

To: Jay Hobgood, Chair, Council on Academic Affairs
From: Dan Mendelsohn, Chair, Subcommittee B
Date: November 27, 2009
Subject: Proposal for a Revision to the Mathematics Major

Subcommittee B has reviewed the subject proposal for a wide sweeping change to the Mathematics Major. The proposal calls for the creation of multiple tracks, two of which are based on the current major (Traditional Track) and the education major (Education Track) for secondary school mathematics teachers. The only change in these two tracks is the addition of a statistics course requirement, which many students were already taking anyway. The remainder of the proposal introduces four new tracks in different application areas: Finance, Biology, Applied Math, and Applied Discrete Math. The Applied Math track has five sub-tracks: Dynamics, Chemistry, Physics, Digital Signal/Image Processing, and Radio Wave Propagation. All of the tracks share a common core and have a major component which includes in all of the new tracks a significant number of courses in the application areas. The Applied Discrete Track even has a required minor in Computer Science and Engineering. All of the new tracks are very well thought out, and the entire concept is sound and in keeping with national trends. They represent a major improvement in the formal training in each of these important application areas and the students should benefit greatly.

The only thing which the subcommittee wanted cleared up was the reason for the range of hours given in the major in the proposal, the difference between the honors and non-honors versions, and the overall hour count for students, including an expectation of double counts with the GEC, and a final count for all requirements. After a couple of e-mails and one meeting, Professor Ron Solomon had provided us with all of these details, which were not specifically spelled out in the proposal. That information is summarized in a Table and a set of advising sheets, which have been appended to the proposal. With those clarifications the Subcommittee now is prepared to bring the proposal to the Council with a recommendation for approval.

Finally it is noted that the proposal also includes a request to deactivate the Major in Mathematical Sciences, contingent to the new tracks being approved. This request has the concurrence of the Department of Statistics and the Subcommittee also recommends that this request be granted.

	Trad & Education Honors	Trad & Education Regular	Financial Honors	Financial Regular	Bio Honors	Bio Regular	Applied Honors	Applied Regular	Discrete Honors	Discrete Regular
Core (Math)	25	32	25	32	25	32	25	32	25	32
Major Track	33-35	36-38	40	47-49	41-43	41-43	39-44	39-44	48-57	47-52
Non-Math Pre-Req	0	0	20	20	15	15	19	19	0	0
Total Major Plus Pre-Reqs	58-60	68-70	85-87	92-94	81-85	88-92	83-88	90-95	75- 82	79-84
GEC	90	90	90	90	90	90	90	90	90	90
GEC Double Counts	15	20	20	25	30	35	30	35	10	15
Free Electives	46-48	41-43	24-26	19-21	36-40	34-38	31-36	31-36	19-28	22-27
Total	181	181	181	181	181	181	181	181	181	181

NOTES

1. The actual GEC is 80-100 hours because of the language requirement variation of 0 to 20 hours. The 90 hours used in the table assumes a typical student would be taking 10 hours of foreign language.
2. GEC double counts: 10 hours of Quantitative and Logical Skills are fulfilled by Math 151-152. 10 Additional Breadth Hours can be fulfilled by Math 153 and Stat 420 or 421. That would be all for the traditional and education tracks. Other tracks fulfill more GECs. The financial track fulfills the 10 hours of Social Sciences breadth with Econ 200 and 201. The bio-math track fulfills 15 credits of the Natural Sciences Breadth requirement with Bio 113-114 and Chem 121. The Applied Track fulfills 15 credits of the Natural Sciences Breadth requirement with Physics 131, 132, 133. For a few of the Applied Track versions there could be even more double count in the GEC than listed.
3. Except for the Traditional and Education Tracks, the Major Track hour count includes many courses from outside Math and in the Discrete Track it includes a 22-25 hour Minor in CSE.
4. Because of the Stat 421 Core requirement, students in the Traditional and Education Tracks must also take any one of the three pre-reqs for Stat 421 (Stat 420, Math 530, Math 531H. However, any of these may count as an elective in these tracks.
5. The Applied Track - Chemistry option has ten more hours in the major, but also has ten more hours in GEC double count.

MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major – Traditional Track
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Name: last	first	middle	Major
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Local Address:	Degree Sought: BA BS
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City, State:	Zip	e-mail address
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Phone: residence	business	Expected Date of Graduation: quarter/yr
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Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)		X	
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yes no

If completing two majors, list both below and file a separate form for each one:

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1) 2)

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Math 153 (GEC)	5	
Math 152 (GEC)	5				

Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00))

Core Requirements (Substitutions are rarely if ever permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 568 or 571	3		Stat 421 (GEC)	5	

Required Courses for Traditional Track:

Math 255	5		Math 530, 531H or Stat 420	3, 5 or 5	
Math 547	3		Math 580	3	
Math 548	3		Math 581	3	
Math 549	3		Math 582	3	
Electives (10 credit hours)					

53 or 55

Total of Part B only

Check whether this is:	X	
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See back for information about major programs. original revision

Distribution: One copy each -

Faculty adviser, Student, College Office, Denney Hall, Rm, 130

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Signature of faculty adviser

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Name of adviser (please print)

Mathematics	292-
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Department Campus phone

	Date:
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*** To Faculty Advisors ***

We had changed our routing for the math major program forms: please sign the form and return it to Karen in MW 100C for typing or our Office MA250 or either of our mailboxes. Please do NOT hand it back to the student.

MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major – Education Track
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Name: last	first	middle	Major
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Local Address:	Degree Sought: BA BS
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City, State:	Zip	e-mail address
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Phone: residence	business	Expected Date of Graduation: quarter/yr
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Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)	yes	no
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If completing two majors, list both below and file a separate form for each one:

1)	2)
----	----

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Math 153 (GEC)	5	
Math 152 (GEC)	5				

**Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)
Core Requirements (Substitutions are rarely if ever permitted)**

Courses	Hours	Grade	Courses	Hours	Grade
Math 254*	5		Math 345*	4	
Math 255 or 578*	5		Stat 421* (GEC)	5	
Math 568* or 571*	3				

Required Courses for Traditional Track:

Math 547	3		Math 580*	3	
Math 548	3		Math 581*	3	
Math 549	3		Math 582	3	
Math 530, 531H or Stat 420	3, 5 or 5		Math 507*	5	
Math 504*	5		Math 578*	5	
* needed for OSU MED program					

53 or 55

Total of Part B only

Check whether this is:	x	
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Signature of faculty adviser

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Name of adviser (please print)

Mathematics	292-
-------------	------

Department Campus phone

	Date:
--	-------

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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major - Financial Track
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Name: last	first	middle	Major
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Local Address:	Degree Sought: BA BS
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City, State:	Zip	e-mail address
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Phone: residence	business	Expected Date of Graduation: quarter/yr
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Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)		X		
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yes no

If completing two majors, list both below and file a separate form for each one:

--	--

1)

2)

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Econ 200 (GEC)	5	
Math 152 (GEC)	5		Econ 201 (GEC)	5	
Math 153 (GEC)	5		Acct 310	5	
			CS&E 200	5	

Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)

Core Requirements (Substitutions are rarely if ever permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 568 or 571	3		Stat 421 (GEC)	5	

Required Courses for Financial Track

Math 255	5		Math 618	4	
Math 512	3		Math 632	4	
Math 530, 531H or Stat 420	3, 5 or 5		CSE 201 or 202	5	
Math 589	3		Bus Fin 420 or 620	5	
Math 607	5		Practicum Seminar	3-5	

57, 59 or 61

Total of Part B only

Check whether this is:	X	
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See back for information about major programs. original revision

Distribution: One copy each -

Faculty adviser, Student, College Office, Denney Hall, Rm, 130

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Signature of faculty adviser

Chunsheng Ban

Name of adviser (please print)

Mathematics

292-5331

Department

Campus phone

	Date:
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*** To Faculty Advisors ***

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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major: Bio - Mathematics Track		
Name: last		first	middle	Major	
Local Address:		Degree Sought:		BA	BS
City, State:		Zip		e-mail address	
Phone: residence		business		Expected Date of Graduation: quarter/yr	
Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)			yes	no	<input checked="" type="checkbox"/>

If completing two majors, list both below and file a separate form for each one:

1)	2)
----	----

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Chem 121 (GEC)	5	
Math 152 (GEC)	5		Bio 113 (GEC)	5	
Math 153 (GEC)	5		Bio 114 (GEC)	5	

Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00))
Core Requirements (Substitutions are rarely if ever permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 255	5	
Math 345	4		Math 512	3	
Math 571	3		Math 607	5	
Math 572	3		Stat 421 (GEC)	5	

Required Courses for Bio-Mathematics Track

Math 350	3-5		Bio 401 & 402	5, 5	
Math 530, 531H or Stat 420	3, 5 or 5		or MG 660 & 661	5, 5	
Electives (9 credit hours)					

58, 60 or 62

Total of Part B only

Check whether this is:	<input checked="" type="checkbox"/>	original	revision
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Distribution: One copy each -
Faculty adviser, Student, College Office, Denney Hall, Rm, 130

Signature of faculty adviser	
Name of adviser (please print)	
Mathematics	292-
Department	Campus phone
Date:	

*** To Faculty Advisors ***
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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major: Applied Track - Dynamics Option
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Name: last	first	middle	Major

Local Address:	Degree Sought: BA BS

City, State:	Zip	e-mail address

Phone: residence	business	Expected Date of Graduation: quarter/yr				
Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%;"></td> <td style="width:50%; text-align:center;">X</td> </tr> <tr> <td align="center">yes</td> <td align="center">no</td> </tr> </table>		X	yes	no
	X					
yes	no					

If completing two majors, list both below and file a separate form for each one:

1)	2)
----	----

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Physics 131 (GEC)	5	
Math 152 (GEC)	5		Physics 132 (GEC)	5	
Math 153 (GEC)	5		Physics 133 (GEC)	5	
			CSE 202	4	

**Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)
Core Requirements (Substitutions are rarely if ever permitted)**

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 571	3		Stat 421 (GEC)	5	

Required Courses for Applied Math Track:			Group I Electives: Math courses 9 hours from:		
Math 255 or 415	5 or 4		Math 547, 548, 549	3, 3, 3	
Math 512	3		Math 601, 602, 603.02	3, 3, 3	
Math 514	3		Math 665, 666	4, 4	
Math 572	3		Math 701	5	
Math 530, 531H or Stat 420	3, 5 or 5		Math 513 or 551	3 or 5	
Math 607	5				
Group II Electives: Dynamics Option -9 hrs:					
Mech Eng 410	4		Mech Eng 502	3	
Mech Eng 430	4		Mech Eng 503	3	
Mech Eng 501	4		Mech Eng 504	3	

56 to 61

Total of Part B only

Check whether this is:	x	
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Distribution: One copy each - Faculty adviser, Student, College Office, Denney Hall, Rm, 130

Signature of faculty adviser	
Name of adviser (please print)	
Mathematics	292-
Department	Campus phone
	Date:

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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major: Applied Track - Chemistry Option
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Name: last	first	middle	Major

Local Address:	Degree Sought: BA BS

City, State:	Zip	e-mail address

Phone: residence	business	Expected Date of Graduation: quarter/yr
Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)		yes no <input checked="" type="checkbox"/> X

If completing two majors, list both below and file a separate form for each one:

1)	2)
----	----

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Physics 131 (GEC)	5	
Math 152 (GEC)	5		Physics 132 (GEC)	5	
Math 153 (GEC)	5		Physics 133 (GEC)	5	
Chem 121 (GEC)	5		Chem 123 (GEC)	5	
Chem 122 (GEC)	5		CSE 202	4	

Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)

Core Requirements (Substitutions are rarely if ever permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 571	3		Stat 421 (GEC)	5	

Required Courses for Applied Math Track:

Group I Electives: Math courses 9 hours from:

Math 255 or 415	5 or 4		Math 547, 548, 549	3, 3, 3	
Math 512	3		Math 601, 602, 603.02	3, 3, 3	
Math 514	3		Math 665, 666	4, 4	
Math 572	3		Math 701	5	
Math 530, 531H or Stat 420	3, 5 or 5		Math 513 or 551	3 or 5	
Math 607	5				
Group II Electives: Chemistry Option -9 hrs:					
Chem 221	5		Chem 531	3	
Chem 530	3		Chem 532	3	

56 to 61

Total of Part B only

Check whether this is:	original	revision
	<input checked="" type="checkbox"/>	

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Signature of faculty adviser

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Name of adviser (please print)

Mathematics	292-
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Department Campus phone

	Date:
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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major: Applied Track - DS/IP Option
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Name: last	first	middle	Major
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Local Address:	Degree Sought: BA BS
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City, State:	Zip	e-mail address
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Phone: residence	business	Expected Date of Graduation: quarter/yr
Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)		yes no <input checked="" type="checkbox"/> X

If completing two majors, list both below and file a separate form for each one:

1)	2)
----	----

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Physics 131 (GEC)	5	
Math 152 (GEC)	5		Physics 132 (GEC)	5	
Math 153 (GEC)	5		Physics 133 (GEC)	5	
			CSE 202	4	

Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)
Core Requirements (Substitutions are rarely if ever permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 571	3		Stat 421 (GEC)	5	

Required Courses for Applied Math Track:			Group I Electives: Math courses 9 hours from:		
Math 255 or 415	5 or 4		Math 547, 548, 549	3, 3, 3	
Math 512	3		Math 601, 602, 603.02	3, 3, 3	
Math 514	3		Math 665, 666	4, 4	
Math 572	3		Math 701	5	
Math 530, 531H or Stat 420	3, 5 or 5		Math 513 or 551	3 or 5	
Math 607	5				
Group II Electives: DS/IP Option -9 hrs:					
ECE 205	3		ECE 351	3	
ECE 301	3		ECE 352	3	
700 level courses are also available			ECE 600	3	

	56 to 61	
Total of Part B only		
Check whether this is:	<input checked="" type="checkbox"/> original	<input type="checkbox"/> revision

See back for information about major programs. Distribution: One copy each - Faculty adviser, Student, College Office, Denney Hall, Rm, 130

Signature of faculty adviser	
Name of adviser (please print)	
Mathematics	292-
Department	Campus phone
	Date:

*** To Faculty Advisors ***
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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major: Applied Track - RWP Option		
Name: last		first	middle	Major	
Local Address:			Degree Sought:	BA	BS
City, State:		Zip	e-mail address		
Phone: residence		business		Expected Date of Graduation: quarter/yr	
Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)			yes	no	
				X	

If completing two majors, list both below and file a separate form for each one:

1)		2)			
Part A: Required Prerequisites (and / or supplementary requirements)					
Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Physics 131 (GEC)	5	
Math 152 (GEC)	5		Physics 132 (GEC)	5	
Math 153 (GEC)	5		Physics 133 (GEC)	5	
			CSE 202	4	

Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)
Core Requirements (Substitutions are rarely if ever permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 571	3		Stat 421 (GEC)	5	
Required Courses for Applied Math Track:			Group I Electives: Math courses 9 hours from:		
Math 255 or 415	5 or 4		Math 547, 548, 549	3, 3, 3	
Math 512	3		Math 601, 602, 603.02	3, 3, 3	
Math 514	3		Math 665, 666	4, 4	
Math 572	3		Math 701	5	
Math 530, 531H or Stat 420	3, 5 or 5		Math 513 or 551	3 or 5	
Math 607	5				
Group II Electives: RWP Option -9 hrs:					
ECE 205	3		ECE 312	3	
ECE 311	3		700 level courses are also available		

56 to 61

Total of Part B only

Check whether this is:	<input checked="" type="checkbox"/> original	<input type="checkbox"/> revision
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See back for information about major programs.
Distribution: One copy each - Faculty adviser, Student, College Office, Denney Hall, Rm, 130

Signature of faculty adviser	
Name of adviser (please print)	
Mathematics	292-
Department	Campus phone
	Date:

*** To Faculty Advisors ***

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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major: Applied Track - Physics Option		
Name: last		first	middle	Major	
Local Address:			Degree Sought:	BA	BS
City, State:		Zip	e-mail address		
Phone: residence		business	Expected Date of Graduation: quarter/yr		
Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)			yes	no	X

If completing two majors, list both below and file a separate form for each one:

1)		2)			
Part A: Required Prerequisites (and / or supplementary requirements)					
Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Physics 131 (GEC)	5	
Math 152 (GEC)	5		Physics 132 (GEC)	5	
Math 153 (GEC)	5		Physics 133 (GEC)	5	
			CSE 202	4	

Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)
Core Requirements (Substitutions are rarely if ever permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 571	3		Stat 421 (GEC)	5	
Required Courses for Applied Math Track:			Group I Electives: Math courses 9 hours from:		
Math 255 or 415	5 or 4		Math 547, 548, 549	3, 3, 3	
Math 512	3		Math 601, 602, 603.02	3, 3, 3	
Math 514	3		Math 665, 666	4, 4	
Math 572	3		Math 701	5	
Math 530, 531H or Stat 420	3, 5 or 5		Math 513 or 551	3 or 5	
Math 607	5				
Group II Electives: Physics Option -9 hrs:					
Phys 261	4		Phys 263	3	
Phys 262	4		600 level courses are also available		

56 to 61

Total of Part B only

Check whether this is:	<input checked="" type="checkbox"/>
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Distribution: One copy each - Faculty adviser, Student, College Office, Denney Hall, Rm, 130

Signature of faculty adviser	
Name of adviser (please print)	
Mathematics	292-
Department	Campus phone
Date:	

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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major – Applied Discrete Track
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Name: last	first	middle	Major

Local Address:	Degree Sought: BA	BS

City, State:	Zip	e-mail address

Phone: residence	business	Expected Date of Graduation: quarter/yr
Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)		X

yes no

If completing two majors, list both below and file a separate form for each one:

1)	2)
----	----

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 151 (GEC)	5		Math 153 (GEC)	5	
Math 152 (GEC)	5				

**Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)
Core Requirements (Substitutions are rarely if ever permitted)**

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 568	3		Stat 421 (GEC)	5	

Required Courses for Applied Discrete Track:

Courses	Hours	Grade	Required CIS minor (minimum 20 hours):	Hours	Grade
Math 575	5		CSE 221	4	
Math 578	5		CSE 222	4	
CSE 202	5		CSE 321	4	
Math 580, 581, 582, 585	3, 3, 3, 3		CSE 625	3	
or Math 647, 648 & 649	3, 3, 3		Math 530, 531H or Stat 420	3, 5 or 5	
Elective - one or two courses from:			CSE 541, 560, 625, 670	3 or 5	

64, 66, 67 or 69

Total of Part B only

Check whether this is:	X	
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See back for information about major programs. original revision
Distribution: One copy each -
Faculty adviser, Student, College Office, Denney Hall, Rm, 130

Signature of faculty adviser
Name of adviser (please print)
Mathematics 292-
Department Campus phone
Date:

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MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major –Honors Track Option 1
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Name: last	first	middle	Major
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Local Address:	Degree Sought: BA BS
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City, State:	Zip	e-mail address
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Phone: residence	business	Expected Date of Graduation: quarter/yr
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Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)		X	
---	--	---	--

yes no

If completing two majors, list both below and file a separate form for each one:

--	--

1) 2)

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 161.01H (GEC)	5		Math 162.01H (GEC)	5	

**Part B: Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00)
Core Requirements (Substitutions are rarely if ever permitted)**

Courses	Hours	Grade	Courses	Hours	Grade
Math 263.01H	5		Math 345	4	
Math 520H	5		Stat 421 (GEC)	5	

Required Courses for Honors Track:

Math 521H	5		Math 531H	5	
Math 547	3		Math 590H	5	
Math 548	3		Math 591H	5	
Math 549	3		Math 592H	5	
Electives (15 credit hours)					
Math 522H	5		Math 576 & 577	5, 5	
			or Math 540 & 541	5, 5	

60

Total of Part B only

Check whether this is:	X	
------------------------	---	--

See back for information about major programs. original revision

Distribution: One copy each -

Faculty adviser, Student, College Office, Denney Hall, Rm, 130

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Signature of faculty adviser

--

Name of adviser (please print)

Mathematics	292-
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Department Campus phone

	Date:
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*** To Faculty Advisors ***

We had changed our routing for the math major program forms: please sign the form and return it to Karen in MW 100C for typing or our Office MA250 or either of our mailboxes. Please do NOT hand it back to the student.

MAJOR PROGRAM FORM
Colleges of the Arts and Science

			Mathematics Major –Honors Track Option 2
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Name: last	first	middle	Major

Local Address:	Degree Sought: BA BS

City, State:	Zip	e-mail address

Phone: residence	business	Expected Date of Graduation: quarter/yr
Have you filed a degree application in the college office? (NOTE: This form is NOT a degree application)		yes no X

If completing two majors, list both below and file a separate form for each one:

--	--

1) 2)

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Math 190H	5		Math 191H	5	

**Part B: Major Program (Minimum grade of “C-” required. Minimum grade average of “C” (2.00)
Core Requirements (Substitutions are rarely if ever permitted)**

Courses	Hours	Grade	Courses	Hours	Grade
Math 264H	5		Stat 421 (GEC)	5	
Math 520H	5				

Required Courses for Honors Track:

Math 521H	5		Math 590H	5	
Math 531H	5		Math 591H	5	
			Math 592H	5	
Electives (15 credit hours)					
Math 522H	5		Math 576 & 577	5, 5	
			or Math 540 & 541	5, 5	

55

Total of Part B only

Check whether this is:	x	
------------------------	---	--

See back for information about major programs. original revision

Distribution: One copy each -

Faculty adviser, Student, College Office, Denney Hall, Rm, 130

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Signature of faculty adviser

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Name of adviser (please print)

Mathematics	292-
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Department Campus phone

	Date:
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*** To Faculty Advisors ***

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Arts and Sciences

Curriculum and Assessment Office
4132 Smith Laboratory
174 W. 18th Avenue
Columbus, OH 43210

Phone (614) 292-7226
Fax (614) 688-5678
artsandsciences.osu.edu

June 3, 2009

Daniel Mendelsohn
Associate Professor, Mechanical Engineering
E 338 Scott Lab
201 West 19th Avenue
CAMPUS

Dear Dan:

The Arts and Sciences Committee on Curriculum and Instruction (CCI) unanimously approved a revision to the **Mathematics Major** on May 8, 2009. The main proposers are Ron Solomon (solomon@math.ohio-state.edu) and Dan Shapiro (shapiro.6@osu.edu). The CCI Sciences Subcommittee approved the major at their meeting on April 21, 2009 and the Mathematical and Physical Sciences College Curriculum Committee approved this proposal on February 25, 2009. Please see the attached transmittal history for detailed minutes from these meetings.


The proposed revision updates the major in ways that make cohesive the significant changes in the uses of mathematical knowledge over the past fifty years. It capitalizes on new faculty hires and partnerships with businesses and the community in order to give students more choice and clearer paths to careers within the discipline. While maintaining the Traditional track in abstract mathematics (typically preparation for graduate school), the proposal adds choice to the existing Education track while remaining consistent with Ohio State standards for licensure in secondary mathematics education. The proposal also establishes four new tracks within the major (Financial Math, Bio-Math, Applied Math, and Applied Discrete Math tracks) that better direct students toward prime fields of application for their mathematical skill set.

With the exception of the Traditional and Education tracks, which average 65-70 credits in the major, the number of credit hours required for completion of the major remains essentially unchanged from the current total of 88 credit hours. For complete breakdown of credit changes and pre-requisite requirements, please see John Harder's subcommittee memo and main proposal.

Accompanying this proposal is a formal request from the Department of Mathematics, with concurrence of the Department of Statistics, to **deactivate the Major in Mathematical Sciences** contingent upon the activation of the new undergraduate major in Mathematics (see attached letter from Professor Ron Solomon).

Please let me know if I can be of further assistance as CAA considers this proposal.

Sincerely,


Kathleen M. Hallihan
Director, Curriculum and Assessment

c: Randy Smith
Melissa Soave
Terry Gustafson
Christopher Highley

-----Original Message-----

From: solomon@math.ohio-state.edu [mailto:solomon@math.ohio-state.edu]

Sent: Thursday, May 21, 2009 11:29 AM

To: Hallihan, Kathleen

Subject: Re: Withdrawal of Mathematical Sciences major

To: Kate Hallihan

On behalf of the Department of Mathematics, and with concurrence of our colleagues in the Department of Statistics, I request that the Major in Mathematical Sciences be deactivated. For over a decade, the Mathematical Sciences Major has languished without faculty support from either department, and it has attracted very few and very weak majors. Meanwhile there have been major changes in the Statistics program. Finally, in view of the interdisciplinary options offered by the newly approved Mathematics Major, we see no need at this time to continue the Major in Mathematical Sciences, and we request that it be deactivated in conjunction with the activation of the new Undergraduate Major in Mathematics.

Many thanks.

Ronald Solomon
Professor and Undergraduate Vice Chair
Department of Mathematics
The Ohio State University

Date: 1 May 2009

Subject: Revision of Math Major

From: John D. Harder, Chair CCI Sciences Subcommittee

The CCI Sciences Subcommittee considered the proposal for revision of the Math Major at its meeting on 21 April 2009. After careful examination and discussion of the proposal, it was unanimously approved by the Subcommittee with one recommendation.

Department of Mathematics proposes to revise the mathematics undergraduate curriculum in order to:

1. Capitalize on the newly developing strengths within the university, such as the Mathematical Biosciences Institute.
2. Create more choices of degree track for undergraduate majors, directed towards the diversity of new and expanding fields such as mathematical finance, mathematical biosciences, coding theory and cryptography.
3. Formalize some changes that have been occurring in an ad hoc way for several years

The goal of the revision is to establish six degree tracks as follows:

Traditional Track:	- preparation for graduate work in mathematics
Education Track	- for licensure in secondary mathematics education
Financial Track	- preparation for employment in financial mathematics
Bio-Math Track	- preparation for mathematical modeling and study of biology
Applied Track	- traditional option for students interested in physical sciences
Applied Discrete Track	- preparation in discrete mathematics and computer science

All students will complete a core curriculum of 20–29 credit hours of foundational courses, the principal portion of which is a 4-course sequence in calculus. An additional 37–47 credit hours of advanced course work are required in one of the six tracks customized to different career paths in mathematics and allied disciplines. New courses are not proposed for the revised major.

Credit hours required for each of the proposed tracks:

Traditional	65-70	Includes 10-15 hrs of 100-level calculus, 5-hr increase with the addition of Statistics 421.
Education	65-70	Includes 10-15 hrs of 100-level calculus, 5-hr increase with the addition of Statistics 421.
Financial	83-88	Includes 10-15 hrs of 100-level calculus. Also required are 20 hr of non-math prerequisites (Econ 200-01, Acct 310, CSE 200).
Bio-Math	83-88	Includes 10-15 hrs of 100-level calculus. Also required are 25 hrs of non-math prerequisites (Chem 121-123 and Bio 113-114), and 9 hrs of electives in math, biological sciences, or chemistry.
Applied	84-94	Includes 10-15 hrs of 100-level calculus. Also required are 19 hrs of non-math prerequisites (Phys 131-133, CSE 202), and 9 hrs of electives in math, statistics, physics, or chemistry.

Applied Discrete 70-81 Includes 10-15 hrs of 100-level calculus. Also required are 4 hr of prerequisite CSE courses.

With the exception of the Traditional and Education Tracks, the number of credit hours required for completion of the major in one of the six tracks remains essentially unchanged, which currently is 88 credit hours.

Concurrence has been obtained from academic units with interests in math instruction including: College of Biological Sciences, Department of Evolution, Ecology and Organismal Biology, College of Engineering (including the Departments of Computer Science, Electrical, and Mechanical Engineering), College of Medicine, Biomedics and the Center for Microbial Interface Biology, Nationwide Financial Services, and the Departments of Chemistry and Physics.

Discussion of the proposed revision by the Committee focused on assessment of learning objectives. The proposal lists 4 specific educational objectives, attainment of which is assessed with coordinated homework assignments and written examinations in sequential courses, e.g., the calculus series. Assessment is also pursued in exit surveys of mathematics majors, tracking of placement of graduates in advanced educational programs and professional employment. Additional assessment is available in some tracks e.g., the Praxis examination for students in the Math Education Track.

Revision of Math Major

1 May 2009

The following concerns regarding assessment were raised and discussed:

1. Lack of embedded questions was noted but not considered a concern in the context of the multifaceted assessment plan.
2. Assessment plans should be developed for each track.
3. The four overall learning outcomes would lend themselves nicely to be mapped to each of the six tracks, but the questions or measures would be quite different, for example, for students in the Financial and Bio-Math Tracks.
4. Correction (page 15, Bio-Math Track): The title for Neuro 300 is "Introduction to Neuroscience", not Neurology

The Committee Recommends that the Math Department develop at least one measureable learning outcome and assessment for each of the six tracks in the proposed major.

The consensus of the Committee is that proposed revision of the Math Major is well justified and clearly described. It recognizes developing strengths in the University and opportunities for interdisciplinary endeavors. The six-track approach should be attractive to students and raise awareness of career opportunities.

The Committee voted unanimously in favor of the proposed revision of the Math Major with recommendation underlined above.

Transmittal History for Revisions to the Mathematics Major

A&S Committee on Curriculum and Instruction
May 8, 2009 Approved Minutes excerpt

1. Math Major Revision (Guest: Ron Solomon)
 - a. Summary (Harder): (see cover letter) reviewed on 4/21 by Sciences subcommittee. Impressed with justification for major as stated in cover letter. Revision also formalizes ad-hoc changes occurring currently. Features 6 new degree tracks, the traditional track being almost identical to existing major. Applied track is different from current but is close in number of credits. 20-29 hours in foundational courses (calculus) with 37-47 hours of electives. No new courses with major but over past year, 3 new courses have been approved in anticipation of major revision (Intro to Bio Math, Intro to Financial Math, and Intro to Coding Theory and Design Theory related to Discrete track)
 - Tracks vary in number of hours required and courses associated with tracks
 - Bio Math and Applied tracks are directed toward closer links with the Biological and the Physical Sciences respectively
 - New Financial track will help develop career opportunities for students
 - Committee focused most of attention on assessment. In Math there are many sequential courses which lend themselves to assessment of student success, exit surveys, alumni surveys; Committee noted that embedded test questions are not currently used and recommends that each track have targeted assessment related to goals of tracks (see subcommittee cover letter)
 - b. History/Rationale (Solomon):
 - The mode of mathematics teaching developed after WWII via French Mathematicians and was very abstract in nature. Traditional track follows this and is good for training abstract mathematicians.
 - Developments over last 50 years include Computer Science (with connections to Design and Graph theory), which permits investigations by mathematicians that were not possible in the past, such as weather forecasting and applications of mathematics to biological processes. In view of these developments, it seemed appropriate to develop these new applied tracks.
 - UCLA has developed a similar curricular structure which has been extremely successful.
 - Applied track was begun a few decades ago, but it is now appropriate to further develop these tracks to provide more flexible and varied options for students. Many colleagues in Math department have worked very hard at developing these tracks through interaction with all relevant disciplines (Applied Discrete track involves Computer Science, Applied links Math to Physical Sciences and Engineering, Biomath driven by Math/Bio Institute, which also offers internship opportunities)
 - c. Q: Bio/Math track p.15 requirement of Chem 121-123 and Bio 113-114 sequence and advanced Bio courses (401-402): Clarification of core versus pre-reqs: Core

- is Bio is 113-114 and 401-402. There is no change to proposal, 113-114 are still considered pre-reqs, 401-402 are part of core as is Math 350 and pure Math and Stats courses. Subsequent to that are elective choices (9 hours) in math, biological sciences or chemistry
- d. Comment: Great proposal. Q: There are a lack of electives in Earth Sciences within Bio/Math and Applied Math yet there are many courses in ES in paleontology and climate that could enhance major for students. Can these be included? Students may design program in consultation with advisor to include electives in appropriately approved areas, such as ES. It is intended as a highly-recommended set of electives. ES to consult with Math for possible inclusion of appropriate courses.
 - e. Q: Can we include Atmospheric Sciences courses from Geography? How do we get courses in there that will have to be added to track and then go back through approval process? Or can elective for Applied remain a boutique for students to investigate? Proposer hopes for approval of proposal today as is, and revisions can be made later. Applied track already lists several possible options in this area.
 - f. Resources – with so much change is there need for new faculty? There are only 3 new (previously approved) courses included in this proposal. The proposal is rather a new organization that allow students to supplement Math courses with courses from other departments. Dept has approval for new hires in Math Biology and dept is in process of hiring for next year. In financial math, there is a shortage of faculty resources and dept has a goal of hiring new people in this area. Actuarial Science major is very popular and growing and dept wishes to address understaffing issues in near future.
 - g. **CCI would like to approve proposal with understanding that Math will consult with other interested parties including ES and Geography as the program moves forward and will consider revisions to major track to include appropriate courses?**

Motion to Approve Hubin, 2nd Trudeau

Unanimously Approved

CCI Social, Behavioral, Biological, Mathematical and Physical Sciences Subcommittee
Tuesday, April 21, 2009

1. Math Major revision
 - Divided their major into 6 tracks- 2 tracks unchanged, 3 new, 1 revised
 - No new courses, just dividing up what they already had
 - Concurrence
 - Plenty of concurrences for the new tracks, including Nationwide
 - Nothing from Traditional or Education tracks, but they were not changed so concurrence is not necessary
 - Assessment of the major
 - Diverse and complete- exit survey, alumni survey, but no embedded questions

- The major has vertical integration with sequential prerequisites, and thus, assessment of what students have learned is achieved in subsequent courses.
 - They could show how students are “prepared” for the course. The problem with that is if it was a prereq course, everyone would have taken it and there is no control group for comparison of learning.
 - Embedded questions are nice but not necessary
 - Much of their assessment is qualitative rather than quantitative
 - Track-specific assessment (Math Ed & Financial)- there are tests for licensure or to become an actuary/risk manager (How many students will take that exam? Can they make them take the exams?)
 - Obtaining Praxis scores for Bio students is difficult; the College of Education gets aggregated scores and cannot tell who gets what scores from this school; individual students can report back
 - Math Ed students should all report back their results
 - Surprised at the low numbers of Math majors graduating each year
 - Require sensible assessment plan for each tract. Geography, for example, had Capstone courses for each track to assess their new majors.
 - No specific learning outcomes by track, but they have overall learning outcomes that lend themselves nicely to be mapped to each track; some tracks have specific outcome measures; others are more general, e.g, attracting majors and alumni feedback
 - For instance, learning outcome 1- integral and differential calc; if we bring in enough students to learn this, we have achieved it; outcome 3 is general enough to be measured for all tracks; If the alumni appreciate what they learned and attract majors seems general enough
 - Bio-Math major: made numerous changes in response to BIO CC concerns, but is there some way to ask or make a learning outcome that would relate specifically to biology. That would be different than one for the financial track. For example: "Explain a biological problem using quantitative concepts and models"
 - Courses are not changed. The tracks are attractive and would probably attract more majors, but if you are talking about differences between Biological systems and Physics, there should be different outcomes
 - **Suggestion- Provide at least 1 measurable, learning outcome that would be track-specific**
 - P.15- Neurology to Neuroscience on Bio-Math track, some concern over prereq changes that were to have been made in a past revision after consultation with BIO
 - They do mention a history of how they have used assessment in the past
- Breitenberger, Fredal- **UNANIMOUSLY APPROVED WITH recommendation in bold above**

MAPS Curriculum Committee

Wednesday, February 25, 2009

1. Math Major Revision

- Modeled after a proposal from Dance department for their revision to the major, responding to bullet points of approximately 30 questions to address
- Began the revision process a little over a year ago, when a proposal of a Financial degree was initiated; took a more general look at the Undergraduate degree
- 6 tracks
 - i. Traditional- unchanged
 - ii. Education- unchanged, made more transparent which courses are most appropriate for Education majors, admission to the MA in Education program, allowing secondary teaching of Math in Ohio- the math content is unchanged other than a requirement for Diff Eq dropped, and a choice between Discrete Math modeling or Diff Eq course; clarifies existing option
 - iii. Applied- existed but had different required courses from traditional track; for sake of clarity the differences were made more transparent; significantly changed- previously it was not coherent at the elective level, spelling out more carefully sample schedules and specific “tracks” applied to multiple disciplines
 - iv. Applied Discrete- new, embedded in a computer science minor
 - v. Financial
 - vi. Bio-Math-
- Letters of support and concurrence from Nationwide (endorsement of Financial track), Computer Science & Engineering (endorsing Applied Discrete track), EEOB, Medical Center, draft of endorsement and comments from Bio (Caroline Breitenberger) & Infectious Diseases (Bio-Math track), Mechanical Engineering, Chemistry, Electrical Engineering (Applied track)
 - i. Requests concurrence from Physics
- Sample schedules- for each applied option, 9 cr from Group I, 9 cr from Applications Group II- is the idea that students will take more courses?
 - i. Prerequisites increase the hours
 - ii. Advisors will sit down with students and allow them to set up a schedule
 - iii. All students would have help customizing by faculty members
 - iv. Already interest being shown in Bio-Math track
 - v. For Physics- 12 cr from 261-262-263, other courses 4 credits, now at 16 cr; 416 is a prereq for the upper division courses now and lab experience is recommended, so would those students get 416 waived?
 1. should it automatically be waived, or permission from instructor? If they want to be physics majors they would have to take that course
 2. in advanced physics courses, lab work in 416 is recommended. The issue here is allowing instructors in upper division courses to incorporate programming in the teaching experience. But without minimum ability, such as 416, and CSE 202 is a 416 prereq, these students are at a disadvantage

3. in this program, Math 571 & 572 are MatLab linear algebra courses, with CSE 202 as a prereq; so they will have that background
 4. **thus Physics has granted concurrence if students with 571-572 with strong MatLab background can get 416 waived as a prereq;** perhaps include a 571-572 syllabus to show MatLab exposure
- students will want to sign up early for especially the Applied track
 - **can you require a minor within a major? (Applied Discrete option) If so, this is fine. If not, include the minor courses as part of the track and would not get a minor [ADDED POST-MTNG FROM D ANDERECK: I think the most relevant data point is that Middle Childhood requires a minor in a particular program, Education, so that is a fine parallel and precedent. I agree that we are all set. Dave]**
 - i. FAES requires students to take a minor from a selected list
 - ii. If students take 1 option they get 39 credits, another option get 40 credits; if you can show a minimum number of hours for a major and requiring a minor program that is OK; however if you have to get the full minor to make the major that is an issue
 - iii. With **CSE 202**, that takes them over; can be added in officially; it is de facto required; just **list it explicitly in Applied track; and prob/stats requirement on all programs**
 - Some of the tracks have a Stats course explicitly listed; some have it encouraged; in the GEC, BA programs require a Stats course. There is no explicit requirement in the BS is that it is assumed it is in the major program. This is an opportunity to include data analysis GEC into the program. Otherwise, strongly encouraged Stats course should be changed to required. Honors version of Traditional does not include Stats; here we could add Stats 421, giving data analysis part. **Also will list in the requirements for all tracks.**
 - **Point #29- can excellence in teaching be added, or remove “as researchers in Mathematics”**
 - Financial track is still in demand despite recent slump
 - **Point #25- 60 credit hours in GEC to 80; also change strongly recommend to require**
 - **Point #26- lower electives to 50-55, and 51 to 71**
 - **Point #20- New students expected- projected to be a net increase in 30 and a shift from traditional track to an applied track; of the 70 students graduating with a degree in Math each year; if growth is 50% each year, are resources being strained for the courses specific to Bio-Math or Financial tracks? Is there a formal admission to the program? A major orientation? Perhaps change to declare a math major each year or formal admission process. Then make the meeting of a faculty advisor as a prereq. Can upper division courses contain all potential increases in enrollment?**
 - At the 300-level courses, what percentages are taught by full faculty? Almost 100% for mainline major courses, and certainly increased from a number of

years ago. Dept is trying to put a rule in place to mandate 345 course (key to program) always be taught by faculty and math majors taking that course be assigned a faculty advisor and meet often that qtr.

- Committee and Curriculum Office impressed with the proposal; sample for every option was important
- Point 21- There is a suggestion in the proposal to meet with advising
- **Some suggestions in concurrences/changes to elective options in track that will be incorporated**
- **Some renumbering; #5 track**
- **UNANIMOUSLY APPROVED with contingencies stated in bold above-**
Craigmile, Pinsonneault

PROPOSAL FOR A REVISION OF THE UNDERGRADUATE DEGREE REQUIREMENTS IN THE DEPARTMENT OF MATHEMATICS

I. EXECUTIVE SUMMARY

The Department of Mathematics proposes to revise the mathematics undergraduate curriculum in order to:

1. Capitalize on the newly developing strengths within the university, such as the Mathematical Biosciences Institute.
2. Create more choices of degree track for undergraduate majors, directed towards the diversity of new and expanding fields such as mathematical finance, mathematical biosciences, coding theory and cryptography, etc.
3. Formalize some changes that have been occurring in an ad hoc way for several years.

A reduced set of Core Requirements for all mathematics majors has been established. This set of Core Requirements will typically be completed by students during their first two years of study, although honors students or students with advanced placement credit can complete the Core in four academic quarters.

Beyond this set, students have the opportunity to choose from among six degree tracks:

- a. Traditional Track
- b. Education Track
- c. Financial Track
- d. Bio-Math Track
- e. Applied Track
- f. Applied Discrete Track

The Traditional Track is unchanged from the current traditional major program. Likewise the Education Track simply clarifies the currently recommended program of study for students whose goal is a career in secondary education. It affords a bit of additional choice between differential equations and discrete modeling, while remaining consistent with Ohio State standards for licensure in secondary mathematics education.

The Applied Track is substantially revised and clarified. The set of required courses is changed only slightly by the addition of Math 345 and the removal of Math 513. The principal change occurs in the elective courses in which emphasis is placed on the interdisciplinary nature of this track. Students are now required to take a 9 credit sequence of courses in a physical science or engineering discipline, closely correlated with their advanced mathematics studies. The Applied Track requires three more credit hours of course work than did the earlier Applied-Math Option, but it more than compensates for that by giving focus and guidance, directing students towards important fields of application for their mathematical skill set.

The remaining three tracks (Applied Discrete, Financial, and Bio-Math) are entirely new and reflect the rapid growth of employment opportunities for mathematicians in the areas of computers and national security, of finance and risk management, and of mathematical bio-sciences. The Applied Discrete Track builds on the traditional strengths of our faculty in logic and combinatorial mathematics, along with close working relationships with the Department of Computer Science and Engineering. The Financial Track builds on the great success of our undergraduate Actuarial Science degree program, housed in the Department of Mathematics, and supplements it with additional material preparing students for master's level study in financial mathematics. Finally, the Bio-Math Track exploits the presence of the National Science Foundation-funded Mathematical Bio-Sciences Institute at the Ohio State University to provide a unique opportunity for students to study and do research in the growing fields of mathematical and statistical bio-sciences. We already have students expressing interest in pursuing this degree track.

Revision of the Curriculum for the Bachelor of Science and Bachelor of Arts Degree Programs in Mathematics

I. GENERAL INFORMATION

1. This is a revision of the current mathematics major. It is designed to offer additional tracks towards a degree in mathematics. This is consistent with the latest trends at successful undergraduate programs. A highly regarded and very successful program is the one at UCLA. Their program features a very similar set of tracks to the ones which we are proposing.
2. The degree titles are Bachelor of Science in Mathematics and Bachelor of Arts in Mathematics. The two degrees differ only in their GEC requirements, which are not affected by this proposal. These changes do not constitute a new degree or major, only a change of requirements within the major.
3. Autumn Quarter 2009 is the proposed implementation date.
4. The major is administered by the Department of Mathematics, in the College of Mathematics and Physical Sciences.

II. RATIONALE

5. Rationale for the proposed revisions

Under the current requirements, there are two possible tracks to an undergraduate major in mathematics: a traditional track and an applied track. Even this is not clearly formulated in the current version, and so at the very least a clarification would be in order. There is also an actuarial science undergraduate major, based in the Department of Mathematics, but not a part of the mathematics major.

More important is the fact that, although the “traditional” track is basically sound as a preparation for students wishing to seek secondary education certification or wishing to continue to graduate school in mathematics, the current “applied option” provides little guidance to students wishing to pursue one of the many possible careers open to people with a good undergraduate mathematics education.

Indeed, with each new year, the variety of careers requiring a deep understanding of mathematics increases. The Department of Mathematics wishes to structure a program which accommodates as much flexibility as possible for students wishing to pursue an undergraduate degree in mathematics as a foundation for their future careers.

Over the past decades, the strength of the Department of Mathematics in a variety of aspects of applied mathematics has grown considerably, most notably, but not exclusively, through the creation of the NSF-funded Math Biology Institute. This gives our Department the breadth and strength of faculty to provide strong training for our students in a variety of mathematical tracks. The purpose of this proposal is to offer students these educational choices and to provide templates for them of good programs of study to achieve their diverse career goals.

Thus, instead of two tracks, we now propose six degree tracks, simultaneously providing more guidance for students towards varied career goals and more flexibility in designing programs that fit their needs.

The BS (and BA) in Mathematics will consist of two phases of study: Core Curriculum for Freshmen and Sophomores; and Career Tracks for Juniors and Seniors.

Core Curriculum – course work for the Freshman and Sophomore years:

These are the 20 – 29 credit hours of foundational courses required of all students earning a degree in mathematics. The principal portion is the Calculus Sequence comprising 20 credit hours, taken in four sequential 5-credit courses. Students with some exposure to high school calculus are encouraged to take the accelerated or honors sequences, which complete this material in three 5-credit courses. The core is completed with a fundamental course in linear algebra and a course in foundations of higher mathematics, which provides the conceptual basis for all advanced study in mathematics. Students who follow the highest honors track (190H-191H-264H) receive this conceptual training already in the 190H-191H sequence, and are therefore exempted from taking the Math 345 foundations course. Students in the highest honors track can complete the core curriculum in four quarters with four 5-credit courses: 190H-191H-264H-520H.

Advanced Career Tracks

These are the additional 37 – 47 credit hours of advanced course work, providing students the choice of six tracks customized to different career paths in mathematics and allied disciplines.

The Traditional Track is almost identical to the old Traditional Degree. The set of elective options is slightly enlarged and updated. It is the standard training for students wishing to pursue graduate study in mathematics. It has been very successful for this purpose, particularly in the honors version.

The new Education Track corresponds closely to the degree program currently recommended to all students wishing to seek secondary education licensure in mathematics. It has served this purpose very well in the past. The set of required courses is identical with that of both the old and new Traditional Tracks, except that Math 578 (Discrete Mathematics Modeling) is an alternative choice to Differential Equations. The set of elective courses is shorter than that for the Traditional Track in order to provide guidance to students concerning which electives are best suited to prepare them for a career in secondary education. Indeed, the elective courses Math 504, 507, and 578, and Statistics 420 and 421 are required for admission to the O.S.U. M.Ed. program. A student choosing to use Math 578 as a required course, could then elect Math 504 and 507, and Stat 420 and 421, to complete the 20 required elective hours in this degree track.

The new Applied Track is similar to the existing Applied Option as regards required courses. [Math 345 is now required, and Vector Analysis is no longer required.] The number of required elective hours is increased from 15 to 18, but more important, the electives bring into clear focus some of the most important sequences in applied disciplines, such as chemistry, physics, mechanical engineering, electrical and computer engineering, which mesh well with the applied expertise of members of the Mathematics Department faculty, and complement the courses offered by the department.

The new Financial Math Track has been introduced to provide an alternative to the Actuarial Science major for the rapidly growing number of students seeking majors in the burgeoning financial mathematics field. Increasingly, employers seek students with greater breadth of knowledge in mathematics than that offered by the Actuarial Science major. The use of stochastic differential equations is becoming widespread in risk analysis and derivative pricing. Thus we have included a requirement of a differential equations course and a

numerical analysis course which, together with probability and statistics, form the underpinnings for the study of stochastic differential equations. The new course, Introduction to Mathematical Finance, will give students an introduction to these methods. The Department of Mathematics is developing a targeted M.S. degree in financial math, and this undergraduate Financial Math Track will be the perfect preparation for this master's program.

The new Bio-Math Track reflects the rapidly growing interface between biology and mathematics. The new faculty and resources associated with the N.S.F.-funded Mathematical Biosciences Institute and the Targeted Investment for Excellence in this field will give us the ability to provide superb training and undergraduate research opportunities for students in this newly emerging field. This undergraduate track will provide excellent preparation for students planning for graduate study in bio-mathematics and will also be an attractive option for pre-Med students wanting a distinctive major to set themselves apart among the applicants to medical school. The Department of Mathematics is developing a targeted M.S. degree in bio-mathematics, and this undergraduate track will provide excellent preparation for this master's program.

The new Applied-Discrete Track is designed for students interested in careers in the areas of software design, cryptography, cryptology, optimization, and other related fields, for which a combination of expertise in discrete mathematics (graph theory, coding theory, etc.) and computer programming is the ideal preparation. The track combines a solid major in discrete mathematics with a minor in computer and information sciences.

6. Unique characteristics and resources that make it appropriate for Ohio State to offer the program.

Ohio State has a distinguished Department of Mathematics and has been offering a very successful undergraduate program in mathematics for many decades. In particular, our Department has very high national ranking in combinatorial mathematics, which will support the Applied Discrete track in conjunction with our CS&E Department. The Financial Math Track will build on the established and growing success of our Actuarial Science degree, and the Bio-Math Track will benefit immensely from the presence at Ohio State of the National Science Foundation-funded Mathematical Biosciences Institute.

7. Benefits for students, the institution, the region and the state.

The State has set the highest priority on the training of more students in STEM disciplines. The introduction of new and attractive tracks in the mathematical sciences, with clearly articulated career goals, can only help in the recruitment and retention of more and better students majoring in mathematics at Ohio State, and contributing after graduation to the highly qualified technologically sophisticated workforce of the State of Ohio.

8. Similar programs within 50 miles of Ohio State.

There are no similar programs within 50 miles.

9. Enrollment patterns of similar programs.

UCLA has a similar program to the one here proposed. Their total undergraduate student population is approximately 10,000 fewer students than at Ohio State. However, their average number of bachelor degrees in mathematics awarded during the period 2004 – 2006 was 179.7, with 72.0 women, as compared with 95.0 at Ohio State, with 28.0 women. This suggests that the introduction of more applied degree tracks should attract more undergraduate majors and more diversity into the major population.

10. Job and study opportunities for graduates.

The new degree track in bio-mathematics will afford opportunities for research internships with the Mathematical Bio-Sciences Institute, which will prepare students for many careers in bio-mathematics and bio-statistics, including genetic code analysis and ecological resource management. The new degree track in financial mathematics will benefit from the established relationship of the current Actuarial Science program with major insurance companies, affording internships and career opportunities there as well as in the general risk management field. The new degree track in applied-discrete mathematics will be well-suited to place graduates with the National Security Agency, the Institute for Defense Analysis and other homeland security employers. There will of course remain the more traditional career tracks of graduate study in mathematics and related disciplines, and of secondary education in mathematics.

11. Licensure requirements for which this program will prepare students.

The Math Education track will continue to prepare students successful for the Praxis exams, required for licensure in secondary education. The Financial Math track, like the Actuarial Science degree track, will prepare students well for the actuarial licensure examinations.

III. GOALS AND OBJECTIVES**12. Learning outcomes assessment plan for the major program****ASSESSMENT PLAN****1. General and specific educational goals and objectives of the major.**

The Ohio State University bachelor's degree in mathematics provides a comprehensive foundation of knowledge, skills, and methods for the pursuit of a wide variety of mathematics-related careers in business, government and education. The mission of the mathematics undergraduate program is to instill the methods of analytical reasoning and logical deduction, which are fundamental to the mathematical method, as well as to provide a basic knowledge of mathematical concepts and algorithms useful to mathematical problem-solving.

In order to accomplish this mission, the Department has identified the following list of specific education objectives for the undergraduate program:

1. Students will master the fundamental techniques of the differential and integral calculus of functions of one and several variables.
2. Students will acquire basic skills with systems of linear equations and the methodology of eigenvalue and eigenvector analysis.
3. Students will acquire facility at reading mathematical discussions and proofs.
4. Students will develop skills at constructing their own mathematical proofs using methods such as proof by contradiction, proof by contraposition, mathematical induction, wellordering, etc.

Beyond these general goals there are track-specific goals for each of the major tracks:

Traditional Track: Mastery of the foundations of analysis and algebra sufficient for success in a graduate program in mathematics.

Education Track: A deep understanding of the mathematical underpinnings of high school algebra, geometry, trigonometry, and calculus.

Financial Track: Mastery of the concepts and tools needed for the mathematical modeling and assessment of financial risk.

Bio-Math Track: Mastery of the concepts and tools needed for the mathematical modeling and study of biological phenomena.

Applied Track: Mastery of the concepts and tools needed for the mathematical modeling and study of physical phenomena.

Applied-Discrete Track: Mastery of the interface between discrete mathematics and theoretical computer science.

2. Methods used to assess whether the educational goals and learning objectives are being met

The general goals and objectives of the major listed above are assessed via written examinations in relevant courses. In particular, Goal 1 is assessed in the beginning calculus courses, Math 151 and 152. The Department has, for the past five years, instituted close coordination of these courses, with homework assignments and examinations set by the Course Coordinators. This guarantees uniformly high standards. A minimum course grade of C- is mandated for advancement to the next course in the sequence. Goal 2 is assessed in the linear algebra course (Math 568 or 571), while Goals 3 and 4 are assessed in Math 345.

Mathematics is a highly vertical discipline and therefore ongoing assessment of the mastery of these educational goals takes place in all subsequent mathematics courses in the program.

The Department also conducts exit surveys of mathematics majors, as well as studying the data collected in the University exit surveys, in order to assess student satisfaction with the program.

The Department tracks placement of graduates in graduate and professional schools and in professional employment, as another measure of the success of the program.

The Department has just begun to send out electronic surveys of mathematics alumni in order to assess the success of our program in the career development of our graduates. We will continue this as an ongoing assessment tool.

Specific tracks have additional external measures of assessment:

For students in the Traditional Track, successful placement in top-ranked graduate programs is a measure of the success of this track.

For students in the Math Education Track, success on the Praxis examinations, in particular on the content examination, is a measure of the success of this track in the training of future secondary math educators. For students in the Financial Track, as in the current Actuarial Math major, success on the Actuarial Society Examinations is a measure of the success of this track in the training of future members of the financial and risk

management professions. Post-graduate scholarships and placement with top financial institutions is a further measure of success.

New degree tracks, such as the new Applied Track, the Bio-Math Track, and the Applied-Discrete Track, will be measured first by their success in attracting majors, second by our success in placing the graduates from these tracks in excellent post-graduation jobs or advanced degree programs, and finally by the alumni feedback indicating their level of satisfaction from the perspective of age and experience in the education which we provided them. The Mathematical Biosciences Institute will give ongoing assessment and feedback on the success of the Bio-Math Track. Microsoft, Google, the National Security Agency, the Institute for Defense Analysis, and other such organizations are natural employers for graduates of the Applied-Discrete Track. We will invite them to recruit here and will solicit their feedback on the quality of our program.

2. Time line over which the assessment plan will be implemented.

The assessment surveys and evaluation of data occurs on an annual ongoing basis. Needless to say, the most meaningful measures of success for the new tracks will not be available for many years, when we can assess the success in career placement of graduates and job satisfaction reported by alumni.

3. How outcomes information will be used to improve student learning and program effectiveness.

The Department of Mathematics is continually evaluating data on student success and satisfaction in order to improve our courses. The implementation five years ago of close coordination of the beginning calculus courses was a result of data suggesting lack of retention of knowledge by some calculus graduates, as evidenced in future mathematics courses, as well as in courses in sister disciplines, such as chemistry. There is work-in-progress at this moment to revise the syllabus and delivery methodology for the basic differential equations course, Math 415, based on data reported primarily by colleagues in the College of Engineering, concerning failure of knowledge transfer from mathematics courses to engineering courses. Likewise the abstract algebra sequence is in the process of redesign in order to improve its relevance to future secondary math educators.

This process will continue with the new undergraduate tracks. The Undergraduate Committee of the Department of Mathematics oversees the evaluation of all courses, both new and existing. Representatives of the important programs (financial math, bio-math, applied math, honors, teacher education) serve on this Committee and provide ongoing monitoring of the successes and failures of the programs.

IV. RELATIONSHIP TO OTHER PROGRAMS

13. Current major and minor programs in the department and how they relate to the proposed revisions.

As noted above, the traditional major program remains unchanged. The new proposal offers greater variety of pathways to a bachelor's degree in mathematics.

14. Overlaps with other programs or departments within the university.

The Applied-Discrete Track requires students to earn a minor degree in Computer and Information Science. The other applied tracks require course work in allied disciplines. We have requested and obtained concurrences from the departments of Computer Science and Engineering, Electrical and Computer Engineering, and Mechanical Engineering, who have agreed to allow students pursuing one of

our applied degree tracks to take courses in their discipline normally restricted to their own majors. (See attachments.) We have also consulted with and obtained concurrences from Biology, concerning the bio-math track.

15. Cooperative arrangements with other institutions and organizations that will be used to offer this program.

We have a letter of cooperation from Nationwide Insurance Company supporting our proposed Financial Math Track. We also have a letter of cooperation from the Director of the Mathematical Bio-Sciences Institute supporting our proposed Bio-Math Track and offering undergraduate research opportunities for participants.

16. Articulation arrangements with other institutions that will be in effect for the program.

No special arrangements are needed.

17. Use of consultants or advisory committees in the development of the program.

The general framework of the program was proposed by a subcommittee of the Undergraduate Committee of the Department of Mathematics, assisted by Rodica Barbu in the collection of data from benchmark institutions. The concept of greater flexibility of degree program was encouraged by our colleague, Peter March, currently Program Director for Mathematics at the National Science Foundation. March specifically recommended the program at UCLA as a model of a successful undergraduate degree program in mathematics. Our proposal is quite similar to this model, taking advantage of the unique strengths of the Ohio State University.

The Financial Math Track was designed by Professor Chunsheng Ban, director of the Actuarial Sciences Program, in consultation with colleagues at Nationwide Insurance Company, including Rick Evans. The Bio-Math Track was designed by a subcommittee of Math Department faculty, led by Dr. Chiu-Yen Kao, in consultation with the directorate of the Mathematical Biosciences Institute. The Applied Math Track was designed by a subcommittee of Math Department faculty, in consultation with College of Engineering colleagues. The Applied-Discrete Track was designed by Professors Carlson and Seress in the Math Department, in close consultation with Professors Weide and Soundarajan in CS&E.

18. Previously submitted proposals.

None.

19. Where students are drawn from.

As with the existing degree program, students will be drawn from the general population of undergraduate students at the Ohio State University. The steadily improving quality of the undergraduate population, together with the Statewide initiatives to encourage more majors in STEM disciplines, should couple well with the increased flexibility and attractiveness of the proposed degree tracks to attract increasing numbers of undergraduates into the program.

V. STUDENT ENROLLMENT

20. Indicate the number of students you anticipate will declare a major in mathematics each year.

Currently, there are approximately 70-75 students who declare a major in mathematics each year. We expect this number to rise gradually as the new degree options become established and publicized. We expect at least 100 new majors per year by four years hence.

VI. DEGREE REQUIREMENTS

21. Courses which constitute the requirements and other components of this program.

There are several alternative tracks for students pursuing an undergraduate degree in mathematics. These will be described in detail below. Students intending to pursue a masters or doctoral degree in mathematics should follow the traditional track, preferably the honors version thereof. Students should design their degree program in consultation with their faculty advisor, preferably before the end of their sophomore year. Students planning an Honors Contract in mathematics must take at least the 161H or 190H sequences and one other honors math sequence.

All tracks have a common core of required courses:

CORE REQUIREMENTS FOR ALL MATH MAJORS:

- A. Calculus Sequence: 151, 152, 153, 254, or one of the accelerated or honors sequences (161, 162, 263; 161H, 162H, 263H; 190H, 191H, 264H).
- B. Linear Algebra: 568 (or 571 or 520H)
- C. Foundations of Higher Mathematics: 345
(waived for students who have taken 191H, and for students pursuing the Applied-Discrete Track)
- D. Data Analysis: Statistics 421

DEGREE TRACKS:

There are six degree tracks available for students pursuing an undergraduate major in mathematics:

1. **Traditional Track**
2. **Education Track**
3. **Financial Track**
4. **Bio-Math Track**
5. **Applied Track**
6. **Applied-Discrete Track**

Each of these is described in detail in the following pages.

Note: A maximum of 3 hours of 593 or 693 may be used in any of these degree programs.

There is also a degree in **Actuarial Science**, which is technically distinct from a degree in mathematics, but which resides in the Department of Mathematics. No change is proposed for the actuarial science major.

1. Math Major: Traditional Track

The traditional track is intended for students seeking a strong foundation in classical mathematics, in particular for students intending to pursue graduate study in mathematics. Students planning to pursue a PhD. in mathematics are strongly encouraged to take the honors version of the math courses listed below, whenever possible.

In addition to the Core Requirements for all mathematics majors, the following are

Required Courses for the Traditional Track

- E. Differential Equations:** 521H (or 255)
- F. Abstract Algebra Sequence:** 590H-591H-592H (or 580-581-582)
- G. Real Analysis Sequence:** 190H-191H (or 547-548-549)

Elective Courses

In addition to the above, students are required to complete a minimum of 15 hours selected from the list below.

- | | |
|---------------------------|-----------------------------|
| a. Calculus on Manifolds | 540H, 541H |
| b. Combinatorics | 575 |
| c. Complex Variables | 522H (or 654 or 660 or 514) |
| d. Discrete Modeling | 578 |
| e. Geometry | 507 |
| f. History of Mathematics | 504 |
| g. Linear Algebra | 572 |
| h. Number Theory | 576H, 577H (or 573) |
| i. Partial Diff. Eqns. | 512 |
| j. Probability | 531H or 530 (or Stat 420) |
| k. Real Analysis | 651-652-653 |
| l. Topology | 655-656-657 |
| m. Vector Analysis | 264H (or 551 or 513) |

Two sample programs are given on the next page. The first is particularly recommended for students intending to pursue graduate study in mathematics.

SAMPLE SCHEDULE (Honors Version)

<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 190H	Math 191H	Math 264H
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 520H	Math 521H	Math 522H
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 590H	Math 591H Math 540H or 576H	Math 592H Math 541H or 577H
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 531H	Math 540H or 576H Stat 421	Math 541H or 577H

Note: 540-541H and 576-577H are offered in alternate years.

- 187H/487H (Problem solving seminars) would be an excellent enhancement.

SAMPLE SCHEDULE (Non-Honors Version)

<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 161H	Math 162H	Math 263H
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 345	Math 568	Math 255
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 580	Math 581 Stat 420	Math 582 Stat 421
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 547 Math 507	Math 548 Math 575	Math 549 Math 514

- 187H/487H (Problem solving seminars) would be an excellent enhancement.

2. Math Major: Education Track

The Education Track is designed for students seeking secondary education licensure in mathematics. A minimum GPA of 2.7 is required. In addition to the Core Requirements for all mathematics majors, the following are

Required Courses for the Education Track:

E. Differential Equations or Discrete Modeling: 255 (or 521H) or 578

F. Abstract Algebra Sequence: 580-581-582 (or 590H-591H-592H)

G. Real Analysis Sequence: 547-548-549 (or 190H-191H)

Elective Courses

In addition to the above, students are required to complete a minimum of 15 hours selected from the list below:

- | | |
|---------------------------|---------------------------------|
| a. Geometry | 507* |
| b. History of Mathematics | 504* |
| c. Differential Equations | 255 (or 521H), if not above |
| c. Discrete Mathematics | 575 |
| d. Probability | 530 (or Stat 420* or Math 531H) |
| e. Number Theory | 573 (or 576H, 577H) |
| f. Modeling | 578*, if not above |

SAMPLE SCHEDULE

<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 151	Math 152	Math 153
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 254*	Math 255**	Math 345* Math 568*
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 580* Stat 420*	Math 581* Stat 421*	Math 582 Math 578*
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 547 Math 507*	Math 548	Math 549 Math 504*

* = required for admission to the O.S.U. M.Ed. program

** = recommended but not required

- 187H/487H (Problem solving seminars) would be an excellent enhancement.

3. Math Major – Financial Math Track

The Financial Math Track is designed for students seeking a career in quantitative finance or a related field. Students planning to pursue graduate studies in financial mathematics are strongly encouraged to take the honors versions of the mathematics courses listed below, whenever possible.

In addition to the Core Requirements for all mathematics majors, the following are

I. Prerequisite Courses:

Economics: Econ 200 and 201 (or 200H and 201H)

Accounting: Acct 310

Computer Science: CSE 200

II. Required Courses for the Financial Track:

E. Differential Equations: Math 255 (or 521H) and Math 512

F. Probability: Math 530 (or Math 531H or Stat 420)

H. Interest Theory: Math 618

I. Financial Economics: Math 632

J. Numerical Analysis: Math 607

K. Intro. to Math. Finance: Math 589

L. Computer Science: CSE 201 (or 202)

M. Finance: Bus-Fin 420 (or 620)

N. Practicum Seminar

O. Recommended Additional Courses:

The following courses could serve to enrich the required program in financial math:

Finance 722; Statistics 635, 645; Math 532, 547, 548, 549, 630, 631; Computer Science 221

SAMPLE SCHEDULE

<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 151 CS&E 200	Math 152 Econ 200	Math 153 Econ 201
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 254 Accounting 310	Math 568 CS&E 202	Math 255 Math 345
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 512 Math 618	Stat 420 Finance 620	Stat 421 Elective (Math 532)
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 589	Math 607	Math 632 Practicum Seminar

4. Math Major – Bio-Math Track

In addition to the Core Requirements for all mathematics majors, the following are

Required Math-Related Courses

- E. **Differential Equations:** 255(or 521H) and 512
- F. **Probability:** Stat. 420 (or Math 530 or 531H)
- G. **Linear Algebra:** 572 (waived for students who have taken 520H=571+572)
- H. **Numerical Analysis:** 607 (or approved substitute)(5cr.)

Required Biology-Related Courses

- I. **Biology Sequence:** Chem 121, Bio 113(or 115H), Bio 114 (or 116H)
- J. **Math Biology Seminar:** Math 350
- K. **Advanced Biology courses:** Bio 401, Bio 402

"Mathematics is applicable to many different aspects of biology, and new applications are continually being found. In order to allow students to choose the directions in which they wish to apply themselves, we have listed several options as electives. We fully expect that students will take the appropriate prerequisites associated with the courses they choose, and students will be advised accordingly."

Students will be required to obtain written approval, prior to their junior year, for their planned program of study from a faculty advisor, assigned by the Mathematics Counselors.

Elective Courses (9 credit hours)

In addition to the above, students are required to complete a minimum of 9 hours selected from the list below. Substitutions are permitted, but only with the written approval of the faculty advisor.

1. Biology:

- Ecology & Evolution: EEOB 400 (evolution), EEOB 410 (animal form and function)
EEOB 503 (introductory ecology)
- Molecular Biology: MG 500 (general genetics)
- Microbiology: MB 509 (basic and practical microbiology)
- Biochemistry 511 (introduction to biological chemistry)
- Neuroscience: Neuro 300 (introduction to neuroscience)

2. Mathematics:

- Advanced ODE/Dynamical System 615, 616 (or 556, 557, when approved)
- Analysis 547 (190H)
- Algebra 580 (590H)
- Complex Variables 514 (522H)
- Discrete Modeling 578
- Geometry 507

3. Chemistry: Chem 251, 252, 253 (Organic chemistry)

Note: The application of mathematics to biology is highly interdisciplinary in nature, continually finding not only new applications within biological fields, but also new fields in which to apply mathematics. As such, we expect future students and interested faculty to propose courses, sequences, and tracks not listed here.

SAMPLE SCHEDULE (I)

Autumn
Math 151
CH 121

Winter
Math 152
Bio 113(115H)

Spring
Math 153
Bio 114(116H)

Autumn
Math 254

Winter
Math 255
Stat 420

Spring
Math 512
Math 345
Stat 421

Autumn
Math 571
Advanced Bio 1
(e.g. Bio 401)

Winter
Math 572
Math 607

Spring
Advanced Bio 2
(e.g. Bio 402)
Math 350

Autumn
Elective Bio 1
(e.g. EEOB 400)

Winter

Spring
Elective Bio 2
(e.g. EEOB 503)

SAMPLE SCHEDULE (II)

Autumn
Math 151
CH 121

Winter
Math 152
Bio 113(115H)

Spring
Math 153
Bio 114(116H)

Autumn
Math 254

Winter
Math 255
Stat 420

Spring
Math 512
Math 345
Stat 421

Autumn
Math 571
Elective Math 1
(e.g. Math 615)

Winter
Math 572
Elective Math 2
(e.g. Math 616)

Spring
Math 350

Autumn
Advanced Bio 1
(e.g. Bio 401)

Winter
Elec. Math 3 (e.g. 547)
(e.g. Math 547)
Math 607

Spring
Advanced Bio 2
(Bio 402)

5. Math Major: Applied Math Track

This applied math option is intended for students seeking a strong foundation in mathematics and its application in physical science. Students will be required to obtain approval for their planned program of study from a faculty advisor prior to their junior year. The Mathematics Councilors will assign a faculty advisor to guide the student through the program. An honors version of the program is available – see the last sample program.

In addition to the Core Requirements for all mathematics majors, the following are

Prerequisite Courses:

- E. Physics Sequence:** Phys 131, 132, 133 (or 131H, 132H, 133H).
- F. Computer Programming:** CSE 202.

Required Courses for the Applied Track:

- G. Differential Equations:** 255, 512 (in some specializations, Math 415 can replace Math 255 – see sample programs).
- H. Probability:** Stat. 420 or Math 530 or Math 531H
- I. Linear Algebra:** 572 (waived for students who take 520H = 571+572).
- J. Numerical Analysis:** 607.
- K. Complex Variables:** 514.

Elective Courses

In addition to the above, students are required to complete a minimum of 9 hours in Group I and 9 hours in Group II.

Group I: Math courses

- Analysis:** 547, 548, 549.
- Mathematical Principles in Science:** 601, 602, 603.02.
- Applied Differential Geometry:** 665, 666.
- Calculus of Variations and Tensor Calculus:** 701.
- Vector Analysis:** 513 or 551.

Group II: Applications

The student should choose a coherent sequence of courses in some discipline outside of mathematics that makes significant use of mathematics. These disciplines may include chemistry, physics, statistics, and various areas of engineering. Some specific choices are listed below. Others may be chosen with the specific approval of your advisor.

Chemistry:

- Chem. 121-122-123: General Chemistry.
- Chem. 221: Analytical Chemistry.
- Chem. 530: Quantum Chemistry.
- Chem. 531: Statistical Mechanics and Thermodynamics.
- Chem. 532: Thermodynamic Equilibrium and Chemical Kinetics.

SAMPLE SCHEDULE

<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 151 Phys 131	Math 152 Phys 132 CSE 202	Math 153 Phys 133
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Chem. 121 Math 254	Chem. 122 Math 255 Math 571	Chem. 123 Math 512 Math 572 Math 345
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 547 Chem. 221	Math 607 Stat 420	Math 512 Stat 421 Math 514
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Chem. 530 Math elective	Chem. 531 Math elective	Chem. 532 Math elective

Special notice: Students can accomplish the math and chemistry (B.A.) double major by adding the following classes;

3rd year – Chem. 251-252-253, along with the organic lab sequence.

4th year – Chem. 541.

Digital Signal/Image Processing:

ECE 205: Circuit Analysis.*
 ECE 301: Analysis and Design in Circuits and Electronics.
 ECE 351: Systems I.
 ECE 352: Systems II.**
 ECE 600: Introduction to Digital Signal Processing.

Students with a strong interest in this topic may consider taking the more advanced courses;

ECE 700: Digital Signal Processing.
 ECE 706: Medical Imaging
 ECE 707: Digital Image Processing.

Students might also consider a Controls/Systems sequence, directly following ECE 351:

ECE 752 (Feedback Control Systems)
 ECE 754 (Nonlinear Systems)
 ECE 755 (Digital Control Systems)

Or, following ECE 352:

ECE 551 (Introduction to Feedback Control Systems)
 ECE 750 (Linear System Theory)
 ECE 759 (Numerical Optimization for Electrical Engineers)

SAMPLE SCHEDULE

<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 151 Phys 131	Math 152 Phys 132 CSE 202	Math 153 Phys 133
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 254	Math 415 Math 571	Math 345 Math 572 Math 512
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 547 ECE 205*	Math 607 Stat 420	Math 514 Stat 421 ECE 301
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
ECE 351 Math elective	ECE 352** Math elective	ECE 600 Math elective

* Requirement of admission to the ECE major will be waived for math majors on a case-by-case basis.

** Pre-requisite of ECE 301 will be waived for math majors on a case-by-case basis.

Dynamics:

- Mech. Eng. 410: Statics.
- Mech. Eng. 430: Dynamics.
- Mech. Eng. 501: Thermodynamics I.
- Mech. Eng. 502: Thermodynamics II.
- Mech. Eng. 503: Fluid Dynamics I.
- Mech. Eng. 504: Fluid Dynamics II.

Students with a strong interest in this topic may consider taking the more advanced courses;

- Mech. Eng. 731: Vibrations of Discrete Systems.
- Mech. Eng. 734: Vibrations of Continuous Systems.
- Mech. Eng. 735: Analytic Dynamics.

SAMPLE SCHEDULE

Autumn

Math 151
Phys 131

Winter

Math 152
Phys 132
CSE 202

Spring

Math 153
Phys 133

Autumn

Chem. 121
Math 254

Winter

Math 415
Math 571

Spring

Math 345
Math 572
Math 512

Autumn

Math 547
Mech. Eng. 410

Winter

Math 607
Stat 420

Spring

Math 514
Stat 421
Mech. Eng. 501

Autumn

Mech. Eng 502
Math elective

Winter

Mech. Eng. 503
Math elective

Spring

Mech. Eng. 504
Math elective

Physics:

Phys. 261: Dynamics of Particles and Waves I.
 Phys. 262: Dynamics of Particles and Waves II.
 Phys. 263: Dynamics of Particles and Waves III.
 Phys. 621: Statistical Physics I.*
 Phys. 622: Statistical Physics II.
 Phys. 644: Theoretical Mechanics.

Phys. 555: Fields and Waves I.*
 Phys. 656: Fields and Waves II.
 Phys. 657: Fields and Waves III.

Phys. 631: Introductory Quantum Mechanics I.*
 Phys. 632: Introductory Quantum Mechanics II.
 Phys. 633: Introductory Quantum Mechanics III.

SAMPLE SCHEDULE

<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 151 Phys 131	Math 152 Phys 132 CSE 202	Math 153 Phys 133
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 254	Math 255 Math 571	Math 512 Math 345 Math 572
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math 547 Math 513 Phys. 261	Stat 420 Math 607 Phys. 262	Math 514 Stat 421 Phys. 263
<u>Autumn</u>	<u>Winter</u>	<u>Spring</u>
Math elective Phys. 621 or Phys. 555 or Phys. 631	Math elective Phys. 622 or Phys. 656 or Phys. 632	Math elective Phys. 664 or Phys. 657 or Phys. 633

* The Physics 416 pre-requisite will be waived for math majors who have taken Math 571/572 on a case-by-case basis.

Radio Wave Propagation:

- ECE 205: Circuit Analysis.
- ECE 311: Electro-Magnetics I.
- ECE 312: Electro-Magnetics II.

Students with a strong interest in this topic may consider taking the following advanced courses;

- ECE 710: Microwave Circuits
- ECE 711: Radiation from Antennas.
- ECE 713: Elements of Radio Wave Propagation.
- ECE 714: Radar Systems.
- ECE 716: Optics with Laser Light
- ECE 719: Electromagnetic Field Theory

SAMPLE SCHEDULE

Autumn

Math 151
PH 131

Winter

Math 152
PH 132
CSE 202

Spring

Math 153
PH 133

Autumn

Math 254

Winter

Math 415
Math 571

Spring

Math 345
Math 512
Math 572

Autumn

Math 547

Winter

Math 607
Stat 420

Spring

Math 514
Stat 421

Autumn

ECE 205
Math elective

Winter

ECE 311
Math elective

Spring

ECE 312
Math elective

Honors Program (Applied Track):

Students intending to pursue a PhD. in mathematics are strongly encouraged to take two quarters of real analysis, two quarters of abstract algebra and the honors version of the math courses listed below, whenever possible. To be eligible for the degree with honors, students must take one of the honors sequences in calculus, and at least one other honors math sequence.

Honors Courses:

- A. **Calculus:** 161H, 162H, 263H replaces 151, 152, 153, 254 or 190H, 191H, 264H replaces 151, 152, 153, 254, 345, 547, 548, 549.
- B. **Linear Algebra:** 520H replaces 571, 572.
- D. **Physics:** Ph131H, Ph132H, Ph133H replaces Ph131, Ph132, Ph133.
- F. **Differential Equations:** 521H replaces 512.
- J. **Complex Variables:** 522H replaces 514.

Elective Honors Courses:

- Applied Differential Geometry:** 540H, 541H replaces 665, 666.
- Vector Analysis:** 264H replaces 513 or 514.

6. Math Major: Applied Discrete Track

The applied discrete math option is intended for students seeking a career in mathematics focusing on discrete mathematics and computation. This includes students intending to pursue a PhD in either combinatorics or mathematical logic. These students are strongly encouraged to take at least two algebra courses, two analysis courses, and the honors options of the course listed below whenever possible.

Students will be required to obtain written approval, prior to their junior year, for their planned program of study from a faculty advisor, assigned by the Mathematics Counselors.

In addition to the Core Requirements for all mathematics majors, the following are

Required Math-Related Courses

E. Computer Programming: CSE 202

F. Combinatorial Mathematics and Graph Theory: Math 575

G. Discrete Mathematical Models: Math 578

H. Probability: Math 530 or 531H (or Stat 420)

I. Either (i) or (ii) below:

(i) Algebra: Math 580-581-582 (or 590H-591H-592H); **and Coding Theory/Designs** (Math 585)

or

(ii) Set Theory and Mathematical Logic: Math 647-648-649

Required CIS Minor:

Students in the applied discrete math track are **required** to take a CIS minor including CSE 625 as one of the two elective courses in their minor program:

Required courses: CSE 221, 222, 321, 625; Math 345 or 366

Elective course: One chosen from CSE 541, 560, 625, 655, 660, 670, 675, 680

Recommended Additional Courses (depending on the student's special interest)

Computer Science and Engineering: CSE 725 (Computability and Unsolvability)

Industrial and Systems Engineering: ISE 702 (Mathematical Programming: Linear)

Linguistics: Lin 601 (Introduction to Linguistics)

Lin 680 (Formal Foundations of Linguistics)

Lin 681 (Algebraic Linguistics)

Lin 683 (Linguistic Semantics)

Mathematics: Math 573 (Elementary Number Theory)

Math 576H/577H (Number Theory through History)

Philosophy: Phil 650 (Advanced Symbolic Logic)

Phil 652 (Nonclassical Logic)

Phil 654 (Philosophy of Logic and Mathematics)

SAMPLE SCHEDULE (I)

Autumn
Math 151

Winter
Math 152
CSE 202

Spring
Math 153
CSE 221

Autumn
Math 254
CSE 222

Winter
Math 568

Spring
Math 345
CSE 321

Autumn
Math 580
CSE 625

Winter
Math 581
Math 575

Spring
Math 582
CSE 655

Autumn
Math 530
Math 585

Winter
Stat 421

Spring
Math 578

SAMPLE SCHEDULE (II)

Autumn
Math 151

Winter
Math 152
CSE 202

Spring
Math 153
CSE 221

Autumn
Math 254
CSE 222

Winter
Math 568

Spring
Math 345
CSE 321

Autumn
Math 648
CSE 625

Winter
Math 649
Math 575

Spring
Math 647
CSE 655

Autumn
Math 530

Winter
Stat 421

Spring
Math 578

22. Minimum number of credits required for completion

60 credits within the degree track. This could be achieved by taking the honors traditional track and taking only the minimum number of required elective credits. In general our honors majors would take at least 70 credits of honors mathematics courses.

23. Average number of credits expected at completion

70 credits within the degree track. The specialized tracks require a somewhat higher number of credit hours.

24. Estimated average number of credits taken per quarter by a typical student

15

25. Number of credits a student is required to take in other departments

This number varies considerably depending on the degree track. All students are required to complete the standard 80 GEC credit hours (of which 10 are Math 151, 152). This is all that is required of students in the traditional or education tracks, although all students are strongly recommended to take Statistics 421.

26. Number of credits a student might take as an elective in other departments.

If a student takes 70-75 credits in mathematics and 71 additional GEC credits, this would allow the student to take 40 – 45 elective credits in other departments.

27. Other degree requirements

None.

28. Specialized professional associations from which accreditation will be sought.

This is a modification of an existing degree program in mathematics. The education track remains unchanged from the existing track, which is consistent with Ohio State standards for licensure in secondary mathematics education. No other accreditation is required.

29. Number and qualifications of full-time and part-time faculty.

Since this is not a new major, the faculty is well-established. The current size of the full-time faculty is 55. This is supplemented by a varying number of postdoctoral faculty. The current number is 25. All of the regular and postdoctoral faculty have doctoral degrees in mathematics and have been carefully vetted for their excellence.

30. Existing facilities and equipment

Since this is not a new major, the department facilities and equipment are well-established and fully functioning.

31. Additional university resources required

The Department of Mathematics is at a historic (for the past 40 years) low in the number of regular faculty. The University has committed to an increase of 10 in the number of regular faculty. Nevertheless, it will be possible to begin the implementation of these new degree tracks with the current faculty and staff. If student demand grows as anticipated, then more faculty (and perhaps staff as well) will be required. This will be justified by the increased revenue generated.

32. Program description as it would appear in the appropriate college bulletin.

The Ohio State Department of Mathematics undergraduate degree program offers an intensive education in the fundamentals of calculus, linear algebra, and the foundations of logical reasoning. Building on this, students have the opportunity to pursue several avenues of deeper study, directed towards the many career opportunities available to mathematics professionals. The traditional track offers a solid preparation for students wishing to pursue advanced degrees in mathematics, as well as the logical underpinning for other professional careers, such as law and medicine. The education track provides the deep understanding of K-12 mathematics needed by professional math educators at the secondary level. The finance track provides a basic knowledge of probability and statistics with applications to risk analysis. The bio-math track weds mathematics to the expanding domain of applications to the biological, ecological, and medical sciences. The applied-discrete track provides a foundation of logic and discrete mathematics, tied to a minor in computer science. The applied track offers a firm grounding in differential equations and numerical analysis, linked to applications in chemistry, physics, and engineering.

Note: See appendix for letters of support and concurrence.



Department of Computer
Science and Engineering

2015 Neil Avenue
Columbus, OH 43210-1277

Phone 614-292-1444
FAX 614-292-2911
Email sundarajan.1@osu.edu

May 10, 2008

Prof. David Andereck
Chair, MPS Curriculum Committee

Dear Prof. Andereck:

I am writing in support of the *applied discrete math track* for math majors interested in discrete math and computing that the Mathematics Department has proposed. Over the last few years, many math majors have taken a number of CSE courses; several of them have completed our minor and, indeed, many have gone on to join our graduate program. The proposed track would provide a structured set of courses for such students including an appropriate combination of discrete math courses and the CIS Minor program.

Hence we strongly endorse the proposed track. If you have any questions, please call or email me.

Thank you and best wishes.

Sincerely,

Neelam Soundarajan
Chair, Undergrad Studies Committee, CSE Dept.

cc: Prof. Bruce Weide, Assoc. Chair, CSE Dept.



On Your Side™

May 21, 2008

Dr. Chunsheng Ban
Department of Mathematics
The Ohio State University
100 Math Tower
231 West 18th Avenue
Columbus, OH 43210-1174

Dear Dr. Ban:

Over the last several months, the Nationwide Quantitative Risk Management (QRM) group has collaborated quite closely with you to provide your students with a basic understanding of derivative mathematics and financial engineering. I am taking this opportunity to summarize many of our conversations and explain why this field of study is vital to the insurance industry.

The insurance industry's need for talented individuals trained in derivative mathematics arises from the ubiquity of variable annuity guarantees. Variable annuities are analogous to mutual funds (with certain tax advantages) with associated performance guarantees that mix insurance and financial risk. In concept, these guarantees can look like:

- If your account has lost value after five years, we will replace the value lost
- If you die, your beneficiaries will receive the highest account value ever attained over the life of the contract, even if the current account value is less
- If you withdraw money following a set lifetime schedule, we will continue the payout schedule if your account is ever exhausted

These risks are different from traditional actuarial risks because they are not diversifiable. When the financial markets decline, every single financial guarantee an insurer has written becomes more valuable. Unlike more traditional life insurance risk, writing a larger portfolio only makes the risk concentration worse.

Obviously a different mathematical toolkit is needed to manage financial guarantees. And there is tremendous demand for actuaries that understand the techniques for valuing and managing both insurance and financial risk, at Nationwide and in the broader industry. The key qualifier however is "both". There are several respected academic programs that teach actuarial science or financial engineering, but none that bring both concepts together. But facility with both paradigms is required to manage guarantees that simultaneously contain both insurance and financial elements.



Biomedical Informatics

3190 Graves Hall
333 West 10th Avenue
Columbus, OH 43210
Phone: 614-292-4778
Fax: 614-688-6600

October 29, 2008

Dear Dr. Friedman

Your proposed major in biological mathematics is well conceived and does not overlap with any curriculum we are teaching or planning in Biomedical Informatics. I concur that it should be enacted.

In fact we hope that your coursework such as "Advanced ODE/Dynamical Systems" and "Discrete Modeling" will prepare students to enter graduate programs and postdoctoral research. These areas are key elements to the work we propose in the OSU-MIDAS center for computational modeling of global infectious diseases threats.

Sincerely

Daniel Janies, Ph.D.

Associate Professor

Daniel.Janies@osumc.edu



Department of Evolution, Ecology and Organismal Biology

College of Biological Sciences
318 West 12th Avenue
Columbus, OH 43210-1293

Phone (614) 292-8088
Fax (614) 292-2030

October 29, 2008

Dr. Avner Friedman
Department of Mathematics
The Ohio State University
CAMPUS

Dear Dr. Friedman,

The EEOB Curriculum Committee has reviewed the proposal for a bio-math track in the mathematics major. The Committee is fully supportive of this proposal and considers such a track to be an important opportunity for undergraduate students seeking a strong foundation in both mathematics and biology. We feel that the EEOB classes listed as required or elective courses for the track are appropriate, and may in the future suggest additional EEOB courses that could contribute to the program.

Sincerely,

A handwritten signature in cursive script that reads 'Thomas E. Hetherington'.

Thomas E. Hetherington, Chair
EEOB Curriculum Committee



Division of Infectious Diseases
Department of Internal Medicine
Center for Microbial Interface Biology

N 1149 Doan Hall
410 W. 10th Ave.
Columbus, Ohio 43210-1240

Phone: (614) 293-5671
Fax: (614) 293-4556

www.internalmedicine.osu.edu/infectiousdiseases
www.cmib.osu.edu

October 31, 2008

Dear Professor Friedman:

As director of OSU's Center for Microbial Interface Biology and director of the Division of Infectious Diseases in the Medical School, I am writing in support of the bio-math track for math majors interested in applications of mathematics to the biological and medical sciences, which has been proposed by the Department of Mathematics. I foresee that this program of courses will be attractive to a number of students either seeking a mathematically oriented pre-medical track or seeking a double major in mathematics and some sub-discipline of the biological sciences related to infectious diseases, microbial pathogenesis and biodefense. The proposed track would provide a structured set of courses for such students, including an appropriate mix of mathematics courses and biology courses.

Hence we strongly endorse the proposed track. If you have any questions, please feel free to contact me.

Sincerely,

Larry S. Schlesinger, M.D.
Samuel Saslaw Professor
Director, Division of Infectious Diseases and the Center for Microbial Interface Biology
Associate Director, Medical Scientist Program

From: solomon@math.ohio-state.edu
Subject: [Fwd: Re: applied math option in major math program]
Date: Tue, February 17, 2009 1:20 pm
To: solomon@math.ohio-state.edu

Subject: Re: applied math option in major math program
From: "D. A. Mendelsohn" <mendelsohn.1@osu.edu>
Date: Thu, January 22, 2009 1:44 pm
To: "baker" <baker@math.ohio-state.edu>
Cc: kinzel.1@osu.edu
srinivasan.3@osu.edu

Greg,

Please let this e-mail serve as a letter of concurrence for the overall concept of the Applied Math option for the Math Major, but specifically with the Dynamics Applications Area which includes Mech Eng 410, 430, 501, 502, 503, 504, 731, 734 and 735. The 400 and 500 level courses represent a very strong, challenging and coherent specialization in theoretical mechanics. The Undergraduate Studies Committee endorses the proposal and will waive (on an individual basis) the prerequisite for 501 which requires enrollment as an Engineering Major for students in this Area of the Option.

Please let me know if you need anything further from us.

Dan Mendelsohn, Chair
Undergraduate Studies Committee
Dept. of Mechanical Engineering

From: baker@math.ohio-state.edu
Subject: [Fwd: Re: applied option for math grads]
Date: Wed, February 4, 2009 7:41 pm
To: solomon@math.ohio-state.edu

----- Original Message -----
Subject: Re: applied option for math grads
From: "Christopher M. Hadad" <hadad@chemistry.ohio-state.edu>
Date: Wed, February 4, 2009 6:35 pm
To: baker@math.ohio-state.edu

>Thank you for your help in correcting and improving the applied math option
>in the undergraduate math program. I believe we have made all the changes
>you suggest.

>
>The Department is now ready to forward the revised program for approval at
>the College level. We would appreciate a letter of support. If there are
>any questions or concerns please don't hesitate to contact me.

>
>Greg Baker

>
>Attachment converted: CMH_HD:appmath.doc (WDBN/«IC») (004F27D2)

Dear Greg,

With this email, I offer concurrence by Chemistry on your proposed applied mathematics option for the undergraduate math program.

If you need further confirmation, please let me know.

Best regards,

Christopher

Vice Chair for Undergraduate Studies/Chemistry
(614) 292-1204

Christopher M. Hadad	E-mail: hadad@chemistry.ohio-state.edu
Professor	Phone: (614) 292-1204 (office)
Department of Chemistry	
Ohio State University	FAX: (614) 292-1685
100 West 18th Avenue	Office: 100C Celeste Laboratory
Columbus, OH 43210-1185	http://www.chemistry.ohio-state.edu/~hadad

Subject: Proposed Math Major Track in Applied Math



Date: February 17, 2009

From: Betty Lise Anderson, Curriculum

COMMUNICATION
Department of Electrical and
Computer Engineering

Committee Chair

To: Prof. Baker

Cc: Prof. Solomon (Math), Prof. Klein (ECE), Prof. Valco
(ECE)

The Department of Electrical Engineering Curriculum Committee has reviewed your proposal for an Applied Math Option for math majors. We are in favor of such a track.

We make the following observations: In the "applications" section of the proposal, in which a student must take a minimum of nine credit hours in a coherent sequence of courses, there is track called "Digital Signal/Image Processing." It starts with a sequence of courses

- ECE 205 (Circuit Analysis)
- ECE 351 (Systems I)
- ECE 352 (Systems II).

The course ECE 352, however, currently has ECE 301 (Analysis and Design in Circuits and Electronics) as a prerequisite. In discussing this with respect to your proposal, we felt that a math student with prior knowledge of linear algebra and LaPlace Transforms would probably be able to take ECE352 without ECE 301 without a problem; ECE 351 covers "Laplace transform; frequency response and Bode plots; Z-transforms; state variables, state equations; computer-aided analysis," but applies them to circuits as examples. Thus, we felt that we could allow math students into 352 without taking 301, but we'd like to require that they get our departmental permission (mostly to avoid our own students trying to skip ECE301).

- ECE 719 Electromagnetic Field Theory I

If we can answer questions about these suggestions, please don't hesitate to ask.

From: "Richard Hughes" <hughes@mps.ohio-state.edu>
Subject: concurrence on Math Proposal
Date: Wed, February 25, 2009 4:09 pm
To: "Ron Solomon" <solomon@math.ohio-state.edu>

Dear Ron

Please accept this email as a positive concurrence on the part of the Physics Department for the Applied Track in the new Math revision proposal.

Note that the Physics "track" lists Physics 621/555/631 in the Sample Schedule. These courses currently require Physics 416 as a prerequisite. We see that Math 571 and Math 572 are required in this option, and they both have a significant Matlab component. Students will need to obtain permission of the instructor to take these courses without Physics 416. We note that the applied option can be successfully completed without these courses (621/555/631), so we do not see this as a significant impediment.

Regards

Richard

--

=====
Richard E. Hughes
Vice Chair for Undergraduate Studies
Particle and AstroParticle Physics (GLAST/CDF/CMS)
The Ohio State Department of Physics
Physics Research Building
191 West Woodruff Ave; Columbus, OH 43210
Office 1047: (614) 292-3885
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Center for Life Sciences Education

Ron Solomon
Department of Mathematics
Ohio State University

260 Jennings Hall
1735 Neil Avenue
Columbus, OH 43210

Phone (614) 292-9861
Fax (614) 292-4390

breitenberger.1@osu.edu

Dear Ron:

The Bio-Math track proposed as part of the mathematics major revisions has been considered by the College of Biological Sciences Curriculum Committee. We feel that this track within the mathematics major will provide a wonderful opportunity for students interested in applications of mathematics to living systems to develop some breadth in the biological sciences in combination with their mathematics major. This track will be attractive to students either seeking a mathematically oriented pre-medical track or seeking a double major in mathematics and one of the areas in the biological sciences. The proposed track would provide a structured set of courses for such students, including an appropriate mix of mathematics courses and biological sciences courses.

Our committee had some questions about the inclusion or omission of specific courses in the proposed track, all of which have been promptly addressed in a way that strengthens the proposed track. Hence we strongly endorse the proposed track, and we look forward to recommending it to students interested in this very important area of study.

If you have any questions, please feel free to contact me.

Regards,

A handwritten signature in cursive script that reads "Caroline Breitenberger".

Caroline Breitenberger
Associate Dean, College of Biological Sciences
Director, Center for Life Sciences Education