

PENNSSTATE



Department of Mathematics
Eberly College of Science

UNDERGRADUATE
MATHEMATICS
HANDBOOK

SUMMER 2008 – SPRING 2009

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Chapter 1

Introduction

Welcome to the Mathematics Program! We hope your experience as a mathematics major is a rewarding one. Mathematics is not only a fascinating subject of great intrinsic beauty, its wide applicability to the natural and social sciences is also universally recognized. The Mathematics Program offers two degrees: the B.A. Degree and the B.S. Degree. Our curriculum emphasizes the development of analytical skills and independent thinking which is vital in an ever-changing world.

In this handbook, we give an overview of the various options available within the Mathematics Program and their course requirements. When planning your program of studies, use the check sheets in this handbook together with information available online (online advising service at <http://www.elion.psu.edu>, undergraduate degree bulletin at <http://www.psu.edu/bulletins/bluebook>), and consult your academic advisor. *For more information about anything pertaining to the Undergraduate Mathematics Program, please consult your academic advisor (if you are currently a mathematics major) or the Mathematics Undergraduate Studies Director in 104 McAllister Building, (814) 865-7528, undergrad@math.psu.edu.

Admission and Retention

Entrance to the Eberly College of Science

Any student entering the college may gain entrance into any major in the college if the following requirements have been met:

1. The student must have a 2.00 cumulative grade point average.
2. The student must have completed Math 140 with a C or better.

Entrance to Mathematics Major

Completion of both MATH 140 and 141 with a grade of C or better in both courses and a cumulative grade point average of at least 2.00 is required for entry into the mathematics major. In addition, a cumulative grade point average of at least 2.00 is required at the beginning of the fifth semester to be retained in the major.

* To make an appointment with your advisor, please send him/her an email message. You can find his/her email address at <http://www.math.psu.edu/UG/advisors.htm>.

Special Options within the Major

The Department offers seven options under the B.S. Degree program. The choice of an option depends on your own interests as well as on your career plans. It is an important choice because the course requirements differ greatly. These differences, for the most part, are only in the junior and senior years (the Teacher Certification Option is the exception). This means that you can put off the choice of an option until as late as your fifth semester. If possible, this decision should not be made much later. Descriptions of the different options are given later in this handbook. You are encouraged to talk to your advisor for more information.

Areas of Application

The Applied Analysis and Systems Analysis options under the B.S. Degree program require an approved sequence in an area of application. Choosing these courses should not be taken lightly. In these options, you are preparing to apply mathematics to solving problems in specific areas outside mathematics. This means that you must learn both the mathematics relevant to those areas and at least enough of the area of application to be able to communicate with the experts in that area. The courses chosen should form a coherent pattern and should include one or two 400-level courses. Be sure to have your course selections approved, in writing, by your advisor and a copy placed in your file in the Undergraduate Office in 107 Whitmore Laboratory. Forms are available in 104 McAllister Building.

The General Mathematics Option under the B.S. Degree program requires a sequence in mathematics or related area. The same guidelines apply here as in the Applied Analysis and Systems Analysis options.

Supporting Courses

These are optional courses that students can select. You can use these courses to fulfill minor requirements in another subject. For restrictions, see Appendix C.

General Education

Every student has to take 45 credits of General Education courses. The course selections are designed to provide you with a well-rounded academic experience within an integrated curriculum that allows for individual flexibility. General Education courses may be relevant to your major or to your particular interests. The Baccalaureate Degree General Education program consists of two components: (1) Skills and (2) Knowledge Domains for a total of 45 credits. The Skills component includes: Writing/Speaking (9 credits) and Quantification (6 credits). The Knowledge Domains include: Health and Physical Activity (3 credits), Natural Science (9 credits), Arts (6 credits), Humanities (6 credits), and Social and Behavioral Sciences (6 credits). For a complete listing of all approved courses in the Skills and Knowledge Domains, please refer to the web site <http://www.psu.edu/bulletins/bluebook/gened/>.

Concurrent Majors

A candidate receiving approval from the colleges involved may gain entrance to more than one major. The idea of majoring in two areas in order to broaden one's knowledge is a good one, but such a program requires ability and diligence. Anyone interested in taking on a second major should first speak with the Director of Undergraduate Studies in both of the departments concerned. The final academic record shall indicate the completion of the requirements for each major. For more information, see <http://www.psu.edu/dus/handbook/concurrent.html> Note that students will not be allowed to complete concurrent majors in computer science or computer engineering and mathematics with the computational option. However, computer science majors can complete a concurrent major in mathematics with an option other than the computational option.

Minors in other Disciplines

Mathematics students are strongly encouraged to pursue minors in fields outside of mathematics. The interdisciplinary nature of the mathematical sciences allows for combining and integrating many different subjects within the mathematics B.A. and B.S. programs. The selection of courses for the area of application and supporting courses of the mathematics majors, can be done to simultaneously fulfill the requirements for minors in other subjects. The minors listed below, can be efficiently combined with a B.S. degree in mathematics:

1. Statistics
2. Economics
3. Information Science and Technology
4. Interdisciplinary Minors

For a listing of available minors, visit the web site <http://www.psu.edu/dus/handbook/minors2.html>

Honors Courses and the University Scholars Program

Several hundred of the most talented Penn State undergraduates are in the University Scholars Program. For incoming students, admission to this program is by a separate application reviewed by the Faculty Selection Committee. For students already here, admission to the program is on the basis of cumulative grade point average or, in some cases, by faculty nomination. To graduate in the program, a student must maintain a high average every semester, take a certain minimum number of credits in courses with an Honors designation, and write an Honors Thesis. More information about the Scholars Program is available at the Program Office in 10 Schreyer Honors College or at <http://www.scholars.psu.edu>. The Mathematics Department teaches Honors sections of several courses. It is possible for a student not in the Scholars Program to enroll in Honors sections. For more information, see the Director of Undergraduate Studies in 104 McAllister Building.

The Minor in Mathematics

The minor is designed to provide students with an interest in mathematics an opportunity to study a broad range of mathematical topics. The requirements allow students a great deal of flexibility in choosing courses of interest. To earn the mathematics minor, students must take MATH 140 GQ(4) and MATH 141 GQ(4); select 6-8 credits from MATH 220 GQ(2), 230(4), 231(2), 232(2), 250(3), 251(4), 310(3), 311W(3), or 312(3); and select 12 credits from 400-level MATH courses. A total of 26-28 credits are required for the minor. A grade of C or better is required for MATH 140, MATH 141, and all 12 credits from 400-level MATH courses. For more information on the mathematics minor, including the mathematics minor application form, please see <http://www.math.psu.edu/UG/minor.htm>.

Evaluation of Courses from Other Universities

Each student who applies for courses to be transferred to Penn State is required to have a transcript sent to the Office of Admissions, where the Admissions staff evaluates it. When a course taken elsewhere is believed equivalent to a course given at Penn State, credit for that specific Penn State course is assigned and an entry made in the "Number" column. If such a correspondence cannot be made, general credits (denoted "GEN" in the "Credits" column) are assigned as appropriate. The general credit designation does not imply that the credits cannot be transferred, but merely that the Office of Admissions is unable to establish the degree of overlap between a course taken elsewhere and a course offered at Penn State. The general credit designation implies that the student has the responsibility for obtaining assessments of course equivalencies "as appropriate." The determination of "appropriateness" is left to the individual colleges. For the College of Science, the policy depends on the type of course for which general credit has been assigned.

Cooperative Education Program

The Cooperative Education Program gives students a chance to integrate their academics with relevant workplace experience. Students gain an understanding of how to apply their learning experience in an academic and non-academic setting. Requirements to participate in a mathematics co-op are a cumulative grade point average of 2.00 or above and completion of 30 credits. Note that some companies may request more stringent requirements.

For further information on The Eberly College of Science Cooperative Education Program, see <http://www.science.psu.edu/coop>.

MASS Program

MASS is a semester-long program that provides a comprehensive mathematical environment for a group of talented undergraduate students selected from colleges and universities across the country. The program combines advanced learning with research initiation. For more information, see <http://www.math.psu.edu/mass>.

Careers for Mathematics Graduates

A mathematics degree is a useful qualification when it comes to looking for a career. This is because mathematics is used in a variety of areas of employment. For information about careers for mathematics graduates, you are strongly encouraged to visit <http://www.math.psu.edu/sellersj/mathurls.htm>. You are also welcome to talk to the Director of Undergraduate Studies in 104 McAllister Building.

Chapter 2

Bachelor of Arts Degree in Mathematics

This degree program is intended for students whose interests outside mathematics are oriented toward the arts, humanities and social sciences. The requirements in these areas are greater than for the B. S. degree (See Appendix D).

Students in this degree program are strongly encouraged to select an area where mathematics is applied. These courses can be used as Supporting Courses. Areas similar to those in the B.S. degree can be used.

The only courses in this degree which can be scheduled under the satisfactory/unsatisfactory option are supporting courses (Appendix C of the Department Handbook).

Bachelor of Arts Check Sheet (120 credits)

1 MAJOR REQUIREMENTS (41-42 credits)	
MATH 140* (4) ___	CHOOSE 3 CREDITS BELOW:
MATH 141* (4) ___	
CMPSC 121 CMPSC 101 (3) ___ OR CMPSC 201 (3) ___	
MATH 220* (2) ___	
MATH 230* (4) ___	
MATH 250* (3) ___ OR MATH 251* (4) ___	CHOOSE 6 CREDITS OF 400-LEVEL MATH EXCEPT: MATH 401, 405, 406, 441, 470 and 471.
MATH 311W* (3) ___	
MATH 312* (3) ___	
MATH 403* (3) ___	
MATH 435* (3) ___ OR	
MATH 436* (3) ___	
	MATH _____ * (3) ___
	MATH _____ * (3) ___

Total Credits: _____

Note: Requirements indicated with * identify courses that require a minimum grade of 'C' for graduation.

BACHELOR OF ARTS CHECK SHEET

2 BACHELORS OF ARTS REQUIREMENTS (38-39 credits)		
FOREIGN LANGUAGE (12): LEVEL I: _____ (4) ____	#BA Knowledge Domains (9 CR) _____() ____ _____() ____ _____() ____ _____() ____	SUPPORTING COURSES (14-15) _____ () ____
LEVEL II: _____ (4) ____		_____ () ____
LEVEL III: _____ (4) ____		_____ () ____
OTHER CULTURES (3 CR): _____ () ____		_____ () ____ _____ () ____ _____ () ____ _____ () ____ _____ () ____ _____ () ____

Total Credits: _____

Foreign Language – Proficiency in a single foreign language equivalent to completion of three semesters of course work must be demonstrated. If fewer than 12 credits are needed to reach this level of proficiency, then choose courses from the Mathematics Department Supporting Courses List (Appendix C in the Department Handbook) to total 12 credits. Policies regarding placement in a foreign language can be found in Appendix A of the Department Handbook.

BA Knowledge Domains – Students must complete 9 credits in any one of these areas or any combination of areas. However, mathematics majors may not satisfy this requirement by taking quantification (GQ) courses. See <http://www.psu.edu/bulletins/bluebook/gened/bad.html> for details on the courses which can be used to satisfy this requirement.

Note: Other Cultures courses do not double count as US/IL courses.

Supporting Courses – A list of supporting courses is in Appendix C in the Department Handbook.

BACHELOR OF ARTS DEGREE

3 GENERAL EDUCATION (40 credits)		
ENGL 15 OR 30 (3) ___ (GWS)	ARTS (6 CR) (GA)	SOC. /BEHAV. SCI. (6 CR) (GS)
ENGL 202 (3) ___ (GWS)	_____ () ___	_____ () ___
CAS 100 (3) ___ (GWS)	_____ () ___	_____ () ___
NATURAL SCI. (9 CR) (GN)	_____ () ___	_____ () ___
_____ ()	HUMANITIES (6 CR) (GH)	HEALTH/ PHYS. ACT. (3 CR) (GHA)
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()		
WRITING ACROSS THE CURR. _____	US CULTURES (3 CR) (US) _____	FIRST-YEAR SEMINAR _____ (1) ___
	INT'L CULTURES (3 CR) (IL) _____	

Total Credits: _____

General Education Courses – a description of these requirements can be found at <http://www.psu.edu/bulletins/bluebook/gened/>.

Note: A student may, in consultation with the advisor and the student’s college dean, develop a sequence of 9 credits in either the arts, humanities, or social or behavioral sciences by substituting 3 credits from one of the other two areas not in the student’s major field of study.

US Cultures and International Cultures Requirement Students must complete a 3-credit course in United States Cultures (US) and a 3-credit course in International Cultures (IL). See <http://www.psu.edu/bulletins/bluebook/gened/gi.html> for available courses.

4 REMEDIAL & REPEATED COURSES	5 SENATE POLICY 83-80	6 CREDITS
Courses that do not meet degree requirements:	Source/Time for credit acquisition:	Total Credits Earned: (less repeats and remedial: must have at least 120)
_____	36 of the last 60 credits at PSU?	_____
_____	_____	
_____	60 credits in the last 5 years?	
_____	_____	

Grand Total Credits _____

IMPORTANT: 120 credits are needed to graduate.

**Recommended Academic Plan for Bachelor of Arts Mathematics (MTHBA at University Park)
Effective Fall 2007**

Semester 1	Credits	Semester 2	Credits
MATH 140(GQ)	4	MATH 141(GQ)	4
FOREIGN LANGUAGE	4	FOREIGN LANGUAGE	4
NATURAL SCIENCE (GN)	3	NATURAL SCIENCE (GN)	3
ARTS(GA), HUMANITIES (GH) or SOCIAL and BEHAVIORAL SCIENCE (GS)	3	ENGL 15 or 30 (GWS)	3
First Year Seminar	1		
Total Credits:	15	Total Credits:	14
Semester 3	Credits	Semester 4	Credits
MATH 220 (GQ)	2	MATH 250 or 251	3 - 4
MATH 230	4	MATH 312	3
MATH 311W	3	CMPS 101 or CMPS 121 or CMPS 201	3
FOREIGN LANGUAGE	4	CAS 100 A, B, or C (GWS)	3
Supporting Course	3	Supporting Course	3
Total Credits:	16	Total Credits:	15 - 16
Semester 5	Credits	Semester 6	Credits
MATH 411 or 412 or 417 or 419 or 421	3	MATH 435 or 436	3
NATURAL SCIENCE (GN)	3	ENGL 202C (GWS) Effective Writing: Technical	3
ARTS(GA), HUMANITIES (GH) or SOCIAL and BEHAVIORAL SCIENCE (GS)	3	ARTS(GA), HUMANITIES (GH) or SOCIAL and BEHAVIORAL SCIENCE (GS)	3
ARTS(GA), HUMANITIES (GH) or SOCIAL and BEHAVIORAL SCIENCE (GS)	3	BA KNOWLEDGE DOMAIN	3
OTHER CULTURES	3	Supporting Course	3
HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5	HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	Credits	Semester 8	Credits
MATH 403	3	400-Level MATH course except MATH 401, 405, 406, 441, 470 or 471	3
400-Level MATH course except MATH 401, 405, 406, 441, 470 or 471	3	BA KNOWLEDGE DOMAIN	3
ARTS(GA), HUMANITIES (GH) or SOCIAL and BEHAVIORAL SCIENCE (GS)	3	ARTS(GA), HUMANITIES (GH) or SOCIAL and BEHAVIORAL SCIENCE (GS)	3
BA KNOWLEDGE DOMAIN	3	Supporting Course	3
Supporting Course	3	Supporting Course	3
Total Credits:	15	Total Credits:	15

Bold type indicates courses requiring a quality grade of C or better.

Scheduling patterns: Courses taught fall semester only – MATH 421. Courses taught spring semester only – MATH 412, 417.

Notes: A student must earn a total of 120 credits for graduation. Students who choose to use their high school foreign language experience to satisfy the foreign language requirement will need to take additional supporting courses to meet the 120 credit requirement.

Chapter 3

Bachelor of Science Degree in Mathematics

There are seven options under this degree. They have in common a core of freshman and sophomore mathematics courses and university-wide general education requirements. In addition, six of the seven options have a foreign language requirement. The options are described within each section of this chapter.

Actuarial Mathematics Option

The goal of this option is to train people to enter the Actuarial Science profession. Actuaries are in great demand in the insurance and other related businesses. To become an actuary, it is necessary to pass one or more of a sequence of demanding examinations administered by a national organization, the Society of Actuaries. The courses required in this option are intended to prepare students for these examinations.

The key mathematical areas are probability, statistics, and advanced courses in insurance and in operations research. (See Appendix E in the Department Handbook for information about the Actuarial Science Examinations.)

Actuarial Mathematics Check Sheet (120 credits)

1 MAJOR REQUIREMENTS (26-27 credits)			
MATH 140*(4)___	CMPSC 121 (3)___ OR	MATH 230* (4) ___	MATH 311W* (3) ___
MATH 141*(4)___	CMPSC 101 (3) ___ OR	MATH 250* (3) ___ OR	MATH 312* (3) ___
MATH 220* (2)___	CMPSC 201 (3)___	MATH 251* (4) ___	

Total Credits: _____

2 OPTION REQUIREMENTS (53-54 credits)		
STAT 460 (3) ___	MATH 484* (3) ___	SUPPORTING COURSES (9-10) _____() ___ _____() ___ _____() ___ _____() ___ _____() ___
INS 301 (3) ___	#CHOOSE 3 CREDITS OF STAT 462 OR A 400-LEVEL MATH EXCEPT:	
INS 410 (3) ___	MATH 401, 405, 406, 441, 470 and 471.	
INS 411 (3) ___		
INS 412 (3) ___	STAT 462 *(3) ___ OR	
IE 425 (3)	MATH _____*(3) ___	
MATH 414* (3) ___		
MATH 415* (3) ___	FOREIGN LANGUAGE (8):	
MATH 416* (3) ___	LEVEL I: _____ (4) ___	
MATH 451* (3) ___ OR MATH 486* (3) ___	LEVEL II: _____ (4) ___	

Total Credits: _____

#See Appendix E in the Department Handbook. STAT 462 is a recommended course choice to study for the actuarial exams.

Foreign Language – Proficiency in a single foreign language equivalent to completion of two semesters of course work must be demonstrated. If fewer than 8 credits are needed to reach this level of proficiency, then choose courses from the Mathematics Department Supporting Courses List (Appendix C in the Department Handbook) to total 8 credits. Policies regarding placement in a foreign language can be found in Appendix A of the Department Handbook.

Supporting Courses – Actuarial students are encouraged to choose supporting courses, which satisfy VEE requirements and/or minors such as statistics and economics. See Appendix E for more details.

Note: Requirements indicated with * identify courses that require a minimum grade of ‘C’ for graduation.

ACTUARIAL MATHEMATICS OPTION CHECK SHEET

3 GENERAL EDUCATION (40 credits)		
ENGL 15 OR 30 (3) ____ (GWS)	ARTS (6 CR) (GA)	SOC. /BEHAV. SCI. (6 CR) (GS)
ENGL 202 (3) ____ (GWS)	_____ () ____	ECON 002 _____ () ____
CAS 100 (3) ____ (GWS)	_____ () ____	ECON 004 _____ () ____
NATURAL SCI. (9 CR) (GN)	_____ () ____	_____ () ____
_____ ()	HUMANITIES (6 CR) (GH)	HEALTH/ PHYS. ACT. (3 CR) (GHA)
_____ ()	_____ () ____	_____ () ____
_____ ()	_____ () ____	_____ () ____
_____ ()	_____ () ____	_____ () ____
_____ ()		
WRITING ACROSS THE CURR. _____	US CULTURES (3 CR) (US) _____	FIRST-YEAR SEMINAR _____ (1) ____
	INT'L CULTURES (3 CR) (IL) _____	

Total Credits: _____

General Education Courses – Mathematics majors in the Actuarial option are encouraged to take ECON 002 and ECON 004 to meet the Social/Behavioral General Education requirements. A description of these requirements can be found at <http://www.psu.edu/bulletins/bluebook/gened/>.

US Cultures and International Cultures Requirement Students must complete a 3-credit course in United States Cultures (US) and a 3-credit course in International Cultures (IL). See <http://www.psu.edu/bulletins/bluebook/gened/gi.html> for available courses.

Note: A student may, in consultation with the advisor and the student’s college dean, develop a sequence of 9 credits in either the arts, humanities, or social or behavioral sciences by substituting 3 credits from one of the other two areas not in the student’s major field of study.

ACTUARIAL MATHEMATICS OPTION CHECK SHEET

4 REMEDIAL & REPEATED COURSES	5 SENATE POLICY 83-80	6 CREDITS
Courses that do not meet degree requirements:	Source/Time for credit acquisition:	Total Credits Earned: (less repeats and remedial; must have at least 120)
_____	36 of the last 60 credits at PSU?	_____
_____	_____	_____
_____	60 credits in the last 5 years?	_____

Grand Total Credits: _____

IMPORTANT: 120 credits are needed to graduate.

Recommended Academic Plan for Bachelor of Science Mathematics, Actuarial Mathematics Option (MTHBS AMATH at University Park) Effective Fall 2007

Semester 1	Credits	Semester 2	Credits
MATH 140(GQ)	4	MATH 141(GQ)	4
FOREIGN LANGUAGE	4	FOREIGN LANGUAGE	4
NATURAL SCIENCE (GN)	3	NATURAL SCIENCE (GN)	3
SOCIAL and BEHAVIORAL SCIENCE (GS) ECON 002	3	ENGL 15 or 30 (GWS)	3
First-Year Seminar	1		
Total Credits:	15	Total Credits:	14
Semester 3	Credits	Semester 4	Credits
MATH 220 (GQ)	2	MATH 250 or 251	3 - 4
MATH 230	4	MATH 312	3
MATH 311W	3	CMPSC 101 or CMPSC 121 or CMPSC 201	3
SOCIAL and BEHAVIORAL SCIENCE (GS) ECON 004	3	ARTS(GA) or HUMANITIES (GH)	3
NATURAL SCIENCE (GN)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15 - 16
Semester 5	Credits	Semester 6	Credits
MATH(STAT) 414	3	MATH(STAT) 415	3
MATH 484	3	INS 411	3
INS 410	3	ENGL 202C (GWS)	3
CAS 100 A, B, or C (GWS)	3	ARTS(GA) or HUMANITIES (GH)	3
INS 301	3	Select 3 credits of supporting courses in consultation with academic adviser	3
HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5	HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	Credits	Semester 8	Credits
MATH(STAT) 416	3	STAT 462 or 400-level MATH course except MATH 401, 405, 406, 441, 470 or 471	3
INS 412	3	STAT 460	3
I E 425	3	MATH(CMPSC) 451 or MATH 486	3
ARTS(GA) or HUMANITIES (GH)	3	ARTS(GA) or HUMANITIES (GH)	3
Select 3 credits of supporting courses in consultation with academic adviser	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15

Bold type indicates courses requiring a quality grade of C or better.

Scheduling patterns: Courses taught fall semester only- INS 410, INS 412 and STAT 463. Courses taught spring semester only – INS 411

Notes: A student must earn a total of 120 credits for graduation. Students who choose to use their high school foreign language experience to satisfy the foreign language requirement will need to take additional supporting courses to meet the 120 credit requirement.

Applied Analysis Option

The goal of this option is to train people to apply mathematics toward the solution of problems in the natural sciences and engineering. The main mathematical tools needed are real analysis, differential equations, complex analysis, and matrix theory. The requirements also include an approved sequence of courses in an area of application. (See Appendix F in the Department Handbook for suggested sequences.)

Applied Analysis Check Sheet (120 credits)

1 MAJOR REQUIREMENTS (26-27 credits)			
MATH 140* (4)___	CMPSC 121 (3)___ OR	MATH 230* (4) ___	MATH 311W* (3) ___
MATH 141* (4)___	CMPSC 101 (3) ___ OR	MATH 250* (3) ___ OR	MATH 312* (3) ___
MATH 220* (2)___	CMPSC 201 (3)___	MATH 251* (4) ___	

Total Credits: _____

2 OPTION REQUIREMENTS (53-54 credits)		
MATH 403* (3)___	CHOOSE 8 CREDITS OF NATURAL SCIENCE FROM THE FOLLOWING: (i)BIOL 110*(4) ___ AND 220W*(4) ___ (ii)CHEM 110*(3) ___ AND CHEM 111*(1) ___ CHEM 112*(3) ___ AND CHEM 113*(1) ___ (iii)PHYS 211*(4) ___ AND PHYS 212*(4) ___	SUPPORTING COURSES (7-8) _____() ___ _____() ___ _____() ___ _____() ___ _____() ___ _____() ___
MATH 421* (3) ___		
MATH 436* (3) ___		
CHOOSE 3 CREDITS OF:	FOREIGN LANGUAGE (8):	
MATH 414* (3) ___ OR	LEVEL I: _____ (4) ___	
MATH 418* (3) ___	LEVEL II: _____ (4) ___	
CHOOSE 6 CREDITS OF:	AREA OF APPLICATION (12):	
MATH 411* (3) ___ OR	_____() ___	
MATH 412* (3) ___ OR	_____() ___	
MATH 422* (3) ___	_____() ___	

Total Credits: _____

Foreign Language – Proficiency in a single foreign language equivalent to completion of two semesters of course work must be demonstrated. If fewer than 8 credits are needed to reach this level of proficiency, then choose courses from the Mathematics Department Supporting Courses List (Appendix C in the Department Handbook) to total 8 credits. Policies regarding placement in a foreign language can be found in Appendix A of the Department Handbook.

Application Area – Choose an approved sequence of 12 credits in an area of application, have it approved by your advisor and then file a copy in 104 McAllister Building. Possible courses include engineering and the physical, earth or biological sciences. (Appendix F in the Department Handbook.)

Supporting Courses – A list of supporting courses is in Appendix C in the Department Handbook. The only courses in this degree which can be scheduled under the satisfactory/unsatisfactory option are supporting courses.

Note: Requirements indicated with * identify courses that require a minimum grade of 'C' for graduation.

APPLIED ANALYSIS OPTION CHECK SHEET

3 GENERAL EDUCATION (40 credits)		
ENGL 15 OR 30 (3) ____ (GWS)	ARTS (6 CR) (GA)	SOC. /BEHAV. SCI. (6 CR) (GS)
ENGL 202 (3) ____ (GWS)	_____ () ____	_____ () ____
CAS 100 (3) ____ (GWS)	_____ () ____	_____ () ____
NATURAL SCI. (9 CR) (GN)	_____ () ____	_____ () ____
_____ ()	HUMANITIES (6 CR) (GH)	HEALTH/ PHYS. ACT. (3 CR) (GHA)
_____ ()	_____ () ____	_____ () ____
_____ ()	_____ () ____	_____ () ____
_____ ()	_____ () ____	_____ () ____
_____ ()		
WRITING ACROSS THE CURR. _____	US CULTURES (3 CR) (US) _____	FIRST-YEAR SEMINAR _____ (1) ____
	INT'L CULTURES (3 CR) (IL) _____	

Total Credits: _____

General Education Courses –A description of these requirements can be found at <http://www.psu.edu/bulletins/bluebook/gened>.

US Cultures and International Cultures Requirement Students must complete a 3-credit course in United States Cultures (US) and a 3-credit course in International Cultures (IL). See <http://www.psu.edu/bulletins/bluebook/gened/gi.html> for available courses.

Note: A student may, in consultation with the advisor and the student’s college dean, develop a sequence of 9 credits in either the arts, humanities, or social or behavioral sciences by substituting 3 credits from one of the other two areas not in the student’s major field of study.

APPLIED ANALYSIS OPTION CHECK SHEET

4 REMEDIAL & REPEATED COURSES	5 SENATE POLICY 83-80	6 CREDITS
Courses that do not meet degree requirements:	Source/Time for credit acquisition:	Total Credits Earned: (less repeats and remedial; must have at least 120)
_____	36 of the last 60 credits at PSU?	_____
_____	_____	
_____	60 credits in the last 5 years?	
_____	_____	

Grand Total Credits: _____

IMPORTANT: 120 credits are needed to graduate.

**Recommended Academic Plan for Bachelor of Science Mathematics, Applied Analysis Option (MTHBS APANL at University Park)
Effective Fall 2007**

Semester 1	Credits	Semester 2	Credits
MATH 140(GQ)	4	MATH 141(GQ)	4
FOREIGN LANGUAGE	4	FOREIGN LANGUAGE	4
NATURAL SCIENCE (GN)	3	NATURAL SCIENCE (GN)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ENGL 15 or 30 (GWS)	3
First-Year Seminar	1		
Total Credits:	14 - 15	Total Credits:	14
Semester 3	Credits	Semester 4	Credits
MATH 220 (GQ)	2	MATH 251	4
MATH 230	4	MATH 312	3
MATH 311W	3	CMPS 121 or CMPS 101 or CMPS 201	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	NATURAL SCIENCE (Major)	4
NATURAL SCIENCE (Major)	4		
Total Credits:	16	Total Credits:	14
Semester 5	Credits	Semester 6	Credits
MATH 411 or 412 or 422	3	MATH 411 or 412 or 422	3
MATH 403	3	MATH 436	3
CAS 100 A, B, or C (GWS)	3	ENGL 202C (GWS)	3
APPLICATION COURSE	3	APPLICATION COURSE	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5	HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	Credits	Semester 8	Credits
MATH 421	3	MATH 414 or 418	3
APPLICATION COURSE	3	APPLICATION COURSE	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
Select 3 credits of supporting courses in consultation with academic adviser	3	NATURAL SCIENCE (GN)	3
Select 3 credits of supporting courses in consultation with academic adviser	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15

Bold type indicates courses requiring a quality grade of C or better.

Scheduling patterns: Courses taught fall semester only- MATH 421. Courses taught spring semester only - MATH 412. MATH 422 is currently not offered.

Notes: A student must earn a total of 120 credits for graduation. Students who choose to use their high school foreign language experience to satisfy the foreign language requirement will need to take additional supporting courses to meet the 120 credit requirement.

Computational Mathematics Option

The goal of this option is to train people in those areas of mathematics most relevant to scientific computations. These include the mathematical tools needed for analyzing algorithms (i.e., computational procedures) as well as those mathematical problem-solving methods which can be implemented on computers. The main areas needed are numerical analysis, matrix theory, differential equations, statistics, combinatorics, and linear programming.

Computational Mathematics Check Sheet (120 credits)

1 MAJOR REQUIREMENTS (26-27 credits)			
MATH 140* (4) ___	CMPSC 121 (3) ___	MATH 230* (4) ___	MATH 311W* (3) ___
MATH 141* (4) ___		MATH 250* (3) ___ OR	MATH 312* (3) ___
MATH 220* (2) ___		MATH 251* (4) ___	

Total Credits: _____

2 OPTION REQUIREMENTS (53-54 credits)		
CMPSC 122 (3) ___	CHOOSE 6 CREDITS OF COMPUTATIONAL MATH BELOW: CMPSC 468* (3) ___ OR MATH 310* (3) ___ OR MATH 459* (3) ___ OR MATH 468* (3) ___ OR MATH 485* (3) ___ FOREIGN LANGUAGE (8): LEVEL I: _____ (4) ___ LEVEL II: _____ (4) ___	SUPPORTING COURSES (12-13) _____ () ___ _____ () ___ _____ () ___ _____ () ___ _____ () ___ _____ () ___ _____ () ___ _____ () ___ _____ () ___
CMPSC 465 (3) ___		
MATH 414* (3) ___		
MATH 415* (3) ___		
MATH 455* (3) ___		
MATH 456* (3) ___		
MATH 484* (3) ___		
CHOOSE 3 CREDITS OF: MATH 467* (3) ___ OR MATH 469* (3) ___		
CHOOSE 3 CREDITS OF: MATH 411* (3) ___ OR MATH 412* (3) ___ OR MATH 422* (3) ___		

Total Credits: _____

CSE 103 and CMPSC 201C – Students are strongly advised to take CSE 103 which is based on a Unix platform rather than CMPSC 201C which is based on the Microsoft platform. However, CMPSC 201C is an acceptable substitute.

Foreign Language – Proficiency in a single foreign language equivalent to completion of two semesters of course work must be demonstrated. If fewer than 8 credits are needed to reach this level of proficiency, then choose courses from the Mathematics Department Supporting Courses List (Appendix C in the Department Handbook) to total 8 credits. Policies regarding placement in a foreign language can be found in Appendix A of the Department Handbook.

Supporting Courses – A list of supporting courses is in Appendix C in the Department Handbook. The only courses in this degree which can be scheduled under the satisfactory/unsatisfactory option are supporting courses.

Note: Requirements indicated with * identify courses that require a minimum grade of ‘C’ for graduation.

COMPUTATIONAL MATHEMATICS OPTION CHECK SHEET

3 GENERAL EDUCATION (40 credits)		
ENGL 15 OR 30 (3) ___ (GWS)	ARTS (6 CR) (GA)	SOC. /BEHAV. SCI. (6 CR) (GS)
ENGL 202 (3) ___ (GWS)	_____ () ___	_____ () ___
CAS 100 (3) ___ (GWS)	_____ () ___	_____ () ___
NATURAL SCI. (9 CR) (GN)	_____ () ___	_____ () ___
_____ ()	HUMANITIES (6 CR) (GH)	HEALTH/ PHYS. ACT. (3 CR) (GHA)
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()		
WRITING ACROSS THE CURR. _____	US CULTURES (3 CR) (US) _____	FIRST-YEAR SEMINAR _____ (1) ___
	INT'L CULTURES (3 CR) (IL) _____	

Total Credits: _____

General Education Courses—a description of these requirements can be found at:

<http://www.psu.edu/bulletins/bluebook/gened/>.

US Cultures and International Cultures Requirement Students must complete a 3-credit course in United States Cultures (US) and a 3-credit course in International Cultures (IL). See <http://www.psu.edu/bulletins/bluebook/gened/gi.html> for available courses.

Note: A student may, in consultation with the advisor and the student’s college dean, develop a sequence of 9 credits in either the arts, humanities, or social or behavioral sciences by substituting 3 credits from one of the other two areas not in the student’s major field of study.

COMPUTATIONAL MATHEMATICS OPTION CHECK SHEET

4 REMEDIAL & REPEATED COURSES	5 SENATE POLICY 83-80	6 CREDITS
Courses that do not meet degree requirements:	Source/Time for credit acquisition:	Total Credits Earned: (less repeats and remedial; must have at least 120)
_____	36 of the last 60 credits at PSU?	_____
_____	_____	
_____	60 credits in the last 5 years?	
_____	_____	

Grand Total Credits: _____

IMPORTANT: 120 credits are needed to graduate.

**Recommended Academic Plan for Bachelor of Science Mathematics, Computational Mathematics Option (MTHBS
CMPUT at University Park) Effective Fall 2007**

Semester 1	Credits	Semester 2	Credits
MATH 140(GQ)	4	MATH 141(GQ)	4
FOREIGN LANGUAGE	4	FOREIGN LANGUAGE	4
NATURAL SCIENCE (GN)	3	NATURAL SCIENCE (GN)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ENGL 15 or 30 (GWS)	3
First-Year Seminar	1		
Total Credits:	15	Total Credits:	14
Semester 3	Credits	Semester 4	Credits
MATH 220 (GQ)	2	MATH 250 or 251	3 - 4
MATH 230	4	MATH 312	3
MATH 311W	3	CMPSC 122	3
CMPSC 121	3	NATURAL SCIENCE (GN)	3
Select 3 credits of supporting courses in consultation with academic adviser	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15 - 16
Semester 5	Credits	Semester 6	Credits
MATH(STAT) 414	3	MATH(STAT) 415	3
MATH (CMPSC) 467 or MATH 469	3	MATH 411 or 412 or 422	3
CMPSC 465	3	CMPSC 468 or MATH 310 or 459 or 468 or 485	3
CAS 100 A, B, or C (GWS)	3	ENGL 202C (GWS)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5	HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	Credits	Semester 8	Credits
MATH(CMPSC) 455	3	MATH(CMPSC) 456	3
MATH 484	3	CMPSC 468 or MATH 310 or 459 or 468 or 485	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Select 3 credits of supporting courses in consultation with academic adviser	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15

Bold type indicates courses requiring a quality grade of C or better.

Scheduling patterns: Courses taught fall semester only - MATH(CMPSC) 467 and MATH 485. MATH 468 will be offered Fall 2007, 2009, 2011.... Courses taught spring semester only - MATH 310, MATH(CMPSC) 456. MATH 422, MATH 459 and MATH 469 are currently not offered.

Notes: A student must earn a total of 120 credits for graduation. Students who choose to use their high school foreign language experience to satisfy the foreign language requirement will need to take additional supporting courses to meet the 120 credit requirement.

General Mathematics Option

The purpose of this option is to provide a way for students to construct, within limits, their own curricula. It thus allows room in the major for a student interested in an unusual area of application or one with an unusual range of interests within mathematics. The option requires at least one course at the 400 level in each of the areas of analysis, algebra, and applied mathematics. An approved sequence of 12 credits is required which may consist of courses either in mathematics or in a related area, or in an area of application.

General Mathematics Check Sheet (120 credits)

1 MAJOR REQUIREMENTS (26-27credits)			
MATH 140* (4)___	CMPSC 121 (3)___ OR	MATH 230* (4) ___	MATH 311W* (3) ___
MATH 141* (4)___	CMPSC 101 (3) ___ OR	MATH 250 * (3) ___ OR	MATH 312* (3) ___
MATH 220* (2)___	CMPSC 201 (3)___	MATH 251* (4) ___	

Total Credits: _____

2 OPTION REQUIREMENTS (53-54 credits)		
MATH 403* (3)___	CHOOSE 6 CREDITS OF 400-LEVEL MATH	SUPPORTING COURSES (15-16) _____() ___ _____() ___ _____() ___ _____() ___ _____() ___ _____() ___
CHOOSE 3 CREDITS OF: MATH 414* (3) ___ OR MATH 418* (3) ___	EXCEPT: MATH 401, 405, 406, 441, 470 and 471. MATH _____ * (3) ___	
CHOOSE 3 CREDITS OF: MATH 435* (3) ___ OR MATH 436* (3) ___	MATH _____ * (3) ___	
CHOOSE 3 CREDITS OF: MATH 411* (3) ___ OR MATH 412* (3) ___ OR MATH 419* (3) ___ OR MATH 421* (3) ___ OR MATH 422* (3) ___	FOREIGN LANGUAGE (8): LEVEL I: _____ (4) ___ LEVEL II: _____ (4) ___	
	AREA OF APPLICATION (12): _____() ___ _____() ___ _____() ___ _____() ___	

Total Credits: _____

Foreign Language – Proficiency in a single foreign language equivalent to completion of two semesters of course work must be demonstrated. If fewer than 8 credits are needed to reach this level of proficiency, then choose courses from the Mathematics Department Supporting Courses List (Appendix C in the Department Handbook) to total 8 credits. Policies regarding placement in a foreign language can be found in Appendix A of the Department Handbook.

Application Area – Choose an approved sequence of 12 credits in an area of application, have it approved by your advisor and then file a copy in 107 Whitmore Laboratory.

Supporting Courses – A list of supporting courses is in Appendix C in the Department Handbook. The only courses in this degree which can be scheduled under the satisfactory/unsatisfactory option are supporting courses.

Note: Requirements indicated with * identify courses that require a minimum grade of ‘C’ for graduation.

GENERAL MATHEMATICS OPTION CHECK SHEET

3 GENERAL EDUCATION (40 credits)		
ENGL 15 OR 30 (3) ___ (GWS)	ARTS (6 CR) (GA)	SOC. /BEHAV. SCI. (6 CR) (GS)
ENGL 202 (3) ___ (GWS)	_____ () ___	_____ () ___
CAS 100 (3) ___ (GWS)	_____ () ___	_____ () ___
NATURAL SCI. (9 CR) (GN)	_____ () ___	_____ () ___
_____ ()	HUMANITIES (6 CR) (GH)	HEALTH/ PHYS. ACT. (3 CR) (GHA)
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()		
WRITING ACROSS THE CURR. _____	US CULTURES (3 CR) (US) _____	FIRST-YEAR SEMINAR _____ (1) ___
	INT'L CULTURES (3 CR) (IL) _____	

Total Credits: _____

General Education Courses A description of these requirements can be found at <http://www.psu.edu/bulletins/bluebook/gened/>.

US Cultures and International Cultures Requirement Students must complete a 3-credit course in United States Cultures (US) and a 3-credit course in International Cultures (IL). See <http://www.psu.edu/bulletins/bluebook/gened/gi.html> for available courses.

Note: A student may, in consultation with the advisor and the student's college dean, develop a sequence of 9 credits in either the arts, humanities, or social or behavioral sciences by substituting 3 credits from one of the other two areas not in the student's major field of study.

GENERAL MATHEMATICS OPTION CHECK SHEET

4 REMEDIAL & REPEATED COURSES	5 SENATE POLICY 83-80	6 CREDITS
Courses that do not meet degree requirements:	Source/Time for credit acquisition:	Total Credits Earned (less repeats and remedial; must have at least 120)
_____	36 of the last 60 credits at PSU?	_____
_____	_____	
_____	60 credits in the last 5 years?	
_____	_____	

Grand Total Credits: _____

IMPORTANT: 120 credits are needed to graduate.

**Recommended Academic Plan for Bachelor of Science Mathematics, General Mathematics Option (MTHBS GEN at University Park)
Effective Fall 2007**

Semester 1	Credits	Semester 2	Credits
MATH 140(GQ)	4	MATH 141(GQ)	4
FOREIGN LANGUAGE	4	FOREIGN LANGUAGE	4
NATURAL SCIENCE (GN)	3	NATURAL SCIENCE (GN)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ENGL 15 or 30 (GWS)	3
First-Year Seminar	1		
Total Credits:	15	Total Credits:	14
Semester 3	Credits	Semester 4	Credits
MATH 220 (GQ)	2	MATH 250 or 251	3 - 4
MATH 230	4	MATH 312	3
MATH 311W	3	CMPSC 121 or CMPSC 101 or CMPSC 201	3
NATURAL SCIENCE (GN)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15-16
Semester 5	Credits	Semester 6	Credits
MATH 414 or 418	3	MATH 435 or 436	3
MATH 411 or 412 or 419 or 421 or 422	3	400-Level MATH course except MATH 401, 405, 406, 441, 470 or 471	3
APPLICATION COURSE	3	APPLICATION COURSE	3
CAS 100 A, B, or C (GWS)	3	ENGL 202C (GWS)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5	HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	Credits	Semester 8	Credits
MATH 403	3	400-Level MATH course except MATH 401, 405, 406, 441, 470 or 471	3
APPLICATION COURSE	3	APPLICATION COURSE	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
Select 3 credits of supporting courses in consultation with academic adviser	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Select 3 credits of supporting courses in consultation with academic adviser	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15

Bold type indicates courses requiring a quality grade of C or better.

Scheduling patterns: Courses taught fall semester only – MATH 421. MATH 422 is currently not offered.

Notes: A student must earn a total of 120 credits for graduation. Students who choose to use their high school foreign language experience to satisfy the foreign language requirement will need to take additional supporting courses to meet the 120 credit requirement.

Graduate Study Option

This option is intended to prepare students for graduate study in mathematics. The required courses include those which Graduate Mathematics Departments normally expect their incoming students to have completed.

Graduate Study Check Sheet (120 credits)

1 MAJOR REQUIREMENTS (26-27 credits)			
MATH 140* (4)___	CMPSC 121 (3)___ OR	MATH 230* (4) ___	MATH 311W* (3) ___
MATH 141* (4)___	CMPSC 101 (3) ___ OR	MATH 250 *(3) ___ OR	MATH 312* (3) ___
MATH 220* (2)___	CMPSC 201 (3)___	MATH 251* (4) ___	

Total Credits: _____

2 OPTION REQUIREMENTS (53-54 credits)		
MATH 403* (3)___	CHOOSE 9 CREDITS OF 400-LEVEL MATH EXCEPT: MATH 401, 405, 406, 441, 470 and 471. MATH _____ * (3) ___ MATH _____ * (3) ___ MATH _____ *(3) ___	SUPPORTING COURSES (15-16) _____() ___ _____() ___ _____() ___ _____() ___ _____() ___ _____() ___ _____() ___
MATH 404* (3)___		
MATH 421* (3)___		
MATH 429* (3)___		
MATH 435* (3)___		
MATH 436* (3)___		
CHOOSE 3 CREDITS OF: MATH 414* (3) ___ OR MATH 418* (3) ___	FOREIGN LANGUAGE (8): LEVEL I: _____ (4) ___ LEVEL II: _____ (4) ___	

Total Credits: _____

Foreign Language – Proficiency in a single foreign language equivalent to completion of two semesters of course work must be demonstrated. If fewer than 8 credits are needed to reach this level of proficiency, then choose courses from the Mathematics Department Supporting Courses List (Appendix C in the Department Handbook) to total 8 credits. Policies regarding placement in a foreign language can be found in Appendix A of the Department Handbook.

Supporting Courses – A list of supporting courses is in Appendix C in the Department Handbook. The only courses in this degree which can be scheduled under the satisfactory/unsatisfactory option are supporting courses.

Note: Requirements indicated with * identify courses that require a minimum grade of ‘C’ for graduation.

GRADUATE OPTION CHECK SHEET

3 GENERAL EDUCATION (40 credits)		
ENGL 15 OR 30 (3) ___ (GWS)	ARTS (6 CR) (GA)	SOC. /BEHAV. SCI. (6 CR) (GS)
ENGL 202 (3) ___ (GWS)	_____ () ___	_____ () ___
CAS 100 (3) ___ (GWS)	_____ () ___	_____ () ___
NATURAL SCI. (9 CR) (GN)	_____ () ___	_____ () ___
_____ ()	HUMANITIES (6 CR) (GH)	HEALTH/ PHYS. ACT. (3 CR) (GHA)
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()		
WRITING ACROSS THE CURR. _____	US CULTURES (3 CR) (US) _____	FIRST-YEAR SEMINAR _____ (1) ___
	INT'L CULTURES (3 CR) (IL) _____	

Total Credits: _____

General Education Courses – a description of these requirements can be found at <http://www.psu.edu/bulletins/bluebook/gened/>.

US Cultures and International Cultures Requirement Students must complete a 3-credit course in United States Cultures (US) and a 3-credit course in International Cultures (IL). See <http://www.psu.edu/bulletins/bluebook/gened/qi.html> for available courses.

Note: A student may, in consultation with the advisor and the student’s college dean, develop a sequence of 9 credits in either the arts, humanities, or social or behavioral sciences by substituting 3 credits from one of the other two areas not in the student’s major field of study.

GRADUATE OPTION CHECK SHEET

4 REMEDIAL & REPEATED COURSES	5 SENATE POLICY 83-80	6 CREDITS
Courses that do not meet degree requirements:	Source/Time for credit acquisition:	Total Credits Earned: (less repeats and remedial; must have at least 120)
_____	36 of the last 60 credits at PSU?	_____
_____	_____	
_____	60 credits in the last 5 years?	

Grand Total Credits: _____

IMPORTANT: 120 credits are needed to graduate.

**Recommended Academic Plan for Bachelor of Science Mathematics, Graduate Study Option (MTHBS GRSTD at University Park)
Effective Fall 2007**

Semester 1	Credits	Semester 2	Credits
MATH 140(GQ)	4	MATH 141(GQ)	4
FOREIGN LANGUAGE	4	FOREIGN LANGUAGE	4
NATURAL SCIENCE (GN)	3	NATURAL SCIENCE (GN)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ENGL 15 or 30 (GWS)	3
First-Year Seminar	1		
Total Credits:	15	Total Credits:	14
Semester 3	Credits	Semester 4	Credits
MATH 220 (GQ)	2	MATH 250 or 251	3 - 4
MATH 230	4	MATH 312	3
MATH 311W	3	CMPSC 121 or CMPSC 101 or CMPSC 201	3
NATURAL SCIENCE (GN)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15-16
Semester 5	Credits	Semester 6	Credits
MATH 403	3	MATH 404	3
MATH 435	3	MATH 436	3
400-Level MATH course except MATH 401, 405, 406, 441, 470 or 471	3	400-Level MATH course except MATH 401, 405, 406, 441, 470 or 471	3
CAS 100 A, B, or C (GWS)	3	ENGL 202C (GWS)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5	HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	Credits	Semester 8	Credits
MATH 429	3	400-Level MATH course except MATH 401, 405, 406, 441, 470 or 471	3
MATH 421	3	MATH 414 or 418	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
Select 3 credits of supporting courses in consultation with academic adviser	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Select 3 credits of supporting courses in consultation with academic adviser	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15

Bold type indicates courses requiring a quality grade of C or better.

Scheduling patterns: Courses taught fall semester only – MATH 421. Courses taught spring semester only - MATH 404. MATH 429 will be offered in Spring 2008, 2010, 2012....

Notes: A student must earn a total of 120 credits for graduation. Students who choose to use their high school foreign language experience to satisfy the foreign language requirement will need to take additional supporting courses to meet the 120 credit requirement.

Systems Analysis Option

The intent of this option is to train people to apply mathematics toward the solution of problems in business, economics, and the social and behavioral sciences. The main mathematical tools needed are matrix theory, linear programming, and statistics. The requirements include an approved sequence of courses in an area of application. (See Appendix F in the Department Handbook for suggested sequences.)

Systems Analysis Check Sheet (120 credits)

1 MAJOR REQUIREMENTS (26-27 credits)			
MATH 140* (4)___	CMPSC 121 (3)___ OR	MATH 230* (4) ___	MATH 311W* (3) ___
MATH 141* (4)___	CMPSC 101 (3) ___ OR	MATH 250 *(3) ___ OR	MATH 312* (3) ___
MATH 220* (2)___	CMPSC 201 (3)___	MATH 251*(4) ___	

Total Credits: _____

2 OPTION REQUIREMENTS (53-54 credits)		
MATH 414* (3) ___	CHOOSE 3 CREDITS OF 400-LEVEL MATH EXCEPT: MATH 401, 405, 406, 441, 470 and 471. MATH _____ * (3) ___	SUPPORTING COURSES (12-13)
MATH 415* (3) ___		
MATH 436* (3) ___		
MATH 484* (3) ___		
CHOOSE 6 CREDITS OF:	FOREIGN LANGUAGE (8):	_____ () ___
	LEVEL I: _____ (4) ___	_____ () ___
	LEVEL II: _____ (4) ___	_____ () ___
MATH 310* (3) ___ OR	AREA OF APPLICATION (12):	_____ () ___
MATH 451* (3) ___ OR		_____ () ___
MATH 485* (3) ___ OR		_____ () ___
MATH 486* (3) ___		_____ () ___
		_____ () ___

Total Credits: _____

Foreign Language – Proficiency in a single foreign language equivalent to completion of two semesters of course work must be demonstrated. If fewer than 8 credits are needed to reach this level of proficiency, then choose courses from the Mathematics Department Supporting Courses List (Appendix C in the Department Handbook) to total 8 credits. Policies regarding placement in a foreign language can be found in Appendix A of the Department Handbook.

Application Area – Choose an approved sequence of 12 credits in an area of application, have it approved by your advisor and then file a copy in 107 Whitmore Laboratory. Possible areas include business, economics, industrial engineering or social science (Appendix F in the Department Handbook).

Supporting Courses – A list of supporting courses is in Appendix C in the Department Handbook. The only courses in this degree which can be scheduled under the satisfactory/unsatisfactory option are supporting courses.

Note: Requirements indicated with * identify courses that require a minimum grade of ‘C’ for graduation.

SYSTEMS ANALYSIS OPTION CHECK SHEET

3 GENERAL EDUCATION (40 credits)		
ENGL 15 OR 30 (3) ___ (GWS)	ARTS(6CR) (GA)	SOC. /BEHAV. SCI. (6 CR) (GS)
ENGL 202 (3) ___ (GWS)	_____ () ___	_____ () ___
CAS 100 (3) ___ (GWS)	_____ () ___	_____ () ___
NATURAL SCI. (9 CR) (GN)	_____ () ___	_____ () ___
_____ ()	HUMANITIES (6CR) (GH)	HEALTH/PHYS. ACT. (3 CR) (GHA)
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()	_____ () ___	_____ () ___
_____ ()		
WRITING ACROSS THE CURR. _____	US CULTURES (3 CR) (US) _____	FIRST-YEAR SEMINAR _____ (1) ___
	INT'L CULTURES (3 CR) (IL) _____	

Total Credits: _____

General Education Courses – a description of these requirements can be found at <http://www.psu.edu/bulletins/bluebook/gened/>.

US Cultures and International Cultures Requirement Students must complete a 3-credit course in United States Cultures (US) and a 3-credit course in International Cultures (IL). See <http://www.psu.edu/bulletins/bluebook/gened/gi.html> for available courses.

Note: A student may, in consultation with the advisor and the student’s college dean, develop a sequence of 9 credits in either the arts, humanities, or social or behavioral sciences by substituting 3 credits from one of the other two areas not in the student’s major field of study.

SYSTEMS ANALYSIS OPTION CHECK SHEET

4 REMEDIAL & REPEATED COURSES	5 SENATE POLICY 83-80	6 CREDITS
Courses that do not meet degree requirements:	Source/Time for Credit acquisition:	Total credits earned: (less repeats and remedial; must have at least 120)
_____	36 of the last 60 credits at PSU?	_____
_____	_____	
_____	60 credits in the last 5 years?	
_____	_____	

Grand Total Credits: _____

IMPORTANT: 120 credits are needed to graduate.

**Recommended Academic Plan for Bachelor of Science Mathematics, Systems Analysis Option (MTHBS SYANL at University Park)
Effective Fall 2007**

Semester 1	Credits	Semester 2	Credits
MATH 140(GQ)	4	MATH 141(GQ)	4
FOREIGN LANGUAGE	4	FOREIGN LANGUAGE	4
NATURAL SCIENCE (GN)	3	NATURAL SCIENCE (GN)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ENGL 15 or 30 (GWS)	3
First-Year Seminar	1		
Total Credits:	15	Total Credits:	15.5
Semester 3	Credits	Semester 4	Credits
MATH 220 (GQ)	2	MATH 250 or 251	3 - 4
MATH 230	4	MATH 312	3
MATH 311W	3	CMPS 121 or CMPS 101 or CMPS 201	3
NATURAL SCIENCE (GN)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15-16
Semester 5	Credits	Semester 6	Credits
MATH(STAT) 414	3	MATH(STAT) 415	3
MATH 310 or 485 or 486 or MATH(CMPSC) 451	3	MATH 436	3
APPLICATION COURSE	3	APPLICATION COURSE	3
CAS 100 A, B, or C (GWS)	3	ENGL 202C (GWS)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5	HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	Credits	Semester 8	Credits
MATH 484	3	400-Level MATH course except MATH 401, 405, 406, 441, 470 or 471	3
MATH 310 or 485 or 486 or MATH(CSE) 451	3	APPLICATION COURSE	3
APPLICATION COURSE	3	ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
ARTS (GA), HUMANITIES (GH) or SOCIAL SCIENCE (GS)	3	Select 3 credits of supporting courses in consultation with academic adviser	3
Total Credits:	15	Total Credits:	15

Bold type indicates courses requiring a quality grade of C or better.

Scheduling patterns: Courses taught fall semester only – MATH 485. Courses taught spring semester only - MATH 310.

Notes: A student must earn a total of 120 credits for graduation. Students who choose to use their high school foreign language experience to satisfy the foreign language requirement will need to take additional supporting courses to meet the 120 credit requirement.

Teacher Certification Option Criteria

The goal of this option is to prepare students to be high school mathematics teachers. Many of the requirements are determined by state certification standards, so this option differs from all of the other mathematics options in several respects. For example, there is no foreign language requirement; also, a student in this option must have an advisor in the College of Education, as well as one in the Mathematics Department. A large number of credits in Education courses is required, therefore it is difficult to graduate in four years unless the option is entered during the sophomore year.

All students interested in pursuing the Mathematics Teacher Certification option must contact Mrs. Iris Flynn in the University Certification Office, 228 Chambers Building, University Park, PA (814) 863-1495 or ipf1@psu.edu prior to their sophomore year to declare formally the intent to pursue teacher certification.

Students are then assigned a co-advisor in Education to assist with the proper scheduling and sequencing of all professional certification courses. Students must participate in a formal Entrance to Major process in a designated selection pool typically during the fourth semester in the Spring. New students from other institutions and current Penn State students who wish to be considered for a change of major into Teacher Certification option also participate in appropriate, designated selection pools. Only those students who have formally declared their intent to pursue teacher certification will be considered in the selection process.

The eligibility criteria for competition in the Entrance to Major process selection pool are:

1. A minimum cumulative grade point average of 3.00.
2. A grade of “C” or better in all specified courses, including practica.
3. Passing scores from the PRAXIS I PPST for Reading, Writing, and Mathematics.
4. Documentation of at least 80 hours of volunteer or paid education work experience with learners of the age group the candidate plans to teach. At least 40 of these age-appropriate 80 hours must be with learners whose cultural, social, or ethnic backgrounds differ from the candidate’s own.
5. Completion of an early field experience specified by the certification program.
6. Completion of a core of Education courses specified by the certification program.
7. Completion of additional credits as specified by the certification program.
8. Completion of at least 48 semester credit hours, including English 015 or 030, three credits of literature, and six credits of quantification.
9. Approval from the professional education advisor or the head of the pertinent certification program.

Teacher Certification Option

Teacher Certification Check Sheet (123-124 credits)

1 MAJOR REQUIREMENTS (26-27 credits)			
MATH 140* (4) ___	CMPSC 121 *(3) ___ OR	MATH 230 *(4) ___	MATH 311W* (3) ___
MATH 141 *(4) ___	CMPSC 101* (3) ___ OR	MATH 250* (3) ___ OR	MATH 312* (3) ___
MATH 220 *(2) ___	CMPSC 201* (3) ___	MATH 251* (4) ___	

Total Credits: _____

2 OPTION REQUIREMENTS (63 credits)	
PSYCH 100* (3) ___	MATH 310* (3) ___
HD FS 239* (3) ___	
CI 295* (2) ___	
CI 412W* (3) ___	CHOOSE 3 CREDITS OF THE FOLLOWING: MATH 414* (3) ___ OR MATH 418* (3) ___
EDPSY 014* (3) ___	
EDTHP 115* (3) ___	
MATH 427* (3) ___	CHOOSE 3 CREDITS OF 400-LEVEL EDTHP: EDTHP _____* (3) ___
MATH 435* (3) ___	
MATH 436* (3) ___	
MTHED 411* (3) ___	CI 495C* (3) ___ CI 495E* (15) ___
MTHED 412* (3) ___	
MTHED 427* (3) ___	

Total Credits: _____

Note: Requirements indicated with * identify courses that require a minimum grade of 'C' for graduation. This is a certification requirement.

Note: CI 495C is offered only for satisfactory/unsatisfactory grading. A grade of SA is required. This is the only course in this option which can be scheduled as satisfactory/unsatisfactory.

IMPORTANT: By their sophomore year, students interested in Mathematics Teacher Certification Option must go to the University Certification Office, 228 Chambers, to declare formally their intent to pursue teacher certification.

TEACHER CERTIFICATION OPTION CHECK SHEET

3 GENERAL EDUCATION (40 credits)		
ENGL 15 OR 30 (3) __ (GWS)	ARTS (6 CR) (GA)	SOC. /BEHAV. SCI. (6 CR) (GS)
ENGL 202 (3) __ (GWS)	_____ () __	PSYCH 100 _____ (3) __
CAS 100A (3) __ (GWS)	_____ () __	HD FS 239 _____ (3) __
NATURAL SCI. (9 CR) (GN)	_____ () __	_____ () __
_____ ()	HUMANITIES (6 CR) (GH)	HEALTH/PHYS. ACT. (3 CR) (GHA)
_____ ()	_____ () __	_____ () __
_____ ()	_____ () __	_____ () __
_____ ()	_____ () __	_____ () __
_____ ()		
WRITING ACROSS THE CURR. _____	US CULTURES (3 CR) (US) _____	FIRST-YEAR SEMINAR _____ (1) __
	INT'L CULTURES (3 CR) (IL) _____	

Total Credits: _____

General Education Courses – a description of these requirements can be found at <http://www.psu.edu/bulletins/bluebook/gened/>.

US Cultures and International Cultures Requirement Students must complete a 3-credit course in United States Cultures (US) and a 3-credit course in International Cultures (IL). See <http://www.psu.edu/bulletins/bluebook/gened/gi.html> for available courses.

Note: A student may, in consultation with the advisor and the student’s college dean, develop a sequence of 9 credits in either the arts, humanities, or social or behavioral sciences by substituting 3 credits from one of the other two areas not in the student’s major field of study.

TEACHER CERTIFICATION OPTION CHECK SHEET

4 REMEDIAL & REPEATED COURSES	5 SENATE POLICY 83-80	6 CREDITS
Courses that do not meet degree requirements:	Source/Time for credit acquisition:	Total Credits Earned: (less repeats and remedial; must have at least 123-124)
_____	36 of the last 60 credits at PSU?	_____
_____	_____	
_____	60 credits in the last 5 years?	
_____	_____	

Grand Total Credits _____

IMPORTANT: 123-124 credits are needed to graduate.

Recommended Academic Plan for Bachelor of Science Mathematics, Teacher Certification Option (MTHBS TEACH at University Park)
Effective Fall 2007

Semester 1	Credits	Semester 2	Credits
MATH 140(GQ)	4	MATH 141(GQ)	4
PSYCH 100 (GS)	3	EDPSY 014	3
NATURAL SCIENCE (GN)	3	EDTHP 115 (US)	3
ARTS (GA), HUMANITIES (GH)	3	ENGL 15 or 30 (GWS)	3
First-Year Seminar	1	NATURAL SCIENCE (GN)	3
Total Credits:	14	Total Credits:	16
Semester 3	Credits	Semester 4	Credits
MATH 230	4	MATH 220 (GQ)	2
MATH 311W	3	MATH 250 or 251	3 - 4
CI 295	2	MATH 312	3
CMPSC 121 or CMPSC 101 or CMPSC 201	3	HDFS 239 (GS)	3
<i>LITERATURE (GH)</i>	3	NATURAL SCIENCE (GN)	3
		Select 1 credit of supporting courses in consultation with academic adviser	1
Total Credits:	15	Total Credits:	15 - 16
Semester 5	Credits	Semester 6	Credits
MATH 427	3	MATH 310	3
MATH 435	3	MATH 436	3
ENGL 202C (GWS)	3	MTHED 411	3
CAS 100 A (GWS)	3	MTHED 427	3
400-LEVEL EDTHP	3	ARTS (GA) or HUMANITIES (GH)	3
HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5	HEALTH AND PHYSICAL ACTIVITY (GHA)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	Credits	Semester 8	Credits
MATH 414 or 418	3	CI 495E	15
MTHED 412	3		
CI 412W	3		
CI 495C	3		
ARTS (GA) or HUMANITIES (GH)	3		
Total Credits:	15	Total Credits:	15

Bold type indicates courses requiring a quality grade of C or better.

Scheduling patterns: Courses taught fall semester only - MATH 427. Courses taught spring semester only - MATH 310.

Notes: A student must earn a total of 123 credits for graduation.

Teacher Certification Exit Criteria

Eligibility for a Pennsylvania teacher certificate is based on:

1. Successful completion of a baccalaureate degree.
2. A minimum cumulative grade point average of 3.00.
3. A grade of C or better in all specified courses, including practica.
4. Successful completion of the Pre-Certification Competency Exam on Educating the Handicapped. (This exam is waived for School Psychology and Special Education majors, holders of School Psychology or Special Education degrees, and students who completed the course Special Education 400 or 444 with a grade of at least "C" or better).
5. Approval (a) by the pertinent program representative and (b) by the University Certification Officer.
6. Successful completion of any clearances and tests as specified by the Pennsylvania Dept. of Education. For information on the PRAXIS requirements, see <http://www.ed.psu.edu/edservices/testing.htm>.

Questions? At University Park, please contact the Director of Undergraduate Studies, 104 McAllister Building, 865-7528. At locations other than University Park, please contact the Eberly College of Science and/or the College of Education representatives.

Appendix A – Foreign Language

All students interested in scheduling a foreign language at Penn State may choose either to continue the language they began in high school or to begin a new one. To continue with a language, students must follow the placement policy as outlined below.

Placement Policy

Students who have studied a foreign language in grades 9 through 12 within four years immediately before admission to Penn State may only enroll in that language for credit based on the number of units of high school work completed.

<u>Units of Study, Grades 9-12</u>	<u>Register in</u>
Fewer than two	Course Level 001 (4 crs.)
Two or three	Course Level 002 (4 crs.)
Four or more	Course Level 003 (4 crs.)

Students may choose to audit a lower-level course but may not receive credit for it. Students who feel they are qualified for a more advanced course will be offered a diagnostic examination a few days after the beginning of each semester.

Non-Coursework Knowledge of Foreign Languages

Students who have acquired knowledge of a foreign language by means other than coursework (e.g., family background, travel or study in a foreign country, participation in non-credit summer language institutes, etc.) may enroll in elementary and intermediate courses in that language only with the permission of the course coordinator or department head. Students whose native language is something other than English may not receive credit (through coursework or examination) for elementary and intermediate courses in their native language. Enrollment in skills courses beyond intermediate level (e.g., conversation, composition) must be approved by the department head.

Intensive Courses

Students may choose to enroll in intensive courses--French 111 and 112, Spanish 10 and 20, or Summer Intensive Language Institute courses. Because the objectives of these intensive courses are somewhat different, students may schedule them for full credit even if they have studied the language previously. Questions should be addressed to the course coordinator or department head of the particular language department concerned.

Appendix B – Statistics Courses for Mathematics Majors

The following is a description of statistics courses which may be of interest to undergraduate mathematics majors.

STAT (MATH) 414-415

A two semester sequence in probability and mathematical statistics. This sequence is the one which the Statistics Department most strongly recommends for mathematics majors interested in statistics. It develops the basic theory of probability and statistics.

STAT (MATH) 416

A one-semester course in stochastic modeling (applied probability). This is an excellent course for mathematics majors interested in probability.

STAT (MATH) 418

A one-semester course in probability. This is an excellent course for mathematics majors interested in probability but not statistics.

Note: STAT (MATH) 414 and STAT (MATH) 418 cover very similar material but from different perspectives. STAT 414 is intended to lead to the study of statistics and STAT 418 is intended as a course in probability alone. Students cannot get credit for both 414 and 418. STAT 418 is an adequate prerequisite for STAT 415, although students who plan to take STAT 415 would be better advised to take STAT 414 than STAT 418. Students are permitted to substitute 414 for 418 and vice-versa in the requirements for all options.

Applied Statistics (STAT 460, 462, 464)

These courses offer students a chance to learn about common statistical techniques on a more advanced level and to apply these techniques to data sets. These courses tend to involve less theory and more computing than the probability and mathematical statistics courses; the goal is intelligent application of results, most of which are presented without rigorous proof.

Appendix C – Bachelor of Arts and Bachelor of Science Supporting Courses

Any Baccalaureate Degree course except:

ADTED 100

CAS 126

CMPSC 1, 100, 101B, 102, 110, 142, 144, 154, 164, 174, 175 AND 203

ENGL 4, 5

LL ED 5, 10

MATH 1, 2, 3, 4, 17, 18, 21, 22, 26, 35, 36, 40, 41, 81, 82, 83, 87, 88 and 200

STAT 100

NOTE: Courses which substantially duplicate subject matter covered in other courses the student has taken will not count toward degree requirement, e.g.:

BIOL 11 and BIOL 12 if student has taken BIOL 110

CSE 260 if student has taken MATH 311W

Appendix D – Bachelor of Arts Requirements

The Bachelor of Arts degree requires courses from the Arts (3 credits), Humanities (3 credits), Social and Behavioral Sciences (3 credits), Other Cultures (3 credits) and Foreign Language (0-12 credits). For a complete listing of all approved courses in the Bachelor of Arts basic requirements, please refer to <http://www.psu.edu/ufs/scca/barequi.html>.

Appendix E – Actuarial Science Examinations

We encourage you to visit the Society of Actuaries website at <http://www.soa.org/ccm/content>.

This site contains a full description of the actuarial examinations: topics, textbooks, schedules, locations and application forms. You can also learn more about the Society's VEE (Validation by Education Experience) program at this site.

Due to the nature of the VEE program, the following courses are highly recommended:

ECON 002; ECON 004; FIN 100; FIN 408; STAT 462; STAT 463 or STAT 510

We encourage you to check the Society of Actuaries website mentioned above to confirm current VEE course requirements.

PSU's Actuarial Club web site: <http://www.clubs.psu.edu/up/actscli/>

Note that students earning the B.S. degree in mathematics with actuarial option often pursue at least one of the following minors:

Statistics: <http://www.stat.psu.edu/undergrad/minor>

Economics: <http://www.psu.edu/bulletins/bluebook/major/econmin.htm>

Appendix F – Application Areas

The courses chosen for the area of application should form a coherent pattern and should include one or two 400-level courses. Below, we give examples of various areas and some courses associated with them. However, you are not restricted to this list.

NOTE: When the sequence of courses is approved by the advisor, a copy should be placed in the student's file in 107 Whitmore Laboratory. A form is available in 107 Whitmore Laboratory. This form should be submitted by the beginning of the sixth semester.

Bachelor of Science - Applied Analysis

Aerospace Engineering:

AERSP 301, 302, 304, 306, 308, 309, 311, 312, 313, 401, 402, 407, 410, 412, 413, 423, 425, 430, 450

Astronomy-Astrophysics:

ASTRO 291, 292, 293, 410, 451

Biology:

BIOL 220W, 222, 223, 405, 422W, 428

Chemistry:

CHEM 408, 451, 452, 453, 454

Computer Science and Engineering:

CMPEN 271, 331, 431, 471

Electrical Engineering:

E E - See the following page.

Engineering Mechanics:

E MCH 11, 12, 13, 407, 408, 409, 461

Engineering Science:

E SC 404H, 405H, 406H

Geosciences:

GEOSC 203, 484, 487, 489

Mechanical Engineering (M E) 30*, 33*, 50*, 54, 412, 440, 461*

Mechanical Systems (ME) 50, 54, 440, 450, 454, 455, 456, 458

Thermal Systems (ME) 30, 33, 412, 416, 418, 421, 434, 440

Meteorology:

METEO 300, 421, 422, 451, 452, 454, 455

Physics:

PHYS 204, 213, 214, 237, 400, 401, 402, 406, 410, 411, 412, 413, 420, 443, 444, 457, 458

*Courses are only offered summers.

Bachelor of Science - Applied Analysis Electrical Engineering Application Areas

An emphasis in controls and communications (14 credits):

E E 210, 350, 367, 428

Stronger emphasis in communications involving five courses (17 credits):

E E 210, 350, 351, 367, 459

Stronger emphasis in controls involving five courses (17 credits):

E E 210, 350, 351, 428, 429

An Emphasis in data communications (13 credits):

CSE 271, E E 210, 350, 458

An emphasis in electromagnetics (14 or more credits):

E E 210, 330, and any two of 411, 433, 438, 439, 490, 492

An emphasis in electromagnetics and microwave amplifiers (15 credits):

E E 210, 310, 330, 432

An emphasis in optical systems (14 or more credits):

E E 210, 330, 320, 412 or 414 or 420 or 422

An emphasis in image processing (14 credits):

E E 210, 350, 351, 485; A course such as STAT 414 or 418 is prerequisite.

An emphasis in digital signal processing (14 credits):

E E 210, 350, 351, 453

An emphasis in electronics (14 credits):

E E 210, 310, 311, 447 or 448

An emphasis in semiconductor devices and technology:

E SC 314, E E 210, 310, 418 or 419

Bachelor of Science - Systems Analysis Application Areas

Economics:

ECON 302, 304, 323, 333, 342, 351, 390, 490

Economic Modules:

Human Resource Economics

ECON 315, 412, 424, 427, 435, 436DF, 463

Public Economics and Policy

ECON 323, 423, 425, 428, 432, 445, 497 (Economics of Altruism), 497 (Economics of Science & Technology Policy)

Macroeconomics, Money and Banking

ECON 351, 429, 434, 450, 451

International, Development and Transition Economics

ECON 333, 372, 433, 471

(Economics modules - any student completing three courses (nine credits) with a grade of C or better in any one or more of six fields of concentration in economics can apply for and receive an official letter from Robert Marshall certifying that a module has been completed. You can receive more information in 606 Kern Building.)

Industrial Engineering:

IE 405, 425, 453, 455, 460, 497 (Info Tech in IE), 497 (Optimization Models and Methods)
(Math 414 and 415 can be used as prerequisites instead of IE 322 and IE 323.)

Information Sciences and Technology:

IST 110, 210, 220, 402, 431, 432

Insurance (Actuarial):

INS 301, 410, 411, 412

Psychology:

PSYCH 281, 301W, 400, 403, 404, 407, 482, 484, 485

Statistics:

STAT 401, 416, 460, 462, 464, 470W

Appendix G – Eligibility for Membership in Phi Beta Kappa

Phi Beta Kappa, the nation's oldest and most distinguished national honor society recognizing outstanding achievement in the liberal arts and sciences, was founded in 1776 at the College of William and Mary in Williamsburg, Virginia. The Pennsylvania State University Chapter (Lambda of Pennsylvania) was established in 1937.

Election to Phi Beta Kappa honors the quality and breadth of a student's undergraduate academic achievement. No formal application for Phi Beta Kappa membership is needed. The Chapter reviews student records each spring to identify candidates.

The requirements for a student to be invited into membership in Phi Beta Kappa include:

1. Candidates must have a non-professional major in the arts, humanities, social sciences, or sciences. Most majors in the College of Liberal Arts, Eberly College of Science, College of Earth and Mineral Sciences, and College of Arts and Architecture are acceptable. A few majors in the College of Communications are also considered non-professional. Majors in the College of Agricultural Sciences, Smeal College of Business Administration, College of Education, College of Engineering, and College of Health and Human Development are considered to be professional majors and are not accepted for Phi Beta Kappa membership.
2. Candidates with 90 or more credits completed must have a 3.6 cumulative GPA. Candidates with 60 to 89 credits completed must have a 3.8 GPA.
3. Candidates must have completed a minimum of 60 credits at Penn State.
4. Candidates must have completed at least one foreign language course at the second level (e.g., French 002, German 002, Japanese 002) OR must have equivalent credits granted by Penn State through examination, transfer or advanced placement OR an official of the student's College (e.g. faculty advisor, department head) must certify that the student has the required foreign language competence. The latter option may be the case when the student is a native speaker of another language.
5. Candidates must have completed all of their Penn State General Education requirements in the arts, humanities, social and behavioral sciences, natural sciences, and quantification.
6. Candidates must have at least 80 percent of their total credits in liberal arts and science courses OR at least 100 credits in total that are in liberal arts and science courses. Liberal arts and science courses include most, although not all, of the courses from the approved majors described above.

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