Please forward
David W. Pershing
1/28/11

Approved
Michael K. Young
Please forward
3/15/11

January 28, 2011

TO: David Pershing
        Senior Vice President for Academic Affairs

FR: John Francis
        Chair, Undergraduate Council

RE: **Mathematics Emphases**

At its meeting of Tuesday, January 25, 2011, the Undergraduate Council voted to approve a proposal from the Department of Mathematics for two transcripted emphases. The proposal, along with letters of support, is attached.
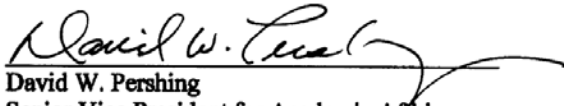
We are asking you, if you also approve of the proposal, to forward it on to the Executive Committee of the Academic Senate for their consideration.

Aaron Bertram
Professor and Chair of Mathematics

Pierre V. Sokolsky
Dean, College of Science
Professor of Physics

David W. Pershing
Senior Vice President for Academic Affairs

Michael K. Young
President
University of Utah

March 29, 2011

Dr. John G. Francis
Sr. Associate Vice President of Academic Affairs
  & Undergraduate Studies
Undergraduate Council
Sterling Sill Center
CAMPUS

Dear John:

I strongly support the Department of Mathematics' enclosed proposal for a new emphasis in **Mathematics of Computation** for undergraduate mathematics majors. The detailed description and list of requirements are attached.

The purpose of this emphasis is to provide undergraduates an academic path toward careers in the software industry—careers that require some level of rigorous mathematical and computer programming skills.

The key features of the Mathematics of Computation emphasis are (1) the senior project and (2) the narrowed focus in the upper-level mathematics electives courses that are required for all mathematics majors. Rather than having free choice from all the upper-level mathematics elective courses, the Mathematics of Computation emphasis major gives students more directed input regarding which classes best prepare students for a career as a mathematician in a Software Engineering field. The senior project also gives students the opportunity to work on a prolonged programming project that more closely simulates the work environment than does an extra class.

This degree differs from a Computer Science degree in that it contains a larger mathematical component and puts a stronger emphasis on the mathematical analysis of computer algorithms. Thus, it appeals to students who want to combine a computing-oriented career in industry with applications and use of mathematics. It is basically the mathematician's side of the Computer Science field.

Sincerely,

Pierre V. Sokolsky
Dean, College of Science, and
Distinguished Professor of Physics and Astronomy

Enc.

Section I: Action

The Mathematics Department proposes to offer an emphasis in Mathematics of Computation.

The purpose of this emphasis is to provide undergraduates an academic path toward careers in the software industry—careers that require some level of rigorous mathematical and computer programming skills.

The key features of the Scientific Computing emphasis are (1) the senior project and (2) the narrowed focus in the upper-level mathematics electives courses that are required for all mathematics majors. Rather than having free choice from all the upper-level mathematics elective courses, the Scientific Computing emphasis major gives students more directed input regarding which classes best prepare students for a career as a mathematician in a Software Engineering field. The senior project also gives students the opportunity to work on a prolonged programming project that more closely simulates the work environment than does an extra class.

This degree differs from a Computer Science degree in that it contains a larger mathematical component and puts a stronger emphasis on the mathematical analysis of computer algorithms. Thus it appeals to students who want to combine a computing oriented career in industry with applications and use of mathematics. It is basically the mathematician's side of the Computer Science field.

Below is a table comparing the requirements for the regular mathematics degree versus the mathematics degree with an emphasis in Mathematics of Computation.

Regular Math Major Requirements	Mathematics of Computation Emphasis Math Major Requirements
Required: Math1210, 1220, 2210 (Calculus) Math2270 (Linear Algebra) Math2280 (Differential Equations) Math3210, 3220 (Foundations of Analysis 1 & 2)	Required: Math1210, 1220, 2210 (Calculus) Math2270 (Linear Algebra) Math2280 (Differential Equations) Math3210, 3220 (Foundations of Analysis 1 & 2) Math5610, 5620 (Numerical Analysis 1 & 2) Math5960 (Special Project)
Math Electives: Students must choose seven math classes at or above the 4200-level, or they can include Math2200 (Discrete Math) as one of the seven choices.	Math Electives: Students must choose four math electives from the following list: Math2200 (Discrete Math) Math5010 (Probability)

	Math5080, 5090 (Statistical Inferences 1 & 2)
	Math5040, 5050 (Stochastic Processes 1 & 2)
	Math5075 (Time Series Analysis)
	Math5110, 5120 (Math Biology 1 & 2)
	Math5410 (Differential Equations)
	Math5420 (Dynamical Systems)
	Math5440 (Partial Differential Equations)
	Math5470 (Chaos & Nonlinear Systems)
	Math5710, 5720 (Applied Math 1 & 2)
	Math5740 (Math Modeling)
	Math5750 (Topics in Mathematics—one example is Game Theory; these change from semester to semester)
	Math5760, 5765 (Math Finance 1 & 2)

Allied Courses:
 	
    Physics 2210, 2220 (Physics for Scientists and Engineers)
	Allied Courses:
	
	    Physics 2210, 2220 (Physics for Scientists and Engineers)
	
	And, students must choose at least one programming class from this list:
	
	    CS 1020 (Intro to Programming in C++)
	
	    CS 1410 (Intro to Computer Science)
	
	    CS 2000 (Intro to Program Design in C)

Section II: Need

Careers in the computer/software world are numerous, and that industry continues to grow rapidly. In addition, this Mathematics of Computation emphasis degree would benefit any career that requires strong quantitative skills, such as engineering, insurance companies, and the world of finance. This degree provides all the essential components for success in such fields, since it is a blend of mathematics and programming. Our students report back to us that employers are searching for students with specific experience in computer programming and applications of mathematics. Although students with a regular mathematics degree could potentially qualify for the same jobs, this stated emphasis on the diploma may appeal to more employers and be more easily recognized as directly applicable to their field. This degree provides students with the explicit opportunity to train for such careers while also building a strong mathematical foundation.

Section III: Institutional Impact

We consider this emphasis primarily a service to students and don't anticipate any significant institutional impact.

Section IV: Finances

There will be no financial impact to the department or the institution.

THE **U**.
UNIVERSITY
OF UTAH

School of Computing

50 S. Central Campus Dr. RM 3190 Merrill Engineering Bldg. Salt Lake City, Utah 84112-9205 801-581-8224 Fax 801-581-5843

To Whom It May Concern:

I have reviewed the proposal by the Mathematics Department for an emphasis area in entitled "Mathematics of Computation." I have also discussed this proposal with the relevant members of our faculty.

We fully support this proposal as it is currently written. If either the name of the degree or the name of the emphasis area is changed in the future, then we will need to review the proposed changes again.

I strong encourage approval of this new emphasis area.

Sincerely,

Al Davis
Professor and Director

January 6, 2011

Dr. John G. Francis
Senior Vice President of Academic Affairs
    and Undergraduate Studies
Undergraduate Council
Sterling Sill Center
CAMPUS

Dear John:

I strongly support the Department of Mathematics' enclosed proposal for a new emphasis in **Statistics** for mathematics majors. The detailed description and list of requirements are attached.

The purpose of this emphasis is to provide undergraduates an academic path toward careers in the business, finance and actuarial science—careers that require some level of rigorous mathematical and statistical skills.

The key features of the Statistics emphasis are the narrowed focus in the upper-level mathematics electives courses that are required for all mathematics majors. Rather than having free choice from all the upper-level mathematics elective courses, the Statistics emphasis major gives students more directed input regarding which classes best prepare students for a career in a Statistics field or for a Masters of Statistics degree program.

This degree also requires the two allied courses to be from Economics or Finance, as opposed to the engineering physics course. The table in the attached list compares the requirements for the regular mathematics degree versus the mathematics degree with an emphasis in statistics.

If you have any questions about this proposal, please feel free to contact Mathematics Chair Aaron Bertram: bertram@math.utah.edu or 801-581-7870.

Sincerely,

Pierre V. Sokolsky
Dean, College of Science, and
Professor of Physics and Astronomy

Enc.

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Section I: Action

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The Mathematics Department at the University of Utah proposes to offer an emphasis in Statistics.

The purpose of this emphasis is to provide undergraduates an academic path toward careers in the business, finance and actuarial science—careers that require some level of rigorous mathematical and statistical skills.

The key feature of the Statistics emphasis is the narrowed focus in the upper-level mathematics electives courses that are required for all mathematics majors.   Rather than having free choice from all the upper-level mathematics elective courses, the Statistics emphasis major gives students more directed input regarding which classes best prepare students for a career in a Statistics field or for a Masters of Statistics degree program. This degree also requires two allied courses chosen from disciplines where Statistics is applied.

This Statistics emphasis will not affect the total number of credit hours required, compared to the regular mathematics major.

Below is a table comparing the requirements for the regular mathematics degree versus the mathematics degree with an emphasis in statistics.

Regular Math Major Requirements	Statistics Emphasis Math Major Requirements
Required: Math1210, 1220, 2210 (Calculus) Math2270 (Linear Algebra) Math2280 (Differential Equations) Math3210, 3220 (Foundations of Analysis 1 & 2)	Required: Math1210, 1220, 2210 (Calculus) Math2270 (Linear Algebra) Math3070, 3080 (Applied Statistics 1 & 2) Math3210, 3220 (Foundations of Analysis 1 & 2) Math5010 (Probability) Math5080, 5090 (Statistical Inference 1 & 2)
Math Electives: Students must choose seven math classes at or above the 4200-level, or they can include Math2200 (Discrete Math) as one of the seven choices.	Math Electives: Students must choose four math electives from the following list: Math2200 (Discrete Math) Math4200 (Complex Variables) Math5030 (Actuarial Math) Math5040, 5050 (Stochastic Processes 1 & 2)

	Math5075 (Time Series Analysis) Math5210 (Real Analysis) Math5410 (Differential Equations) Math5610, 5620 (Numerical Analysis 1 & 2) Math5710, 5720 (Applied Math 1 & 2) Math5750 (Topics in Mathematics—one example is Game Theory; these change from semester to semester) Math5760, 5765 (Math Finance)
Allied Courses: Physics 2210, 2220 (Physics for Scientists and Engineering)	Allied Courses: Two upper division courses (which must first be approved by the undergraduate mathematics advisor) must be completed on a topic in which statistics is applied. Departments offering such courses include (but are not limited to) Biology, Chemistry, Physics, Geology, Economics, Finance, and Operations and Information Systems. (For the purpose of this requirement, Physics 2210 and 2220 may be counted as upper division courses.)

Section II: Need

In Spring 2010, the mathematics department graduated 38 students, and 8 of those 38 (21%) students indicated a Statistics emphasis. Careers as a Statistician or Actuary consistently appear on nationwide lists of the best paid and most stable jobs to have in the United States. As such, an emphasis in Statistics is the most common emphasis students request from the undergraduate advisor. We do not have a separate Statistics Department that would have its own Statistics degree program which makes this emphasis a much-needed program for students to make some distinction in the type of mathematics and applications they are prepared to use in their careers.

Section III: Institutional Impact

There will be no impact to the department or the institution.

Section IV: Finances

There will be no financial impact to the department or the institution.

November 8, 2010

Pierre Sokolsky, Dean
College of Science
University of Utah
Campus

Dear Pierre,

I'm writing to support the proposed new emphasis in Statistics for mathematics majors.
The detailed description and list of requirements are attached.

Our curriculum committee in Statistics has reviewed this proposal and they approve the
emphasis as it is described. The Statistics emphasis will give students a roadmap of
courses that will prepare them well for a career in a statistical field or for a Master's of
Statistics degree program. The attached chart compares the current math major with the
new statistics emphasis in detail.

We are asking for your approval and a letter of support for this new Statistics emphasis so
that the proposal can be forwarded to the administration and Board of Regents.

Sincerely,

Aaron Bertram
Professor and Chair

Attachment