), and this division is respected in the assignment of courses.

Courses up to and including the 500-level are of sufficiently general nature and the members of the department have broad enough interests that a variety of faculty can teach them. This flexibility permits a consistent set of offerings for our undergraduates when individual faculty members take leave, sabbatical, or obtain grant funded course releases.

The sheer number of sections of 100/200-level courses that we must offer as service to the college and university, along with the 300-to-600-level courses we must offer for a viable major and as service for those needing upper-level material means that we will have to make extensive use of instructors for the foreseeable future. Indeed, in recent years we have had to use instructors even for some 500-level courses simply because no tenured faculty member was available.

Our commitment to enhancing the experience of all undergraduates continues to expand, but is threatened by staffing issues. We have embraced our responsibility to reach out to other departments to create interdisciplinary courses, to provide courses for the Honors College, to teach in the Core and to develop new courses. We have enthusiastically engaged in the RULES program for revision of our Freshman sequences, all while enrollments continue to grow and the importance of mathematics and statistics in the curriculum continues to expand. Staffing issues remain the primary obstruction to our continuing these efforts.

In order to make the best of our current situation, we have established the following guidelines:

1. All faculty are encouraged to teach 100/200-level courses regularly. These include large lecture classes and the Honors classes, which the department feels are as important as large lecture classes. However, sometimes the needs of the department, our majors, or our clients require that certain faculty be assigned to more advanced courses.

2. Whenever possible, large lecture multi-section classes will have at least one section taught by a tenured faculty member, and this individual will serve as a resource and mentor to the instructors teaching the course. Ideally, this would be true of all multi-section classes. However, even with the recent replacements and additions to our faculty, the size of our faculty does not allow us to guarantee this.

3. Where it is not possible for a tenured faculty member to teach a section of a multi-section course, the Undergraduate Committee will serve as resource and mentor of the instructors.

The following tables indicate our plan for staffing our courses over the next three years. As was discussed above, it was natural to divide our offerings into two groups, mathematics and statistics, and the following tables reflect this division.

In conversation with members of the Dean's Office, it was noted that some of our documents that described the proposed teaching of new hires used enrollment limits rather than projected enrollments. Please note that these tables use projected enrollments. These projections are based on actual enrollments from 1997 to 2012.

MATHEMATICS THREE YEAR PROJECTIONS FALL

Course		Title	Proj Enrl	Fall 2013	Proj Enrl	Fall 2014	Proj Enrl	Fall 2015
MA 109	A1	The Art and Science of Quantitative Reasoning	71	Hall	71	Kolaczyk	71	Hall
MA 118	A1	College Algebra and Trigonometry	40	Kimura	40	P/T Lecturer	40	P/T Lecturer
MA 119	A1	Pre-calculus Review	30	N/O	30	Hall	30	N/O
MA 120	A1	Applied Mathematics for Social and Management Science	30	F/T Lecturer	30	P/T Lecturer	30	FT Lecturer
	B1		50	P/T Lecturer	50	F/T Lecturer	50	P/T Lecturer
MA 121	A1	Calculus for Life and Social Sciences I	125	F/T Lecturer	125	P/T Lecturer	125	P/T Lecturer
	B1		50	Fried, Isaac	75	Fried, Isaac	75	Fried, Isaac
	C1		125	Post Doc	125	P/T Lecturer	125	F/T Lecturer
	D1		125	P/T Lecturer	125	F/T Lecturer	125	P/T Lecturer
	E1		125	F/T Lecturer	125	P/T Lecturer	125	P/T Lecturer
	F1		125	F/T Lecturer	125	P/T Lecturer	125	P/T Lecturer
	G1		100	F/T Lecturer	100	P/T Lecturer	100	P/T Lecturer
MA 122	A1	Calculus for Life and Social Sciences II	125	F/T Lecturer	125	F/T Lecturer	125	P/T Lecturer
MA 123		Calculus I – RULES Coordinator		Blanchard		Mueser		Blanchard
			TF's	F/T Lecturer		F/T Lecturer		F/T Lecturer
	A1		150	F/T Lecturer	150	F/T Lecturer	150	F/T Lecturer
	B1		150	Blanchard	150	Arazyan	150	Blanchard
	C1		150	Post Doc	150	Szczesney	150	Post Doc
	D1		150	Wayne	150	Hall	150	Wayne
MA 124	A1	Calculus II	134	F/T Lecturer	134	F/T Lecturer	134	F/T Lecturer
	B1		133	Meuser	125	Post Doc	125	Mesuer
	C1		133	Szczesny	133	Meuser	133	Szczesny
MA 127	A1	Enriched Calculus	50	Hall	50	P/T Lecturer	50	Hall
MA 129	A1	Honors Calculus	20	Stevens	20	Stevens	20	Stevens
MA 142	A1	Introduction to Linear Algebra	50	P/T Lecturer	50	F/T Lecturer	50	P/t Lecturer
MA 193	A1	Discrete Mathematics for Engineering	30	F/T Lecturer	30	P/T Lecturer	30	F/T Lecturer

MA 225	A1	Multivariate Calculus	125	Rohrlich	125	F/T Lecturer	125	Rohrlich
	B1		125	Previato	125	Previato	125	Previato
	C1		125	Rohrlich	125	F/T Lecturer	125	Rohrlich
	D1		50	F/T Lecturer	50	F/T Lecturer	50	F/T Lecturer
MA 226	A1	Differential Equations	125	Devaney	125	Devaney	125	Devaney
MA 231	A1	Honors Differential Equations	20	P/T Lecturer	20	P/T Lecturer	20	PT Lecturer
MA 242	A1	Linear Algebra	35	F/T Lecturer	35	Blanchard	35	F/T Lecturer
	B1		35	Fried, D	35	Isaacson	30	Rosenberg
	C1		35	Rosenberg	35	Rosenberg	35	Fried, D
MA 293	A1	Discrete Mathematics	35	Kanamori	35	Stevens	35	Kanamori
MA 411	A1	Advanced Calculus	50	Kon	50	Rohrlich	50	Kon
MA 471/ MA 671	A1	Chaotic Dynamical Systems (Meets with MA671)	45	Devaney	45	Devaney	45	Devaney
MA 511	A1	Introduction to Analysis I	50	Pollack	50	Fried, D	50	Pollack
MA 531	A1	Mathematical Logic	30	Kanamori	30	Kanamori	30	Kanamori
MA 541	A1	Modern Algebra I	40	F/T lecturer	40	Weinstein	40	F/T Lecturer
MA 556	A1	Numerical Analysis II	20	Fried, Isaac	20	N/O	20	Fried, Isaac
MA 561	A1	Methods of Applied Mathematic I	30	Isaacson	30	Kon	30	Isaacson
MA 563	A1	Introduction to Differential Geometry	30	Fried, D	30	Li	30	Fried, D
MA 565	A1	Mathmod Life Science	30	Isaacson	30	N/O	30	Isaacson
MA 569	A1	Optimization Methods Of Operation Research	30	Lam	30	Lam	30	Lam
MA 573	A1	Qualitative Theory of Ordinary Diff Equations	20	Hall	20	N/O	20	Hall
MA 665	A1	Introduction Mathematical Methods in Neuroscience	20	Kramer	20	Kramer	20	Kramer

MA 666	A1	Advanced Modeling and Data Analysis in Neuroscience	20	Kramer	20	Kramer	20	Kramer
MA 671	A1	Chaotic Dynamical Systems (meets with 471)	10	Devaney	10	Devaney	10	Devaney
MA 711	A1	Real Analysis	20	Weiner	20	Weinstein	20	Weiner
MA 721	A1	Differential Topology I	20	Kimura	20	Szczesny	20	Kimura
MA 725	A1	Differential Geometry I		N/O	5	Rosenberg		N/O
MA 727	A1	Algebraic Topology I	20	Szczesny	20	Fried, D	20	Szczesny
MA 731	A1	Lie Groups Lie Alg	20	Li	20	N/O	20	Li
MA 741	A1	Algebra I	10	Meuser	10	Previato	10	Mesuser
MA 745	A1	Algebraic Geometry I	10	Previato	10	N/O	10	Previato
MA 775	A1	Ordinary Differential Equations	20	Kaper	20	Kaper	20	Kaper
MA 776	A1	Partial Differential Equations	10	Wayne	10	Wayne	10	Wayne
MA 783	A1	Advances Stochastic Processes	15	N/O	15		15	N/O
MA 822	A1	Seminar Topics in Geometry	5	N/O	5	N/O	5	Rosenberg
MA 831	A1	Topics in Mathematical Physics	5	N/O	5	Rosenberg	5	N/O
MA 843	A1	Advanced Number Theory I	10	Weinstein	10	N/O	5	Weinstein
MA 844	A1	Advanced Number Theory II	10	N/O	10	Fried, I	10	N/O
MA 871	A1	Seminar Dynamical Systems	10	N/O	10	Wayne	8	N/O

STATISTICS THREE YEAR PROJECTION FALL

Course		Title	Proj Enrl	Fall 2013	Proj Enrl	Fall 2014	Proj Enrl	Fall 2015
MA 113	A1	Elementary Statistics	125	F/T Lecturer	125	Weiner	125	F/T Lecturer
	B1		90	D'Agostino	90	P/T Lecturer	90	D'Agostino
	C1		125	P/T Lecturer	125	F/T Lecturer	125	P/T Lecturer
	D1		125	Weiner	125	PT Lecturer	125	Weiner
MA 115	A1	Statistics I	125	F/T Lecturer	125	F/T Lecturer	125	F/T Lecturer
	B1		125	Spiliopoulos	125	Spiliopoulos	125	Spiliopoulos
	C1		125	F/T Lecturer	125	F/T Lecturer	125	F/T Lecturer
	D1		125	P/T Lecturer	125	P/T Lecturer	125	P/T Lecturer
	E1		125	F/T Lecturer	125	P/T Lecturer	125	F/T Lecturer
MA 116	A1	Statistics II	125	F/T Lecturer	125	F/T Lecturer	125	F/T Lecturer
MA 213 RULES	A1	Basic Statistics and Probability	26	Eden	26	Post Doc	26	Eden
	B1		130	Eden	130	Eden	130	Eden
MA 214	A1	Applied Statistics	50	Balachandran	50	Eden	50	Post Doc
UPPER DIVISION COURSES								
MA 416	A1	Intermediate Statistical Methods	60	P/T Lecturer	60	P/T Lecturer	60	P/T Lecturer
MA 568	A1	Statistical Anal of Point Proc Data	20	N/O	20	Eden	20	N/O
MA 575	A1	Applied Regression & Analysis Variance I	70	New Hire	70	Kolaczyk	45	New Hire
MA 577	A1	Mathematics of Financial Derivatives	30	Guasoni	30	Guasoni	30	Guasoni
MA 578	A1	Bayesian Stats	30	Carvalho	30	N/O	30	Carvalho
MA 581	A1	Probability	75	Taqqu	75	Weiner	75	Taqqu
MA 588	A1	Nonparametric Statistics	30	F/T Lecturer	30	N/O	30	F/T Lecturer
MA 5XX		New Course		Eden		Eden		Eden
MA 614	A1	Statistical Methods	75	P/T Lecturer	70	P/T Lecturer	70	P/T Lecturer
MA 681	A1	Acc Intro Stats Meth	30	F/T Lecturer	30	N/O		FT Lecturer
MA 685	A1	Advanced Topics in App Stat Analysis	30	P/T Lecturer	30	P/T Lecturer	30	P/T Lecturer

GRADUATE COURSES								
MA 750	A1	Advanced Statistical Methods I	10	N/O	10	Gangopadhyay	10	N/O
MA 779	A1	Probability Theory I	8	Taqqu	8	Taqqu	8	Taqqu
MA 781	A1	Estimation Theory	15	F/T Lecturer	15	Gangopadhyay	15	N/O
MA 881	A1	Statistics Seminar	5	P/T Lecturer	5	Kolaczyk	5	New Hire

MATHEMATICS THREE YEAR PROJECTIONS SPRING

Course		Title	Proj Enrl	Spring 2014	Proj Enrl	Spring 2015	Proj Enrl	Spring 2016
MA 109	A1	The Art and Science of Quantitative Reasoning	40	Kolaczyk	40	Hall	40	Kolaczyk
MA 118	A1	College Algebra and Trigonometry	30	P/T Lecturer	30	F/T Lecturer	30	F/T Lecturer
MA 120	A1	Applied Mathematics for Social and Management Science	125	F/T Lecturer	125	F/T Lecturer	125	F/T Lecturer
MA 121	A1	Calculus for Life and Social Sciences I	120	F/T Lecturer	120	F/T Lecturer	120	F/T Lecturer
	B1		120	F/T Lecturer	120	Fried, Isaac	120	Fried, Isaac
	C1		75	Fried, Isaac	75	F/T Lecturer	75	Szczesny
MA 122	A1	Calculus for Life and Social Sciences II	100	F/T Lecturer	100	P/T Lecturer	100	P/T Lecturer
	B1		100	P/T Lecturer	100	F/T Lecturer	100	F/T Lecturer
MA 123	A1	Calculus I	125	F/T Lecturer	125	P/T Lecturer	125	F/T Lecturer
MA 124		Calculus II RULES Coordinator		F/T Lecturer	125	F/T Lecturer	125	F/T Lecturer
			TFs	F/T Lecturer		F/T Lecturer		F/T Lecturer
	A1		150	Kimura	150	Blanchard	150	Kimura
	B1		150	Hall	150	Pollack	150	Hall
	C1		150	F/T Lecturer	150	Meuser	150	F/T Lecturer
MA 142	A1	Introduction to Linear Algebra	30	F/T Lecturer	20	P/T Lecturer	20	F/T Lecturer
MA 148	A1	Investigation in Number Theory	20	Stevens		N/O	20	N/O
MA 150	A1	Investigation in Geometry	20	N/O	20	Rosenberg	20	N/O
MA 193	A1	Discrete Mathematics for Engineering	30	F/T Lecturer	30	F/T Lecturer	30	F/T Lecturer
MA 196	A1	Introductive Quantitative Biology	30	P/T Lecturer	30	P/T Lecturer	30	P/T Lecturer
MA 225	A1	Multivariate Calculus	125	F/T Lecturer	125	F/T Lecturer	125	F/T Lecturer
	B1		100	Postdoc	100	Weinstein	100	Beck
	C1		75	F/T Lecturer	75	F/t Lecturer	75	Kaper
	D1		50	Rohrlich	50	N/A	50	

MA 226	A1	Differential Equations	125	Hall	125	Blanchard	125	Blanchard
	B1		125	Devaney	125	Devaney	125	Devaney
	C1		60	Guasoni	60	F/T Lecturer	60	F/T Lecturer
MA 230	A1	Honors Multivariate Calculus	10	Kaper	10	Szczesny	10	Sczcesny
MA 242	A1	Linear Algebra	30	P/T Lecturer	30	Blanchard	30	Blanchard
	B1		30	F/T Lecturer	30	Kon	30	Kon
	C1		30	Pollack	30	Pollack	30	Pollack
MA 293	A1	Discrete Mathematics	35	P/T Lecturer	35	P/T Lecturer	35	P/T Lecturer
MA 294	A1	Applied Abstract Algebra	30	P/T Lecturer	30	New Hire Number Theory	30	New Hire Number Theory
MA 341	A1	Introduction to Number Theory	30	P/T Lecturer	30	Meuser	30	Meuser
UPPER DIVISION COURSES								
MA 412	A1	Complex Variables	50	Szczesny	35	Kaper	35	Szczesny
MA 442	A1	Honors Linear Algebra	15	Rohrlich	15	Weinstein	15	Rohrlich
MA 505	A1	History of Math	50	N/O	50	Kanamori	50	N/O
MA 512	A1	Introduction to Analysis I	15	Weinstein	15	Fried, D	15	Weinstein
MA 528	A1	Intro to Modern Geometry	15	Previato	15	Rosenberg	15	Previato
MA 532	A1	Foundations of Math	10	Kanamori	10	Kanamori	10	Kanamori
MA 539	A1	Methods of Scientific Computing	25	N/O	25	Isaacson		N/O
MA 542	A1	Modern Algebra II	20	P/T Lecturer	20	P/T Lecturer	20	P/T Lecturer
MA 555	A1	Numerical Analysis I	15	Fried, Isaac	15	Fried, Isaac	15	Fried, Isaac
MA 562	A1	Methods of Applied Mathematics II	10	F/T Lecturer	10	Wayne	10	F/T Lecturer
MA 564	A1	Introduction to Topology	10	Rosenberg	10	Post Doc	10	Kimura
MA 565	A1	Math Models in Life Science	20	Isaacson	20	N/O	20	Isaacson

GRADUATE COURSES								
MA 713	A1	Functions of a Complex Variable	8	Blanchard		F/T Lecturer	8	Blanchard
MA 717	A1	Functional Analysis	10	Kon		N/O	10	Kon
MA 722	A1	Differential Topology II	5	Rosenberg	5	Kimura	5	Rosenberg
MA 726	A1	Diff Geom II	5	N/O	5	Szczesny	5	N/O
MA 727	A1	Algebraic Topology I	5	N/O		N/O	5	Rosenberg
MA 731	A1	Lie Groups	8	Kimura		N/O	8	Kimura
MA 742	A1	Algebra II	5	Rohrlich	5	Previato	5	Previato
MA 745	A1	Algebraic Geometry I	5	See Fall '11		N/O	5	Meuser
MA 746	A1	Algebraic Geometry II	10	New Hire Number Theory		N/O	10	New Hire Number Theory
MA 770	A1	Mathematical and Statistical Methods of Bioinformatics	10	N/O		N/O	10	Kon
MA 771	A1	Intro Dynamical Systems	5	Devaney	5	Blanchard	5	Devaney
MA 776	A1	Partial Differential Equations	10	N/O		Post Doc	10	N/O
MA 822	A1	Topics in Geometry and Topology	5	Post Doc		Li	5	Post Doc
MA 842	A1	Seminar: Algebra	5	N/O	5	Stevens	5	N/O
MA 844	A1	Adv Num Theory II	5	Pollack	5	N/O	5	Pollack
MA 872	A1	Seminar: Dynamical Systems	5	N/O	5	Hall	5	N/O
MA 876	A1	Seminar: Partial Diff. Equations	5	Wayne	5	Wayne	5	Wayne

STATISTICS THREE YEAR PROJECTION SPRING

Course		Title	Proj Enrl	Spring 2014	Proj Enrl	Spring 2015	Proj Enrl	Spring 2016
MA 113	A1	Elementary Statistics	125	Weiner	125	Weiner	125	Weiner
	B1		125	F/T Lecturer	125	D'Agostino	125	F/T Lecturer
	C1		125	D'Agostino				D'Agostino
MA 115	A1	Statistics I	125	F/T Lecturer	125	P/T Lecturer	125	F/T Lecturer
	B1		125	New Hire	125	F/T Lecturer	125	New Hire
MA 116	A1	Statistics II	125	FT Lecturer	125	F/T Lecturer	125	FT Lecturer
	B1		100	Lam	100	PT Lecturer	125	Lam
MA 213 RULES	A1	Basic Statistics and Probability	125	Carvalho	125	Carvalho	125	Carvalho
MA 214 RULES	A1	Applied Statistics	75	Gangopadyay	75	F/T Lecturer	75	Gangopadyay
UPPER DIVISION COURSES								
MA 570	A1	Stochastic Methods of Oper Research	10	Lam	10	N/O	10	Lam
MA 576	A1	App Reg. & Analysis of Var. II	30	Carvalho	10	Kolaczyk	10	Carvalho
MA 578	A1	Bayesian Statistics	10	N/O	10	F/T Lecturer	10	N/O
MA 582	A1	Mathematical Statistics	50	Weiner	35	Weiner	35	Weiner
MA 583	A1	Introduction to Stochastic Processes	30	Eden	20	Spiliopoulos	20	Eden
MA 584	A1	Multivariate Statistical Analysis	30	N/O	10	New Hire	10	N/O
MA 585	A1	Time Series Analysis	30	Gangopadhyay	15	N/O	15	Gangopadyay
MA 684	A1	Multivariate Analysis	115	F/T Lecturer	100	F/T Lecturer	100	F/T Lecturer
MA 751	A1	Advanced Statistical Methods II	8	Kon	8	N/O	8	N/O
MA 780	A1	Probability Theory II	5	Taqqu	5	Taqqu	5	Taqqu
MA 782	A1	Hypothesis Test	15	Kolaczyk	15	Kolaczyk	15	Gangopadhyay
MA 882	A1	Statistics Seminar II	5	Spiliopoulos	5	Post Doc	5	Spiliopoulos
MA 884	A1	Seminar: Probability and Statistics	5	F/t Lecturer	5	F/T Lecturer	5	F/T Lecturer

STEP IV: EXECUTIVE SUMMARY OF UPDATES AND TEN-YEAR PLANNING

1. UPDATES:

In the last paragraph of Step I, we briefly describe the new seminar courses that we are developing to be offered in the Honors College.

In Step II.A.1 we updated the enrollment figures in the table.

In various places in Step II, we updated course descriptions to reflect the fact that the Program in Mathematical Finance has moved to the School of Management.

Our offerings of MA120, MA121, and MA122 have undergone significant revision to reflect the changes in requirements that were made at CGS and SMG.

In Step III we updated the three-year staffing plan.

2. GOALS AND PLANNING:

Over the coming ten years, mathematics and statistics will play an ever-increasing role in technology and society. Data is generated in ever-vaster amounts, and data-interpretation plays an ever-more central role in fields ranging from biology to engineering, and from economics to the social sciences.

The Mathematics and Statistics Department plans to further build on its long history of generating essential statistics and probability theory for making sense of data and for developing cutting edge mathematics that answers pressing scientific and engineering questions. In addition, the Department plans to deepen its already active participation in campus-wide initiatives in the areas of bioinformatics, neuroscience, quantitative reasoning for College majors, systems biology, University Honors College, and a variety of outreach programs ---such as Focus on Mathematics, our Math Science Partnership with area high schools, and PROMYS, our Summer program for gifted high school students.

The Department's research program and teaching mission in core areas of mathematics are in serious need of additional faculty, especially in the areas of algebra & number theory and of geometry & topology.

The group in number theory consists of only four faculty, three who will be of retirement age in the coming ten years and one who was just promoted to associate professor. The junior member in this group is one of the most successful researchers nationally and internationally in his age group. For us to retain him, and for us to maintain our internationally recognized stature in this field, it is imperative that three additional faculty be hired in number theory over the next five to ten years.

Our core research and teaching missions in geometry and topology are also in significant need of revitalization over the coming ten years. The group is currently below critical mass in terms of faculty and graduate students. In this group also, three members will be of retirement age in this

period. The lack of critical mass has had a deleterious effect on our ability to attract the brightest PhD students in these fields. Indeed, over the past three years, we have lost a series of highly qualified PhD applicants to comparable (and even some lesser) schools due to the relatively small size of the core faculty in geometry, topology, and mathematical physics. The lack of critical mass of faculty in these fields, as well as in algebra & number theory has also negatively impacted our ability to offer a well-developed graduate curriculum.

The search planned for this current 2012-13 AY to hire one mathematician in Statistics is a critical first step in the essential endeavor of getting these core disciplines above critical mass. We are grateful for the administration's strong support for this search this year. It represents a small first, but much needed, installment in the overall effort for us to maintain our stature as a Group I mathematics department, a ranking which we have held since 1996 and which, as measured by our success in research funding, we eminently deserve to retain. Finally, we observe that we are in the strongest position to attract new faculty to BU in the coming five years while our current faculty are still in their prime. The longer we wait, the harder it becomes.

2. The curricular context, course needs, and course staffing:

At the undergraduate level, we foresee that ---over the coming ten years--- the numbers of students enrolled in mathematics and statistics courses will increase somewhat above the extremely high current level. In particular, we are developing a number of new courses and revising existing course offerings to reflect the growing demand among students from various majors, including mathematics and statistics majors.

We are developing new courses jointly with the Biology Department to help establish a major-track in quantitative biology. The first course, MA/BI 196 is already in place; it focuses on quantitative methods to analyze problems in ecology and physiology, and grew out of two very successful quantitative biology modules developed and taught by Prof. Mark Kramer (then a BW postdoc with us) and Postdoc Erik Sherwood over the past three years. There are two other new quantitative biology courses, MA 665/666 (Kramer), which was offered for the first time in Fall 2011 as two credit courses and which is again a success this fall. Additional new courses were developed by Professors Eden, Isaacson, Kopell, and Kramer, all from our group in mathematical biology and neuroscience, in full collaboration with various faculty in biology and BME. The goals include both filling the demand among a good segment of biology and BME majors for courses with some additional quantitative content, as well for fulfilling the demand among mathematics and statistics majors who want to take courses in which the theory they have studied is applied to central problems in biology.

We have developed three new courses for the Kilachand Honors College, the first of which, MA 141, was offered by Prof. Previato this Spring, and the other two of which, MA 148 and MA 150, were developed by Professors Rohrlich and Rosenberg and will be offered 2012-13. Over the next ten years, we plan to propose additional honors courses at the 200--500 levels, which will expose BU students to important fundamental questions that mathematics and statistics can help answer.

At the graduate level, we have embarked on an effort to return the size of the PhD program from its current low of approximately 53 PhD students back to the level of 60 PhD students, which was the

average size approximately throughout the 1990s and the first half of this decade. Our first effort in this direction has already been successful. We have been awarded another GAANN grant from the US Department of Education to support three PhD students per year. We had previously had such a grant for a period of nine years, which helped us substantially to attract some of the best and brightest American PhD students, and we are now looking forward to a similar boost. More external support is being sought, and the CBD RTG has been important for achieving this goal. If the algebra number theory group's RTG proposal is successful also, that would be another positive step (and conversely, if it is not, there is more reason to help increase the number of faculty to above critical mass, so that it can compete effectively for grants).

Course development in the area of probability and stochastic processes is another activity being pursued actively by our group in this field, including Professors Taqqu, Lam, Spiliopoulos and Guasoni.

We are also actively involved with the campus-wide effort which began in Fall 2009, to redesign the bioinformatics curriculum, with Professors Kon, Carvalho and Kolaczyk joining in the campus-wide effort.