The University Senate of Michigan Technological University

Proposal 26-14

(Voting Units: Academic)

"Proposal for a new Bachelors of Science degree in Statistics"

Department of Mathematical Sciences

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1 General description and characteristics of program

The proposed bachelor's degree in Statistics will give students a solid foundation in theory, applied methodology, and computing, preparing them for the workforce or for graduate program in statistics and related areas. The curriculum is balanced, requiring three courses on statistical theory (probability and two semesters of mathematical statistics), four courses on practical techniques (regression analysis, design of experiments, time series analysis, and predictive modeling), and two courses that focus on computing (statistical programming and analysis, and introduction to SAS programming). In addition, it requires the completion of a three-course cognate emphasis approved by an advisor, as well as a course in professional and technical communication.

A detailed description of the program is provided in Section 15, where we compare our proposed degree with the curriculum guidelines published by the American Statistical Association.

2 Rationale

In recent years, at least two trends have resulted in an increasing number of students studying statistics. First, the amount of data collected and analyzed by businesses and industries has grown (in many cases, dramatically), leading to more demand for individuals with expertise in analyzing data. Many of these positions are in "analytics" (business analytics, medical analytics, predictive analytics, etc.), but a knowledge of statistical theory and practice is an excellent background for analytics positions. Second, enrollment in high school AP statistics courses has increased, resulting in more students choosing to study statistics in college.

These trends have been documented by the American Statistical Association. In "More Than 1 Million and Counting: The Growth of Advanced Placement Statistics" (AMSTAT News, September 2012), it was reported that nearly 160,000 students took the AP Statistics exam in 2012. The article "A Major Trend: The Rise of Undergraduate Programs in Statistics" (AMSTAT News, August 2012) discusses the recent growth in bachelor's degrees in statistics from the point of view of several universities that have seen increasing numbers of majors. Based on interviews with program directors at the universities featured in the article, the author concludes that the growth in the AP Statistics program has led directly to an increased number of students majoring in statistics. "Growing Numbers of Stats Degrees" (AMSTAT News, May 2013) presents the data on students majoring in statistics at the undergraduate and graduate levels. Although there are still relatively few undergraduate majors in statistics (only about 850 bachelor's degrees granted in 2011), the numbers have increased by about 40% from 2009 to 2011 and about 78% from 2003 to 2011.

The increase in the number of statistics degrees is also consistent with the increased demand for graduates with these degrees. For example, statistics is listed as one of the most valuable college degrees in a study done by Payscale.com:

> Analysts at Payscale compared its massive compensation database with 120 college majors and job growth projections through 2020 from the U.S. Bureau of Labor Statistics

(BLS) to determine the 15 most valuable majors in the current marketplace. . . . Math and science concentrations are also well-represented on this list. Biochemistry (No. 2), computer science (No. 3), applied mathematics (No. 10), mathematics (No. 11), physics (No. 14) and statistics (No. 15) majors are increasingly in demand and well-paid. [Forbes (www.forbes.com), 5/15/2012, "The 15 Most Valuable College Majors"]

Perhaps a more authoritative source of information is the *Occupational Outlook Handbook* published by the Bureau of Labor Statistics:

> Employment of statisticians is projected to grow 27 percent from 2012 to 2022, much faster than the average for all occupations. Growth is expected to result from more widespread use of statistical analysis to make informed business, healthcare, and policy decisions.
>
> . . .
>
> Statisticians typically need a graduate degree in statistics or mathematics. However, there are an increasing number of positions available for those with only a bachelors degree. [BLS Occupational Outlook Handbook, January 2014]

Graduates with the proposed B.S. in Statistics will be well-prepared to enter a master's degree program or enter the job market directly.

The Department of Mathematical Sciences currently offers a bachelor's degree in Mathematics with a concentration in Statistics. We believe that a bachelor's degree in Statistics will have more visibility, particularly to high school students whose experience with AP Statistics has inclined them to major in Statistics, and therefore lead to a higher enrollment. Also, as discussed below, offering the degree within the Mathematics major is somewhat constricting; it implies more mathematics courses than is common in statistics degrees. A stand-alone statistics degree can be better targeted to the needs of statistics majors.

With respect to the University's strategic plan, this program supports Goal 2.1 *(Integration of research, instruction, and innovation that achieves the University Student Learning Goals)*, specifically, *strengthen existing programs and develop new offerings in emerging interdisciplinary areas.* The existing concentration in Statistics within the bachelor's degree in Mathematics will be replaced by a stronger bachelor's degree in Statistics.

3 Discussion of related programs within the university and at other institutions

Mathematics degree at Michigan Tech The Department of Mathematical Sciences offer a bachelor's degree in Mathematics with a concentration in Statistics. This concentration provides a strong foundation in statistics, equivalent to most programs surveyed at other universities (see below). However, it requires eight courses in Mathematics, while most bachelor's degrees in statistics require four or five Mathematics courses. On the other hand, it requires essentially no cognate courses, whereas many programs at other universities requires students to choose a cognate area (in which statistics is typically applied) and take several related courses in that area.

The proposed bachelor's degree in Statistics will replace several theoretical courses in Mathematics with a cluster of applications-oriented courses in a cognate area. We believe that this will make the degree more attractive to students interested in statistics because of its utility in science, engineering, or business.

Assuming this proposal is approved, the department intends to shelve the concentration in Statistics.

Data Science at Michigan Tech There is currently a proposal before the university to create an interdisciplinary master's degree and a graduate certificate in Data Science. These programs will focus on the analysis of "big data." Either program would be a natural next step for a student with a bachelor's degree in statistics.

Statistics degrees at other universities We chose six undergraduate statistics programs for comparison. Three (North Carolina State University, Brigham Young University, and UC-Berkeley) were featured in a recent American Statistical Association (ASA) webinar on "Curriculum Guidelines for Undergraduate Programs in Statistical Science," another (Carnegie Mellon University) was featured in a recent article in the ASA newsletter on the growth of the statistics major, and two additional programs from large schools (University of Illinois and University of Michigan) were chosen.

The following table summarizes the requirements of the various programs in mathematics, statistics, and cognate courses:

University	# Math.	# Statistics	# cognate	total
UC-Berkeley	4	6	3	13
NC State	5	10	5	20
BYU	4–6	12–14	0	18
Illinois	4–5	8–9	0	13
Michigan	4–6	7–9	0	13
Carnegie Mellon	4–5	8–9	4	17
mean	4.7	9.0	2.4	15.7
Michigan Tech	8	9	0	17

As noted above, our current concentration in Statistics requires a typical number of statistics courses. The specific courses required vary from program to program. It is typical to include an introductory statistics course and courses on probability, regression, statistical computing, and one or two courses on statistical theory, all of which we propose to include. Our additional courses are commonly found in other programs, although most often they are included on lists of statistics electives. The only significant difference between our proposed courses and the programs we used for comparison is that the other programs, being larger, usually offer more advanced statistics electives.

4 Projected enrollment

The concentration in Statistics offered within the bachelor's degree in Mathematics has graduated 22 students in the last eight years (2.75 students per year). Our goal is to increase the graduation rate by approximately 1–2 students per year until we reach a steady-state of at least ten graduates per year. (We would welcome even more students and could probably handle twice that number in our advanced statistics courses. However, we believe that a steady-state average of ten graduates per year is realistic.)

In terms of enrollment (rather than average number of graduates), our goal is to increase the current enrollment of 10–12 students studying the Statistics concentration to a steady-state of 40 students majoring in Statistics.

The new degree program will be reviewed after three and six years, specifically, in the Spring semesters of 2017 and 2020. The review will encompass the curriculum and enrollment in both the major and in the required courses, as follows:

1. In Spring 2017, the curriculum will be compared to the new ASA curriculum guidelines, which are expected to appear in the next year or two. (In Section 15 below, we compare the proposed program to the current ASA guidelines, which are about 12 years old.) Adjustments will be made as needed to make sure our curriculum is as good as possible.
2. Enrollment in the major will be compared with our goals, as stated above. We should have approximately 25 students enrolled in the major by Spring 2017 and 40 by Spring 2020.
3. Enrollment in key courses will be reviewed to see if more sections are needed. Although some required courses (e.g. MA3720, MA4760, MA4770) are not currently close to capacity, two of the applied courses (MA4710, MA4720) are already popular because they are useful for students from other departments.

5 Scheduling Plans

Regular.

6 Curriculum design

Major requirements

Course #	Title	Credits
MA1160	Calculus with Technology I	4
MA2160	Calculus with Technology II	4
MA2330	Introduction to Linear Algebra	3
MA2710	Introduction to Statistical Analysis	3
MA3160	Multivariable Calculus with Technology	4
MA3560	Mathematical Modeling with Differential Equations	3
or		
MA3450	Introduction to Real Analysis	3
MA3720	Probability	3
MA3740	Statistical Programming and Analysis	3
MA3750	Introduction to SAS Programming	1
MA4710	Regression Analysis	3
MA4720	Design and Analysis of Experiments	3
MA4760	Mathematical Statistics I	3
MA4770	Mathematical Statistics II	3
MA4780	Time Series Analysis and Forecasting	3
MA4790	Predictive Modeling	3
HU3120	Technical and Professional Communication	3
	Cognate cluster	9
	Gen Ed Core	12
	Gen Ed STEM	11

Gen Ed LG-HASS	12
Free electives	31
Total	124

MA3450 is recommended for students intending to study statistics in graduate school; MA3560 is recommended for students planning to work in industry.

The "cognate cluster" consists of three courses, chosen with approval of the student's advisor, in a discipline in which application of statistics is common.

The relatively large number of electives is both common and important in a statistics curriculum. Students will be able to go far beyond the cognate cluster in fashioning a degree that includes foundational knowledge in one or more disciplines that depend on statistics.

7 New course descriptions

No new courses are proposed. However, certain courses descriptions (MA2710, MA3740, MA4770) are being re-written so that these courses better support the curriculum. The new descriptions are as follows.

MA2710 (Introduction to Statistical Analysis) Introduction to statistical reasoning and methods. Topics include uses and abuses of statistics, graphical and descriptive methods, correlation and regression, probability and statistical inference. The course will include a written project and an introduction to statistical software.

MA3740 (Statistical Programming and Analysis) Using the software R and SAS to process and analyze data. Topics include exploratory data analysis, classical statistical tests, sample size and power considerations, correlation and regression analysis, and design of experiments. Emphasis on advanced programming techniques. Includes a project.

MA4770 (Mathematical Statistics II) Continuation of MA4760. Theory of point and interval estimation, properties of estimators, theory of hypothesis testing, analysis of variance, analysis of categorical data, and other topics if time allows.

8 Library and other learning resources

No additional library resources are needed.

9 Computing Access Fee

Not applicable.

10 Faculty resumes

See attached.

11 Description of available/needed equipment

The following necessary equipment is already available.

1. All campus computer labs are equipped with the statistical software package SAS, which is used in several courses in the proposed degree. Many positions in business and industry expect expertise in SAS.
2. All campus computer labs are equipped with the statistical software package R. There is some indication that an increasing number of employers are looking for expertise in R modeling (as opposed to the more traditional package SAS).
3. Some of the required courses will be taught with a computer lab component. Fisher 330 is a modern teaching lab and will be requested for departmental courses required for this degree. When Fisher 330 is not available, other teaching labs are available on campus.

No additional equipment is needed.

12 Program costs, years 1, 2, and 3

Faculty salaries comprise the majority of program costs. Less significant costs include hardware and software for computer labs and a small budget for recruiting costs (brochures, etc.).

The department currently has three tenured/tenure-track faculty in statistics, one tenured faculty member in probability who routinely teaches mathematical statistics, and two lecturers who teach undergraduate statistics courses. In addition, the department has two open tenure-track lines that it intends to fill with faculty working in statistics. Filling the open lines will be critical for the long-term viability of this program. The majority of the salary money needed for these lines is already in the departmental base budget; however, since one the hires is anticipated at a senior level (associate or full professor), it may be necessary to augment the department's S&W budget.

(Note that the department has plans for covering the necessary courses for 2014-15 and 2015-16 academic years with no additional faculty, in case we are not successful in filling the open lines immediately.)

The SAS and R statistical software packages are essential for the proposed degree program. R is free; it is currently available in campus computer labs and students can install it on their personal computers for free. SAS is expensive, but the university has a license for the software and it is also available in campus computer labs. Therefore, these costs are already part of the university budget.

Total new costs $1,000-16,000 (estimated) in base S&W per year (student recruiting budget plus possible additional salary for senior faculty position).

13 Space

No additional space is required for this program, which will utitilize existing classrooms and computer labs.

14 Policies, regulations and rules

Not applicable.

15 Accreditation requirements

There is no accrediting body for undergraduate degrees in statistics. However, the American Statistical Association produced "Curriculum Guidelines for Undergraduate Programs in Statistical Sciences" (www.amstat.org/education/curriculumguidelines.cfm) during the period 2000-2002. (These are currently undergoing revision by the ASA.) Below are the guidelines from the ASA, copied verbatim from the above website, with comments added in italics to indicate how the pro- posed degree meets the guidelines.

Principles Undergraduate programs in statistics are intended to equip students with quantitative skills that they can employ and build on in flexible ways. Some students will plan graduate work in statistics or other fields, while others will seek employment after their first degree. Programs should be sufficiently flexible to accommodate varying goals. Undergraduate programs are not intended to train professional statisticians, though some graduates may reach this level through work experience and/or further study.

Institutions vary greatly in the type and intensity of programs they are able to offer. The ASA believes almost all institutions can provide a level of statistical education that is useful to both students and employers. We encourage flexibility in adapting these guidelines to institutional constraints. In many cases, statistics minors or concentrations for quantitatively oriented students in fields such as biology, business, and behavioral and social science may be more feasible than a full statistics major.

> *As discussed above (see "Discussion of related programs within the university and at other institution"), we believe that we are able to offer a full statistics major, although we do not have the capacity to develop a list of advanced statistics electives.*

Undergraduate statistics programs should emphasize concepts and tools for working with data and provide experience in designing data collection and analyzing real data that go beyond the content of a first course in statistical methods. The detailed statistical content may vary, and may be accompanied by varying levels of study in computing, mathematics, and a field of application.

> *Students will learn foundational skills in working with data in MA3740 (Statistical Programming and Analysis) and MA3750 (Introduction to SAS Programming); these skills are used in MA4710 (Regression Analysis), MA4720 (Design and Analysis of Experiments), MA4780 (Time Series Analysis and Forecasting), and MA4790 (Predictive Modeling). The courses MA4710, MA4720, MA4780, and MA4790 all require assignments that work with real data.*

Though statistics requires mathematics for the development of its underlying theory, statistics is distinct from mathematics and uses many nonmathematical skills; thus, the curriculum must be more than a sequence of mathematics courses. It is essential that faculty trained in statistics and experienced in working with data be involved in developing statistics programs and teaching or supervising courses required by the programs.

> *An explicit goal of transforming from a Mathematics degree with a concentration in Statistics to a degree in Statistics is to decrease the emphasis on Mathematics and increases the emphasis on nonmathematical skills, including communication and cognate knowledge.*

Skills Needed Effective statisticians at any level display a combination of skills that are not exclusively mathematical. Programs should provide some background in the following areas:

- Statistical—Graduates should have training and experience in statistical reasoning, in designing studies (including practical aspects), in exploratory analysis of data by graphical and other means, and in a variety of formal inference procedures.

  Training in statistical reasoning is included in all of the required statistics courses. The design of studies is covered in MA4720 (Design and Analysis of Experiments), while exploratory analysis of data (graphical and otherwise) is introduced in MA2710 and MA3740 and also covered in the advanced classes MA4710, MA4720, MA4780, and MA4790. Inference procedures are introduced in MA2710 and MA3740 and studied formally in the mathematical statistics sequence (MA4760 and MA4770).

- Mathematical—Undergraduate major programs should include study of probability and statistical theory, along with the prerequisite mathematics, especially calculus and linear algebra. Programs for nonmajors may require less study of mathematics. Programs preparing for graduate work may require additional mathematics.

  The proposed curriculum has a strong mathematical foundation, including the named prerequisites and three courses in theory (MA3720, MA4760, MA4770).

- Computational—Working with data requires more than basic computing skills. Programs should require familiarity with a standard statistical software package and encourage study of data management and algorithmic problem-solving.

  Students are introduced to SAS and R in MA3740 and MA3750. These software packages are used routinely in the advanced courses MA4710, MA4720, MA4780, MA4790.

- Nonmathematical—Graduates should be expected to write clearly, speak fluently, and have developed skills in collaboration and teamwork and organizing and managing projects. Academic programs often fail to offer adequate preparation in these areas.

  The proposed degree program requires a course on technical communication (HU3120). Written projects are required in MA2710 and MA3740. The project in MA2710 is done on an individual basis, while a team project is required in MA3740.

- Substantive area—Because statistics is a methodological discipline, statistics programs should include some depth in an area of application.

  The proposed degree program requires a "cognate cluster" to address this issue. In addition, a significant number of free electives allow students to add more depth or more breadth, as desired.

Curriculum Topics for Undergraduate Degrees in Statistical Science The approach to teaching the following topics should:

- Emphasize real data and authentic applications.
- Present data in a context that is both meaningful to students and indicative of the science behind the data.
- Include experience with statistical computing.
- Encourage synthesis of theory, methods, and applications.
- Offer frequent opportunities to develop communication skills.

Statistical Topics

- Statistical theory (e.g., distributions of random variables, point and interval estimation, hypothesis testing, Bayesian methods).

  Required coursework in Probability and Mathematical Statistics (a total of nine credits) gives our program a strong basis in statistical theory.

- Graphical data analysis methods.

  Graphical data analysis is introduced in MA2710 and MA3740 and used in more advanced courses (MA4710, MA4720, MA4780, MA4790).

- Statistical modeling (e.g., simple, multiple, and logistic regression; categorical data; diagnostics; data mining).

  Simple regression is introduced in MA2710 and MA3740, while simple and multiple regression are covered in MA4710. Logistic regression is briefly covered in MA3740. Categorical data is

discussed in MA2710 (briefly) and in MA4770. There is some coverage of data mining in MA4790.

- Design of studies (e.g., random assignment, replication, blocking, analysis of variance, fixed and random effects, diagnostics in experiments; random sampling, stratification in sample surveys; data exploration in observational studies).

  Covered in MA4720.

Mathematical Topics

- Calculus (integration and differentiation) through multivariable calculus.

  Covered in MA1160, MA2160, MA3160.

- Applied linear algebra (emphasis on matrix manipulations, linear transformations, projections in Euclidean space, eigenvalue/eigenvector decomposition and singular-value decomposition).

  Covered in MA2330.

Probability

- Emphasis on connections between concepts and their applications in statistics.

  Covered in MA4760 and MA4770 (Mathematical Statistics I and II).

Computational Topics

- Programming concepts; database concepts and technology.

  We do not require programming in a high-level programming language such as C or C++. However, there is considerable emphasis on using statistical software packages.

- Professional statistical software appropriate for a variety of tasks.

  MA3740 and MA3750 provide a strong foundation in two popular tools, R and SAS. Advanced courses build on this foundation.

Nonmathematical Topics

- Effective technical writing and presentations.

  Covered in HU3120. MA2710 and MA3740 require project reports, giving students a chance to practice their technical writing skills.

- Teamwork and collaboration.

  MA3740 requires a team project. MA4710 and MA4720 requires some group assignments to be completed.

- Planning for data collection.

  Data must be collected for projects in MA2710 and MA3740.

- Data management.

  This is not covered in the proposed curriculum.

In the future, we may consider a required capstone project, which would give more emphasis to these nonmathematical topics. We do not believe that we currently have the resources available (specifically, the faculty time) to implement a required capstone project.

Electives There are many electives that might be included in a statistics major. As resources will vary among institutions, the identification of what will be offered is left to the discretion of individual units.

Resources do not allow us to offer advanced electives in statistics.

Practice When possible, the undergraduate experience should include an internship, senior-level "capstone" course, consulting experience, or a combination of these. These and other opportunities to practice statistics should be included in a variety of venues in an undergraduate program.

Students will be encouraged to complete a summer internship, and the department will cultivate contacts in industry to facilitate this.

16 Internal status of the proposal

The new degree was formally proposed to the Department of Mathematical Sciences on December 2, 2013 and approved by a departmental vote on December 9, 2013.

17 Planned implementation date

Fall 2014.

Appendix: Financial documentation

I Relation to University Strategic Plan

1. **Relation of program to the university's educational and research goals:** This pro- gram supports Goal 2.1 *(Integration of research, instruction, and innovation that achieves the University Student Learning Goals)*, specifically, *strengthen existing programs and develop new offerings in emerging interdisciplinary areas.* The existing concentration in Statistics within the bachelor's degree in Mathematics will be replaced by a stronger bachelor's degree in Statistics.
2. **Consistency with the university's resource allocation criteria.** The proposed program should support the university budget in several ways. It is intended to attract new students to the university. It should also feed students into the proposed interdisciplinary master's degree in Data Science and into the anticipated 4+1 B.S./M.S. program in Statistics (see below, Section VIII).

II Impact on University Enrollment

1. **Projected number of students in the program:** Projected steady-state enrollment is 40 students (10 graduates per year), versus approximately 11 students (2.75 graduates per year) in the current concentration in statistics.

2. **Source of new students; in particular, will the students be drawn from existing programs, or will they be students who would otherwise not have come to MTU?** Based on national trends, it is expected that the program will attract some new students to Michigan Tech. We hope that 20 new students (five graduates per year) will be new students.

3. **What is the likely correlation between demand for the new program and existing enrollment patterns at MTU?** This program is in a discipline that is growing rapidly in popularity nationwide, albeit from a very small base. Given the ever-increasing amount of data collected in many areas of life, it is reasonable to predict that demand for degrees in statistics will continue to grow.

4. **What is the current enrollment in the unit?** Fall 2013: 100 students (77 with Mathe- matics as primary major, 23 with Mathematics as secondary major).

III Impact on resources required by department in which the program is housed

1. **Faculty lines:** This program will be supported by existing faculty lines (including two open lines for which searches are ongoing).

2. **Faculty and student labs, including ongoing maintenance:** Existing computer labs, including existing software licenses, are adequate to support this program.

3. **Advising:** The department has a system of distributed advising by faculty (that is, different faculty advisors for different concentrations within the mathematics major). This program will increase the advising load on the statistics advisor (estimated time needed: approximately 30 hours per academic year).

4. **Assessment:** The department will have to establish learning goals for the new degree and assess how well the majors are meeting these goals (estimated time needed: approximately 25 person-hours per academic year).

IV Impact on Resources Required By other Units Within the University

1. **Other academic (e.g., Gen Ed) units with regard to faculty, labs and assessment.** The primary impact will be in Humanities, due to the new requirement of HU3120 (Technical and Professional Communication). If the enrollment goal of 40 students is reached, the Hu- manities department can expect to see 10 additional students per year enrolled in HU3120. According to the chair of Humanities, faculty believe that they can absorb these students into existing sections; however, growth beyond the this level may require more resources on the part of Humanities in the form of additional graduate teaching assistantships.

2. **Information Technology, the Library, central administration and career planning with respect to the impact on the need for computing services, library resources, advising, record keeping, development of employer relations etc.** There should be no significant impact on other units. (It will be critical to maintain the existing SAS license, but this is already included in the existing budget.)

V Assessment of the ability to obtain the necessary resources assuming requested funds are obtained

For high demand fields (e.g., business fields, etc.), will it be possible to fill allocated lines? Statistics is a high-demand field, so the department expects to find it challenging to fill the existing open lines. (These faculty lines are important for the PhD program as well as for the proposed undergraduate degree.) We hired a new faculty member in statistics (PhD from Clemson) last year, so it is possible to find good candidates.

VI Past proposals

The Department of Mathematical Sciences has not initiated any new degree programs in the last five years.

VII Departmental budget contribution

All figures are for 2012-13.

1. **What is the department's total general fund budget?** The general fund base budget was $3,774,393; including graduate student transfer and lab revenues, the total was $4,587,775.

2. **How much tuition does the department generate? This information should be provided for both the credit hours taught by the department and the number of credit hours taken by the department's majors.**

   (a) For courses taught by the department: Undergraduate tuition was $9,348,520 (21,417 SCH times $436.50 per credit hour) and graduate tuition was $403,248 ($542 SCH times $744 per credit hour). Total tuition was $9,751,768.

   (b) For courses taken by our majors and taught by other departments (estimated): 81 majors (primary majors only) times 30 credits per year times 0.6 (60% of credits taken outside the department) times $436.50 per credit equals $636,417.

VIII How do the benefits from this program compare to other alternatives that are currently under considera- tion or development?

The department is considering two other enhancements to its curriculum. The first is complementary to the proposed bachelor's in statistics: we intend to propose a 4+1 B.S./M.S. program in statistics. The second is more speculative: we may propose a bachelor's in Applied Mathematics and move some of our current concentrations in Mathematics (including Actuarial Science and Business Analytics) to Applied Mathematics.

We are proposing the Statistics degree first because it must be in place for the 4+1 program and because it is expected to have a bigger payoff in terms of enrollment than the Applied Mathematics degree under consideration.

Will approval and allocation of resources to this program preclude the development of other programs?

No. Resources allocated to the B.S. in Statistics will also support the 4+1 program in Statistics. There should be no impact on the Applied Mathematics degree, if we decide to propose it.

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