

$$\lim_{n \rightarrow \infty} \sum_{i=0}^n \int_0^{1/2} (i+1)x^i dx = 1$$

Mathematics
at
Georgia State University



Mathematics is one of the great unifying themes of our modern culture. It is a language, a science, an art form, and a tool of tremendous power. The Department of Mathematics and Statistics, in its courses for both majors and non-majors, seeks to introduce students to this vast area of knowledge and to show them how mathematics can be used to solve problems.

The Department of Mathematics and Statistics offers the Bachelor of Science degree with a major in mathematics. The degree program of the Department of Mathematics and Statistics prepares students for careers in business, industry, government, or in the teaching of mathematics at the secondary level. It also provides excellent preparation for further study in mathematics or statistics at the graduate level. Advice and assistance regarding career opportunities and graduate programs is available from the Office of Career and Job Search Services and from faculty advisors in the Department of Mathematics and Statistics. The course of study leading to the B. S. in Mathematics is described below and on the back of this page.

Students interested in a degree in mathematics may also want to consider selecting a concentration in a specific area of mathematics or a related field. The concentrations offered by the Department of Mathematics and Statistics are in actuarial science, computer information systems, computer science, secondary school teaching, managerial sciences, and statistics. If one of these concentrations is chosen, an appropriate notation is added to the diploma and transcript. Most of the required mathematics courses in these concentrations are the same as in the standard B. S. in Mathematics, with additional mathematics courses and elective courses being specified to tailor the program to the concentration. For details on these concentrations, students should consult the Undergraduate Catalog on the G. S. U. website (www.gsu.edu), the Department of Mathematics and Statistics website (www.mathstat.gsu.edu), or separate flyers available from the Department of Mathematics and Statistics.

Academic advisement is available from the Student Advisement Center and from the Office of Academic Assistance in the College of Arts and Sciences (for assistance with the Core Curriculum and non-major courses). Faculty advisors are available in the Department of Mathematics and Statistics to assist students with options and choices involving mathematics programs and courses. Students are encouraged to consult with these advisors often during their academic careers at Georgia State University.

Requirements for the Degree
B. S. in Mathematics

The required courses and optional (elective) courses in the degree program are shown on the back of this flyer. For simplicity, they are listed without regard to Areas of the Core Curriculum. Specific lists of courses from which electives must be chosen (designated by "[from list]") are also omitted in favor of more descriptive titles. For further details on Core Areas and specific course choice lists, the student should see the Undergraduate Catalog on the G. S. U. website (www.gsu.edu).

< Continued on the back of the page >

(Revised October 2005)

Required lower-level non-mathematics courses:

English Composition I & II	Engl 1101 & 1102
U. S. History	Hist 2110
American Government	PolS 1101
Global Economics, Global Politics, and World History Elective	Econ 2100, Hist 1111, Hist 1112, or PolS 2401
Humanities Elective ¹	Literature, philosophy, or media [<i>from list</i>]
Fine Arts Elective ¹	Art, film, music, or theatre [<i>from list</i>]
Two-course Lab Science Sequence	Biology, chemistry, geology, or physics [<i>from list</i>]
Social Science Elective	African-American studies, anthropology, criminal justice, economics, geography, psychology, sociology, or women's studies [<i>from list</i>]
Two Institutional Options Courses	Critical thinking, human communication, comparative culture, or global problems [<i>from list</i>]
Electives (appropriate to the major)	Accounting, biology, chemistry, computer science, economics, foreign language, philosophy, or physics [<i>from list</i>] (to complete a specified number of hours)

Required lower-level mathematics courses:

Precalculus (including analytic geometry and trigonometry)	Math 1113 [if not taken in high school]
Calculus of One Variable I	Math 2211
Calculus of One Variable II	Math 2212
Multivariable Calculus	Math 2215
Discrete Mathematics	Math 2420

Required upper-level mathematics courses:

Bridge to Higher Mathematics	Math 3000
Introductory Linear Algebra	Math 3435
Linear Algebra	Math 4435
Modern Algebra I	Math 4441
Analysis I & II, and Senior Seminar	Math 4661 & 4662, and Math 4991
Mathematical Statistics I	Math 4751
Mathematics Electives	Three courses, chosen from the list below (only one course may be at the 3000-level)

Upper-level mathematics electives:

Differential Equations ²	Math 3260	Introduction to Differential Geometry	Math 4391
Problem Solving with Computers ²	Math 3300	Graph Theory	Math 4420
Applied Combinatorics ²	Math 3420	Modern Algebra II	Math 4442
Elements of Number Theory ²	Math 3450	Theory of Numbers	Math 4450
Introduction to Probability and Its Applications ²	Math 3510	Error Correction Codes	Math 4455
Historical and Cultural Development of Mathematics I & II ²	Math 3820 & 3821	Cryptography	Math 4460
Optimization	Math 4211	Biostatistics ³	Math 4544
Complex Analysis	Math 4250	Introduction to Statistical Methods ³	Math 4547
Introduction to Operations Research	Math 4253	Methods of Regression and Analysis of Variance	Math 4548
Vector Calculus	Math 4258	Numerical Analysis I & II	Math 4610 & 4620
Partial Differential Equations	Math 4265	Inverse and Ill-Posed Problems	Math 4650
Applied Dynamical Systems	Math 4275	Transforms in Applied Mathematics	Math 4671
College Geometry	Math 4301	Mathematical Statistics II	Math 4752
Modern Geometry	Math 4371	Statistical Computing	Math 4767

Notes:

¹ Either the Humanities Elective or the Fine Arts Elective can be replaced by a foreign language.

² At most three 3000-level mathematics courses can be used as major courses, so only one 3000-level mathematics elective can be used as a major course; others can be used as general electives.

³ Only one of Math 4544 and Math 4547 can be used as a major course; the other one can be used as a general elective.

B. S. in Mathematics
Program for Semesters
Department of Mathematics and Statistics
Georgia State University

Mathematics is one of the great unifying themes of our modern culture. It is a language, a science, an art form, and a tool of tremendous power. The Department of Mathematics and Statistics, in its courses for both majors and non-majors, seeks to introduce students to this vast area of knowledge and to show them how mathematics can be used to solve problems.

The Department of Mathematics and Statistics offers the Bachelor of Science degree with a major in mathematics, which prepares a student for a position in business, industry, or government; a career in the teaching of mathematics at the secondary level; or further study at the graduate level in mathematics, statistics, or other related fields.

Students who wish to specialize in a specific area of mathematics or statistics can select one of the concentrations offered within the B. S. degree. The concentrations offered are actuarial science, computer information systems, computer science, managerial sciences, secondary school teaching, and statistics. Each of these concentrations is described more fully in a separate flyer.

Students wishing to **minor in mathematics** should complete Math 2212, Math 2215, and nine hours of additional mathematics courses at the 3000/4000-level. There are some restrictions, so interested students should request approval of their course selections from the Department of Mathematics and Statistics.

Students majoring in mathematics should carefully consider the objectives they wish to pursue after graduation. A particular career or educational objective may suggest a special choice for a minor or concentration that would result in better preparation for that objective. It might also suggest that a cooperative experience with a company in that field would be useful; the Office of Cooperative Education can assist students with co-op opportunities. Faculty members who serve as academic advisers for majors can discuss the choices and concentrations that are available to mathematics majors.

As part of the requirements for the Bachelor of Science in mathematics, a student must take the following courses:

1. Math 2211, 2212, 2215, and 2420.
2. Math 3000, 3435, 4435, 4441, 4442, 4661, 4662, 4751, and 4991.
3. Three additional mathematics courses at the 3000/4000-level (except Math 3030, 3050, 3070, and 3090), at most one of which can be at the 3000-level.

These required courses are placed in Areas A, D, F, and G of the curriculum. **(See the back of this flyer for a sample program.)** Majors in this degree program should consult with an academic adviser in the Department of Mathematics and Statistics to ensure that their course selections are appropriate for the degree program.

**ACADEMIC ADVISEMENT — SEMESTERS
B. S. in Mathematics**

10/05

(Required courses are in bold type; electives must be chosen from lists at right.)

NOTE: A minimum grade of “C” is required in all mathematics and statistics courses and all upper-level courses that are required in this program. Minimum GPA in all courses is 2.00, with at most 12 hours of “D” grades.

AREA	COURSES	CHOICES AND OPTIONS
Undergraduate Core Curriculum (60 hours)		
A: Essential Skills (9 Hours [†])	Engl 1101 (“C” or higher) Engl 1102 (“C” or higher) Math 1113 (or higher Math)	<u>Note:</u> Engl 1103 (plus one additional course from the Humanities Elective list in Area C) can replace Engl 1101 & Engl 1102. E.g., Math 2211, Math 2212, or Math 2215.
B: Institutional Options (4 Hours)	Phil 1010 Speech 1000 or Perspectives	<u>Note:</u> Phil 1010 is recommended, but not required; it can be replaced by Speech 1000, Pers 2001, or Pers 2002.
C: Humanities and Fine Arts (6 Hours)	Humanities Elective Fine Arts Elective	Engl 2110, Engl 2120, Engl 2130, Phil 2010, or Spch 2050. AH 1700, AH 1750, AH 1850, Film 2700, MuA 1500, MuA 1900, MuA 1930, or Thea 2040. <u>Note:</u> A Foreign Language – 1002 or higher – can replace one of the above.)
D: Science, Mathematics, and Technology (11 Hours [†])	Math 2211 (or higher Math) Two-course Lab Science sequence	E.g., Math 2212 (if Math 2211 is in Area A). Biol 2107K-2108K, Chem 1211K-1212K, Geol 1121K-1122K, Phys 1111K-1112K, or Phys 2211K-2212K. <u>Note:</u> Phys 2211K-2212K is recommended, but not required.
E: Social Science (12 Hours)	Hist 2110 PolS 1101 Global Economics/Politics and World History Elective Social Science Foundations Elective	<u>Note:</u> Hist 2110 and/or PolS 1101 can be replaced by exams, with additional course(s) chosen from the Social Science Foundations list. Econ 2100, Hist 1111, Hist 1112, PolS 2401. AAS 2010, Anth 1102, CrJu 2200, Econ 2105, Econ 2106, Geog 1101, AAS/Hist 1140, Psys 1101, Soci 1101, Soci 1160, WSt 2010.
F: Courses Appropriate to the Major (18 Hours [†]) [†] See note on rollover hours below.	Math 2212 (or higher Math) Math 2215 and Math 2420 Electives to complete 18 hours (less any “rollover hours” [†])	E.g., Math 2215 (if Math 2212 is in Area D). If not completed in Area D. Acct 2101, Acct 2102, Biol 2107K, Biol 2108K, Chem 1211K, Chem 1212K, Chem 2400, CSc 2010, CSc 2301, CSc 2310, CSc 2311, Econ 2105, Econ 2106, Lang 2001, Lang 2002, Phil 1010, Phys 2211K, Phys 2212K.
Major and Additional Courses (60 hours) — at least 45 hours must be at the 3000/4000-level		
G: Major Courses (33 Hours)	Math 3000 Math 3435 Math 4435 Math 4441 and Math 4442 Math 4661 and Math 4662 Math 4751 Math 4991 Four Math Electives	<u>Note:</u> Math Electives may include only one 3000-level course, and may not include Math 3030, 3050, 3070, or 3090.
H: Additional Courses (27 Hours)	Electives (any courses to complete 120 total hours*)	(* Except see Academic Residence Requirements below.)
* Academic Residence Requirements: (1) At least 39 of the 45 hours at the 3000/4000-level must be taken at GSU, with an average grade of “C” or better. (2) At least 11 hours of the courses comprising the major (Area G) must be taken at GSU.		
NOTES: [†] (Rollover Hours) If there is an extra hour in Area A and/or Area D, the hour(s) will reduce the 18 hours required in Area F.		

B. S. in Mathematics
Concentration in Actuarial Science
Program for Semesters
Department of Mathematics and Statistics
Georgia State University

Mathematics is one of the great unifying themes of our modern culture. It is a language, a science, an art form, and a tool of tremendous power. The Department of Mathematics and Statistics, in its courses for both majors and non-majors, seeks to introduce students to this vast area of knowledge and to show them how mathematics can be used to solve problems.

The Department of Mathematics and Statistics, in cooperation with the actuarial science program in the Department of Risk Management and Insurance, offers the Bachelor of Science degree with a major in mathematics and a concentration in actuarial science. This program provides strong preparation in both mathematics and actuarial science. Students completing this program may request that a suitable annotation be placed on their permanent record.

An actuary is an executive who uses mathematical and statistical skills to define, analyze, and solve problems of society. Actuaries create and manage programs to reduce the adverse financial impact of the expected and unexpected events that happen to people. They are employed in business, industry, and the government.

Students majoring in mathematics should carefully consider the objectives they wish to pursue after graduation. A particular career or educational objective may suggest a special choice for a minor or concentration that would result in better preparation for that objective. It might also suggest that a cooperative experience with a company in that field would be useful; the Office of Cooperative Education can assist students with co-op opportunities. Faculty members who serve as academic advisers for majors can discuss the choices and concentrations that are available to mathematics majors.

As part of the requirements for the Bachelor of Science in mathematics with a concentration in actuarial science, a student must take the following courses:

1. Math 2211, 2212, 2215, and 2420; CSc 2010 and 2310.
2. Math 3000, 3435, 4211, 4435, 4610, 4661, 4662, 4751, 4752, and 4991.
3. Econ 2105 and 2106.
4. AS 4140, 4230, and 4340.
5. Two of the following courses: AS 4320, 4350, or 4510.

These required courses are placed in Areas A, D, F, G, and H of the curriculum. **(See the back of this flyer for a sample program.)** Majors in this degree program should consult with an academic adviser in the Department of Mathematics and Statistics and with an academic adviser in the Actuarial Science Program to ensure that their course selections are appropriate for the degree program.

ACADEMIC ADVISEMENT — SEMESTERS
B. S. in Mathematics – Concentration in Actuarial Science

10/05

(Required courses are in **bold** type; electives must be chosen from lists at right.)

NOTE: A minimum grade of “C” is required in all mathematics and statistics courses and all upper-level courses that are required in this program. Minimum GPA in all courses is 2.00, with at most 12 hours of “D” grades.

AREA	COURSES	CHOICES AND OPTIONS
Undergraduate Core Curriculum (60 hours)		
A: Essential Skills (9 Hours [†])	Engl 1101 (“C” or higher) Engl 1102 (“C” or higher) Math 1113 (or higher Math)	<u>Note:</u> Engl 1103 (plus one additional course from the Humanities Elective list in Area C) can replace Engl 1101 & Engl 1102. E.g., Math 2211, Math 2212, or Math 2215.
B: Institutional Options (4 Hours)	Phil 1010 Speech 1000 or Perspectives	<u>Note:</u> Phil 1010 is recommended, but not required; it can be replaced by Speech 1000, Pers 2001, or Pers 2002.
C: Humanities and Fine Arts (6 Hours)	Humanities Elective Fine Arts Elective	Engl 2110, Engl 2120, Engl 2130, Phil 2010, or Spch 2050 AH 1700, AH 1750, AH 1850, Film 2700, MuA 1500, MuA 1900, MuA 1930, or Thea 2040. <u>Note:</u> A Foreign Language – 1002 or higher – can replace one of the above.)
D: Science, Mathematics, and Technology (11 Hours [†])	Math 2211 (or higher Math) Two-course Laboratory Science sequence	E.g., Math 2212 (if Math 2211 is in Area A). Biol 2107K-2108K, Chem 1211K-1212K, Geol 1121K-1122K, Phys 1111K-1112K, or Phys 2211K-2212K. <u>Note:</u> Phys 2211K-2212K is recommended, but not required.
E: Social Science (12 Hours)	Hist 2110 PolS 1101 Global Economics/Politics and World History Elective Social Science Foundations Elective	<u>Note:</u> Hist 2110 and/or PolS 1101 can be replaced by exams, with additional course(s) chosen from the Social Science Foundations list. Econ 2100, Hist 1111, Hist 1112, PolS 2401. AAS 2010, Anth 1102, CrJu 2200, Econ 2105, Econ 2106, Geog 1101, AAS/Hist 1140, Psys 1101, Soci 1101, Soci 1160, WSt 2010.
F: Courses Appropriate to the Major (18 Hours [†]) [†] See note on rollover hours below.	Math 2212 (or higher Math) Math 2215 and Math 2420 CSc 2010 and CSc 2310 Electives to complete 18 hours (less any “rollover hours” [†])	E.g., Math 2215 (if Math 2212 is in Area D). If not completed in Area D. Acct 2101, Acct 2102, Biol 2107K, Biol 2108K, Chem 1211K, Chem 1212K, Chem 2400, CSc 2010, CSc 2301, CSc 2310, CSc 2311, Econ 2105, Econ 2106, Lang 2001, Lang 2002, Phil 1010, Phys 2211K, Phys 2212K.
Major and Additional Courses (60 hours) — at least 45 hours must be at the 3000/4000-level		
G: Major Courses (33 Hours)	Math 3000 Math 3435 and Math 4435 Math 4211 Math 4610 Math 4661 and Math 4662 Math 4751 and Math 4752 Math 4991 AS 4140	
H: Additional Courses (27 Hours)	Econ 2105 and Econ 2106 AS 4230 and AS 4340 AS 4320, 4350, or 4510 Electives (any courses to complete 120 total hours*)	If not completed in Area F. Choose 2 of these 3 courses. (* Except see Academic Residence Requirements below.)
* Academic Residence Requirements: (1) At least 39 of the 45 hours at the 3000/4000-level must be taken at GSU, with an average grade of “C” or better. (2) At least 11 hours of the courses comprising the major (Area G) must be taken at GSU.		
NOTES: [†] (Rollover Hours) If there is an extra hour in Area A and/or Area D, the hour(s) will reduce the 18 hours required in Area F.		

B. S. in Mathematics
Concentration in Computer Information Systems
Program for Semesters
Department of Mathematics and Statistics
Georgia State University

Mathematics is one of the great unifying themes of our modern culture. It is a language, a science, an art form, and a tool of tremendous power. The Department of Mathematics and Statistics, in its courses for both majors and non-majors, seeks to introduce students to this vast area of knowledge and to show them how mathematics can be used to solve problems.

The Department of Mathematics and Statistics, in cooperation with the Department of Computer Information Systems, offers the Bachelor of Science degree with a major in mathematics and a concentration in computer information systems. This program provides strong preparation in both mathematics and computer information systems. Students completing this program may request that a suitable annotation be placed on their permanent record. They are eligible to receive a certificate signed by the chair of the Department of Mathematics and Statistics and the dean of the College of Arts and Sciences.

Students majoring in mathematics should carefully consider the objectives they wish to pursue after graduation. A particular career or educational objective may suggest a special choice for a minor or concentration that would result in better preparation for that objective. It might also suggest that a cooperative experience with a company in that field would be useful; the Office of Cooperative Education can assist students with co-op opportunities. Faculty members who serve as academic advisers for majors can discuss the choices and concentrations that are available to mathematics majors.

As part of the requirements for the Bachelor of Science in mathematics with a concentration in computer information systems, a student must take the following courses:

1. Math 2211, 2212, 2215, and 2420; CIS 2010.
2. Math 3000, 3435, 4435, 4661, 4662, 4751, and 4991.
3. One additional mathematics course at the 3000/4000-level (except Math 3030, 3050, 3070, and 3090).
4. CSc 2010, 2310, 2311, 3210, and 3410.
5. One of the following courses: CSc 3320, 4210, or 4320.
6. CIS 3210, 3300, and 3310.
7. One additional CIS course, preapproved by the Director of Undergraduate Advisement.

These required courses are placed in Areas A, D, F, G, and H of the curriculum. **(See the back of this flyer for a sample program.)** Majors in this degree program should consult with an academic adviser in the Department of Mathematics and Statistics to ensure that their course selections are appropriate for the degree program.

B. S. in Mathematics – Concentration in Computer Information Systems**(Required courses are in bold type; electives must be chosen from lists at right.)****NOTE: A minimum grade of “C” is required in all mathematics and statistics courses and all upper-level courses that are required in this program. Minimum GPA in all courses is 2.00, with at most 12 hours of “D” grades.**

AREA	COURSES	CHOICES AND OPTIONS
Undergraduate Core Curriculum (60 hours)		
A: Essential Skills (9 Hours [†])	Engl 1101 (“C” or higher) Engl 1102 (“C” or higher) Math 1113 (or higher Math)	<u>Note</u> : Engl 1103 (plus one additional course from the Humanities Elective list in Area C) can replace Engl 1101 & Engl 1102. E.g., Math 2211, Math 2212, or Math 2215.
B: Institutional Options (4 Hours)	Phil 1010 Speech 1000 or Perspectives	<u>Note</u> : Phil 1010 is recommended, but not required; it can be replaced by Speech 1000, Pers 2001, or Pers 2002.
C: Humanities and Fine Arts (6 Hours)	Humanities Elective Fine Arts Elective	Engl 2110, Engl 2120, Engl 2130, Phil 2010, or Spch 2050. AH 1700, AH 1750, AH 1850, Film 2700, MuA 1500, MuA 1900, MuA 1930, or Thea 2040. <u>Note</u> : A Foreign Language – 1002 or higher – can replace one of the above.)
D: Science, Mathematics, and Technology (11 Hours [†])	Math 2211 (or higher Math) Two-course Laboratory Science sequence	E.g., Math 2212 (if Math 2211 is in Area A). Biol 2107K-2108K, Chem 1211K-1212K, Geol 1121K-1122K, Phys 1111K-1112K, or Phys 2211K-2212K. <u>Note</u> : Phys 2211K-2212K is recommended, but not required.
E: Social Science (12 Hours)	Hist 2110 PolS 1101 Global Economics/Politics and World History Elective Social Science Foundations Elective	<u>Note</u> : Hist 2110 and/or PolS 1101 can be replaced by exams, with additional course(s) chosen from the Social Science Foundations list. Econ 2100, Hist 1111, Hist 1112, PolS 2401. AAS 2010, Anth 1102, CrJu 2200, Econ 2105, Econ 2106, Geog 1101, AAS/Hist 1140, Psys 1101, Soci 1101, Soci 1160, WSt 2010.
F: Courses Appropriate to the Major (18 Hours [†]) [†] See note on rollover hours below.	Math 2212 (or higher Math) Math 2215 and Math 2420[‡] CSc 2010 and CSc 2310 Electives to complete 18 hours (less any “rollover hours” [†])	E.g., Math 2215 (if Math 2212 is in Area D). If not completed in Area D. Acct 2101, Acct 2102, Biol 2107K, Biol 2108K, Chem 1211K, Chem 1212K, Chem 2400, CSc 2010, CSc 2301, CSc 2310, CSc 2311, Econ 2105, Econ 2106, Lang 2001, Lang 2002, Phil 1010, Phys 2211K, Phys 2212K.
Major and Additional Courses (60 hours) — at least 45 hours must be at the 3000/4000-level		
G: Major Courses (33 Hours)	Math 3000 Math 3435 and Math 4435 Math 4661 and Math 4662 Math 4751 Math 4991 One Math Elective CSc 3210 and CSc 3410 CSc 3320 or 4210 or 4320	<u>Note</u> : Math Electives may not include Math 3030, 3050, 3070, or 3090. Choose 1 of these 3 courses.
H: Additional Courses (27 Hours)	CSc 2311 CIS 2010 CIS 3210, 3300, and 3310 One CIS Elective Electives (any courses to complete 120 total hours*)	If not completed in Area F. All 3 courses are required. <u>Preapproved</u> by the Director of Undergraduate Advisement. (* Except see Academic Residence Requirements below.)
* Academic Residence Requirements: (1) At least 39 of the 45 hours at the 3000/4000-level must be taken at GSU, with an average grade of “C” or better. (2) At least 11 hours of the courses comprising the major (Area G) must be taken at GSU.		
NOTES: [†] (Rollover Hours) If there is an extra hour in Area A and/or Area D, the hour(s) will reduce the 18 hours required in Area F. [‡] Math 2420 must be completed before any upper-level CIS courses can be taken.		

B. S. in Mathematics
Concentration in Computer Science
Program for Semesters
Department of Mathematics and Statistics
Georgia State University

Mathematics is one of the great unifying themes of our modern culture. It is a language, a science, an art form, and a tool of tremendous power. The Department of Mathematics and Statistics, in its courses for both majors and non-majors, seeks to introduce students to this vast area of knowledge and to show them how mathematics can be used to solve problems.

The Department of Mathematics and Statistics, in cooperation with the Department of Computer Science, offers the Bachelor of Science degree with a major in mathematics and a concentration in computer science. This program provides strong preparation in both mathematics and computer science. Students completing this program may request that a suitable annotation be placed on their permanent record.

Students majoring in mathematics should carefully consider the objectives they wish to pursue after graduation. A particular career or educational objective may suggest a special choice for a minor or concentration that would result in better preparation for that objective. It might also suggest that a cooperative experience with a company in that field would be useful; the Office of Cooperative Education can assist students with co-op opportunities. Faculty members who serve as academic advisers for majors can discuss the choices and concentrations that are available to mathematics majors.

As part of the requirements for the Bachelor of Science in mathematics with a concentration in computer science, a student must take the following courses:

1. Math 2211, 2212, 2215, and 2420.
2. Math 3000, 3435, 4435, 4661, 4662, 4751, and 4991.
3. One additional mathematics course at the 3000/4000-level (except Math 3030, 3050, 3070, and 3090)..
4. CSc 2010, 2310, 2311, 3210, 3410, 4520, 4610, and 4620.
5. One of the following courses: CSc 3320, 4210, 4330, or 4350.
6. One additional CSc course at the 3000/4000-level.

These required courses are placed in Areas A, D, F, G, and H of the curriculum. **(See the back of this flyer for a sample program.)** Majors in this degree program should consult with an academic adviser in the Department of Mathematics and Statistics to ensure that their course selections are appropriate for the degree program.

ACADEMIC ADVISEMENT — SEMESTERS
B. S. in Mathematics – Concentration in Computer Science

10/05

(Required courses are in bold type; electives must be chosen from lists at right.)

NOTE: A minimum grade of “C” is required in all mathematics and statistics courses and all upper-level courses that are required in this program. Minimum GPA in all courses is 2.00, with at most 12 hours of “D” grades.

AREA	COURSES	CHOICES AND OPTIONS
Undergraduate Core Curriculum (60 hours)		
A: Essential Skills (9 Hours [†])	Engl 1101 (“C” or higher) Engl 1102 (“C” or higher) Math 1113 (or higher Math)	<u>Note:</u> Engl 1103 (plus one additional course from the Humanities Elective list in Area C) can replace Engl 1101 & Engl 1102. E.g., Math 2211, Math 2212, or Math 2215.
B: Institutional Options (4 Hours)	Phil 1010 Speech 1000 or Perspectives	<u>Note:</u> Phil 1010 is recommended, but not required; it can be replaced by Speech 1000, Pers 2001, or Pers 2002.
C: Humanities and Fine Arts (6 Hours)	Humanities Elective Fine Arts Elective	Engl 2110, Engl 2120, Engl 2130, Phil 2010, or Spch 2050. AH 1700, AH 1750, AH 1850, Film 2700, MuA 1500, MuA 1900, MuA 1930, or Thea 2040. <u>Note:</u> A Foreign Language – 1002 or higher – can replace one of the above.)
D: Science, Mathematics, and Technology (11 Hours [†])	Math 2211 (or higher Math) Two-course Laboratory Science sequence	E.g., Math 2212 (if Math 2211 is in Area A). Biol 2107K-2108K, Chem 1211K-1212K, Geol 1121K-1122K, Phys 1111K-1112K, or Phys 2211K-2212K. <u>Note:</u> Phys 2211K-2212K is recommended, but not required.
E: Social Science (12 Hours)	Hist 2110 PolS 1101 Global Economics/Politics and World History Elective Social Science Foundations Elective	<u>Note:</u> Hist 2110 and/or PolS 1101 can be replaced by exams, with additional course(s) chosen from the Social Science Foundations list. Econ 2100, Hist 1111, Hist 1112, PolS 2401. AAS 2010, Anth 1102, CrJu 2200, Econ 2105, Econ 2106, Geog 1101, AAS/Hist 1140, Psys 1101, Soci 1101, Soci 1160, WSt 2010.
F: Courses Appropriate to the Major (18 Hours [†]) [†] See note on rollover hours below.	Math 2212 (or higher Math) Math 2215 and Math 2420 CSc 2010 and CSc 2310 Electives to complete 18 hours (less any “rollover hours” [†])	E.g., Math 2215 (if Math 2212 is in Area D). If not completed in Area D. Acct 2101, Acct 2102, Biol 2107K, Biol 2108K, Chem 1211K, Chem 1212K, Chem 2400, CSc 2010, CSc 2301, CSc 2310, CSc 2311, Econ 2105, Econ 2106, Lang 2001, Lang 2002, Phil 1010, Phys 2211K, Phys 2212K.
Major and Additional Courses (60 hours) — at least 45 hours must be at the 3000/4000-level		
G: Major Courses (33 Hours)	Math 3000 Math 3435 and Math 4435 Math 4661 and Math 4662 Math 4751 Math 4991 One Math Elective CSc 3410 CSc 4610 and CSc 4620	<u>Note:</u> Math Elective may not include Math 3030, 3050, 3070, or Math 3090.
H: Additional Courses (27 Hours)	CSc 2311 CSc 3210 CSc 4520 CSc Elective (from list at right) CSc Elective (3/4000-level) Electives (any courses to complete 120 total hours*)	If not completed in Area F. Choose one course: CSc 3320, CSc 4210, CSc 4330, or CSc 4350. (* Except see Academic Residence Requirements below.)
* Academic Residence Requirements: (1) At least 39 of the 45 hours at the 3000/4000-level must be taken at GSU, with an average grade of “C” or better. (2) At least 11 hours of the courses comprising the major (Area G) must be taken at GSU.		
NOTES: [†] (Rollover Hours) If there is an extra hour in Area A and/or Area D, the hour(s) will reduce the 18 hours required in Area F.		

B. S. in Mathematics
Concentration in Managerial Sciences
Program for Semesters
Department of Mathematics and Statistics
Georgia State University

Mathematics is one of the great unifying themes of our modern culture. It is a language, a science, an art form, and a tool of tremendous power. The Department of Mathematics and Statistics, in its courses for both majors and non-majors, seeks to introduce students to this vast area of knowledge and to show them how mathematics can be used to solve problems.

The Department of Mathematics and Statistics, in cooperation with the Department of Managerial Sciences, offers the Bachelor of Science degree with a major in mathematics and a concentration in managerial sciences. In the managerial sciences, students receive training in management modeling, problem solving, and computer-assisted decision support/expert systems technologies. They learn to apply these skills to the functional areas of administration to increase managerial effectiveness and productivity. Training in managerial sciences leads to such careers as management consultants, logistics specialists, quality assurance analysts, data analysts/statisticians, and decision support/expert systems builders. Students completing this program may request that a suitable annotation be placed on their permanent record.

Students majoring in mathematics should carefully consider the objectives they wish to pursue after graduation. A particular career or educational objective may suggest a special choice for a minor or concentration that would result in better preparation for that objective. It might also suggest that a cooperative experience with a company in that field would be useful; the Office of Cooperative Education can assist students with co-op opportunities. Faculty members who serve as academic advisers for majors can discuss the choices and concentrations that are available to mathematics majors.

As part of the requirements for the Bachelor of Science in mathematics with a concentration in managerial sciences, a student must take the following courses:

1. Math 2211, 2212, 2215, and 2420; CSc 2010 and 2310.
2. Math 3000, 3435, 4435, 4661, 4662, and 4991.
3. One of the following two-course sequences: Math 4751 and 4752 or Math 4547 and 4548.
4. One of the following courses: Math 4253 or CSc 4830.
5. One additional mathematics or computer science course at the 3000/4000-level (except Math 3030, 3050, 3070, and 3090).
6. Mgs 3100, 4000, 4020, 4110, and 4120.
7. One of the following courses: Mgs 4140 or 4760.

These required courses are placed in Areas A, D, F, G, and H of the curriculum. **(See the back of this flyer for a sample program.)** Majors in this degree program should consult with an academic adviser in the Department of Mathematics and Statistics to ensure that their course selections are appropriate for the degree program.

ACADEMIC ADVISEMENT — SEMESTERS
B. S. in Mathematics – Concentration in Managerial Sciences

10/05

(Required courses are in bold type; electives must be chosen from lists at right.)

NOTE: A minimum grade of “C” is required in all mathematics and statistics courses and all upper-level courses that are required in this program. Minimum GPA in all courses is 2.00, with at most 12 hours of “D” grades.

AREA	COURSES	CHOICES AND OPTIONS
Undergraduate Core Curriculum (60 hours)		
A: Essential Skills (9 Hours [†])	Engl 1101 (“C” or higher) Engl 1102 (“C” or higher) Math 1113 (or higher Math)	<u>Note:</u> Engl 1103 (plus one additional course from the Humanities Elective list in Area C) can replace Engl 1101 & Engl 1102. E.g., Math 2211, Math 2212, or Math 2215.
B: Institutional Options (4 Hours)	Phil 1010 Speech 1000 or Perspectives	<u>Note:</u> Phil 1010 is recommended, but not required; it can be replaced by Speech 1000, Pers 2001, or Pers 2002.
C: Humanities and Fine Arts (6 Hours)	Humanities Elective Fine Arts Elective	Engl 2110, Engl 2120, Engl 2130, Phil 2010, or Spch 2050. AH 1700, AH 1750, AH 1850, Film 2700, MuA 1500, MuA 1900, MuA 1930, or Thea 2040. <u>Note:</u> A Foreign Language – 1002 or higher – can replace one of the above.)
D: Science, Mathematics, and Technology (11 Hours [†])	Math 2211 (or higher Math) Two-course Laboratory Science sequence	E.g., Math 2212 (if Math 2211 is in Area A). Biol 2107K-2108K, Chem 1211K-1212K, Geol 1121K-1122K, Phys 1111K-1112K, or Phys 2211K-2212K. <u>Note:</u> Phys 2211K-2212K is recommended, but not required.
E: Social Science (12 Hours)	Hist 2110 PolS 1101 Global Economics/Politics and World History Elective Social Science Foundations Elective	<u>Note:</u> Hist 2110 and/or PolS 1101 can be replaced by exams, with additional course(s) chosen from the Social Science Foundations list. Econ 2100, Hist 1111, Hist 1112, PolS 2401. AAS 2010, Anth 1102, CrJu 2200, Econ 2105, Econ 2106, Geog 1101, AAS/Hist 1140, Psys 1101, Soci 1101, Soci 1160, WSt 2010.
F: Courses Appropriate to the Major (18 Hours [†]) [†] See note on rollover hours below.	Math 2212 (or higher Math) Math 2215 and Math 2420 CSc 2010 and CSc 2310 Electives to complete 18 hours (less any “rollover hours” [†])	E.g., Math 2215 (if Math 2212 is in Area D). If not completed in Area D. Acct 2101, Acct 2102, Biol 2107K, Biol 2108K, Chem 1211K, Chem 1212K, Chem 2400, CSc 2010, CSc 2301, CSc 2310, CSc 2311, Econ 2105, Econ 2106, Lang 2001, Lang 2002, Phil 1010, Phys 2211K, Phys 2212K.
Major and Additional Courses (60 hours) — at least 45 hours must be at the 3000/4000-level		
G: Major Courses (33 Hours)	Math 3000 Math 3435 and Math 4435 Math 4661 and Math 4662 Math 4751 and Math 4752[‡] Math 4211 or CSc 4830 Math 4991 One Math or CSc Elective Mgs 3100	Math 4547 and Math 4548 can replace Math 4751 and Math 4752 [‡] . <u>Note:</u> Math Electives may not include Math 3030, 3050, 3070, or 3090.
H: Additional Courses (27 Hours)	Mgs 4000 and Mgs 4020 Mgs 4110 and Mgs 4120 Mgs 4140 or Mgs 4760 Electives (any courses to complete 120 total hours*)	Choose 1 of these 2 courses. (* Except see Academic Residence Requirements below.)
* Academic Residence Requirements: (1) At least 39 of the 45 hours at the 3000/4000-level must be taken at GSU, with an average grade of “C” or better. (2) At least 11 hours of the courses comprising the major (Area G) must be taken at GSU.		
NOTES: [†] (Rollover Hours) If there is an extra hour in Area A and/or Area D, the hour(s) will reduce the 18 hours required in Area F. [‡] The statistics requirements (Math 4751 & 4752 or Math 4547 & 4548) must be completed before taking Mgs courses.		

B. S. in Mathematics
Concentration in Statistics
Program for Semesters
Department of Mathematics and Statistics
Georgia State University

Mathematics is one of the great unifying themes of our modern culture. It is a language, a science, an art form, and a tool of tremendous power. The Department of Mathematics and Statistics, in its courses for both majors and non-majors, seeks to introduce students to this vast area of knowledge and to show them how mathematics can be used to solve problems.

The Department of Mathematics and Statistics offers the Bachelor of Science degree with a major in mathematics and a concentration in statistics. Students in this program must also select courses in a field to which statistics can be applied. These courses constitute the related field and must be preapproved by a departmental advisor. Examples of related fields are given below. Students completing this program may request that a suitable annotation be placed on their permanent record.

Statisticians give advice on the statistical design of experiments, conduct surveys, and analyze data. They collaborate with specialists in fields such as biology, health sciences, medicine, economics, marketing, psychology, and sociology, as well as in business and industry. They are employed in business, industry, and government.

Students majoring in mathematics should carefully consider the objectives they wish to pursue after graduation. A particular career or educational objective may suggest a special choice for a minor or concentration that would result in better preparation for that objective. It might also suggest that a cooperative experience with a company in that field would be useful; the Office of Cooperative Education can assist students with co-op opportunities. Faculty members who serve as academic advisers for majors can discuss the choices and concentrations that are available to mathematics majors.

As part of the requirements for the Bachelor of Science in mathematics with a concentration in statistics, a student must take the following courses:

1. Math 2211, 2212, 2215, and 2420.
2. Math 3000, 3435, 4435, 4548, 4661, 4662, 4751, 4752, and 4991.
3. CSc 2010 and either CSc 2310 or CSc 2301.
4. One statistics elective from the following list: Math 4544*, Math 4547*, Math 4767, or Math 4830..
5. One additional statistics-related elective from the following list: Math 4211, 4253, 4610, 4620, or the courses not chosen in requirement (4) above.*
6. Four courses in a single related field, which must be preapproved by a departmental adviser and must include at least 3 courses at the 3000/4000-level. Examples of related fields include actuarial science, biology, computer information systems, computer science, decision sciences, economics, and marketing; other related fields that are approved by a departmental advisor are also possible.

* Only one of Math 4544 and Math 4547 can apply to any degree program.

These required courses are placed in Areas A, D, F, G, and H of the curriculum. **(See the back of this flyer for a sample program.)** Majors in this degree program should consult with an academic adviser in the Department of Mathematics and Statistics and with an academic adviser in the Actuarial Science Program to ensure that their course selections are appropriate for the degree program.

(Revised October 2011)

ACADEMIC ADVISEMENT — SEMESTERS
B. S. in Mathematics – Concentration in Statistics

10/05

(Required courses are in bold type; electives must be chosen from lists at right.)

NOTE: A minimum grade of “C” is required in all mathematics and statistics courses and all upper-level courses that are required in this program. Minimum GPA in all courses is 2.00, with at most 12 hours of “D” grades.

AREA	COURSES	CHOICES AND OPTIONS
Undergraduate Core Curriculum (60 hours)		
A: Essential Skills (9 Hours [†])	Engl 1101 (“C” or higher) Engl 1102 (“C” or higher) Math 1113 (or higher Math)	<u>Note:</u> Engl 1103 (plus one additional course from the Humanities Elective list in Area C) can replace Engl 1101 & Engl 1102. E.g., Math 2211, Math 2212, or Math 2215.
B: Institutional Options (4 Hours)	Phil 1010 Speech 1000 or Perspectives	<u>Note:</u> Phil 1010 is recommended, but not required; it can be replaced by Speech 1000, Pers 2001, or Pers 2002.
C: Humanities and Fine Arts (6 Hours)	Humanities Elective Fine Arts Elective	Engl 2110, Engl 2120, Engl 2130, Phil 2010, or Spch 2050 AH 1700, AH 1750, AH 1850, Film 2700, MuA 1500, MuA 1900, MuA 1930, or Thea 2040. <u>Note:</u> A Foreign Language – 1002 or higher – can replace one of the above.)
D: Science, Mathematics, and Technology (11 Hours [†])	Math 2211 (or higher Math) Two-course Laboratory Science sequence	E.g., Math 2212 (if Math 2211 is in Area A). Biol 2107K-2108K, Chem 1211K-1212K, Geol 1121K-1122K, Phys 1111K-1112K, or Phys 2211K-2212K. <u>Note:</u> Phys 2211K-2212K is recommended, but not required.
E: Social Science (12 Hours)	Hist 2110 PolS 1101 Global Economics/Politics and World History Elective Social Science Foundations Elective	<u>Note:</u> Hist 2110 and/or PolS 1101 can be replaced by exams, with additional course(s) chosen from the Social Science Foundations list. Econ 2100, Hist 1111, Hist 1112, PolS 2401. AAS 2010, Anth 1102, CrJu 2200, Econ 2105, Econ 2106, Geog 1101, AAS/Hist 1140, Psys 1101, Soci 1101, Soci 1160, WSt 2010.
F: Courses Appropriate to the Major (18 Hours [†]) [†] See note on rollover hours below.	Math 2212 (or higher Math) Math 2215 and Math 2420 CSc 2010 and CSc 2310 Electives to complete 18 hours (less any “rollover hours” [†])	E.g., Math 2215 (if Math 2212 is in Area D). If not completed in Area D. Acct 2101, Acct 2102, Biol 2107K, Biol 2108K, Chem 1211K, Chem 1212K, Chem 2400, CSc 2010, CSc 2301, CSc 2310, CSc 2311, Econ 2105, Econ 2106, Lang 2001, Lang 2002, Phil 1010, Phys 2211K, Phys 2212K.
Major and Additional Courses (60 hours) — at least 45 hours must be at the 3000/4000-level		
G: Major Courses (33 Hours)	Math 3000 Math 3435 and Math 4435 Math 4548 Math 4751 and Math 4752 Math 4661 and Math 4662 Math 4991 One statistics elective One stat-related elective	Math 4544 [‡] , Math 4547 [‡] , Math 4767, or CSc 4830. Math 4211, Math 4253, Math 4544 [‡] , Math 4547 [‡] , Math 4767, Math 4610, or or CSc 4830.
H: Additional Courses (27 Hours)	Related Field Electives (12 hours) Electives (any courses to complete 120 total hours*)	Must be <u>preapproved</u> by a departmental adviser and must include at least 9 hours at the 3000/4000-level. Some examples of acceptable related fields are actuarial science, biology, computer information systems, computer science, decision sciences, economics, and marketing. (* Except see Academic Residence Requirements below.)
* Academic Residence Requirements: (1) At least 39 of the 45 hours at the 3000/4000-level must be taken at GSU, with an average grade of “C” or better. (2) At least 11 hours of the courses comprising the major (Area G) must be taken at GSU.		
NOTES: [†] (Rollover Hours) If there is an extra hour in Area A and/or Area D, the hour(s) will reduce the 18 hours required in Area F. [‡] Only one of Math 4544 and Math 4547 can apply to any degree program.		

REQUIREMENTS FOR A MINOR IN MATHEMATICS

According to Board of Regents rules and GSU requirements, a minor in mathematics must consist of fifteen (15) hours of courses in mathematics, of which nine (9) hours must be at the 3000-level or above. However, there are several restrictions to these requirements, as indicated below:

- (1) Courses at the 1000- or 2000-level that are in Areas A - E of the Core Curriculum cannot be applied to the minor. Courses in Area F of the Core Curriculum can be applied to the minor.
- (2) Courses at the 3000- or 4000-level that are used as required courses or elective courses in the major cannot be applied to the minor.

The Department of Mathematics and Statistics requirements for a minor in mathematics are Math 2212, Math 2215, and nine (9) hours of additional mathematics courses at the 3000-level or higher, **except for Math 3030, 3050, 3070, and 3090**. The courses chosen must be approved by the Department of Mathematics and Statistics.

Because of the Board of Regents restrictions outlined above, the following restrictions must apply to the Department of Mathematics and Statistics requirements for a minor in mathematics:

- (1) If Math 2212 and Math 2215 are in Area F of the student's Core Curriculum, they can be applied to the mathematics minor. However, if either course is in Area D or in Area A of the student's Core Curriculum, it cannot be applied to the mathematics minor. In this situation, if Math 2420 is a course in Area F, the Department of Mathematics and Statistics will allow it as part of the minor. Otherwise, the student would need more courses at the 3000-level or higher.
- (2) For certain majors, mathematics courses are included in the requirements for the major or can be used as electives in the major; these courses cannot be included in the minor requirements. For example, the requirements for a B.S. in Computer Science include Math 3030 and Csc 4610 (Math 4610). Consequently, these courses cannot be included in the mathematics minor. In addition, Csc 4620 (Math 4620) can be used as an elective course in the major; if it is so used, it cannot be included in the minor. If other Computer Science courses are used as electives, then Csc 4620 (Math 4620) can be included in the minor. Similar situations arise in certain other majors, such as Physics, Astronomy, and Economics,

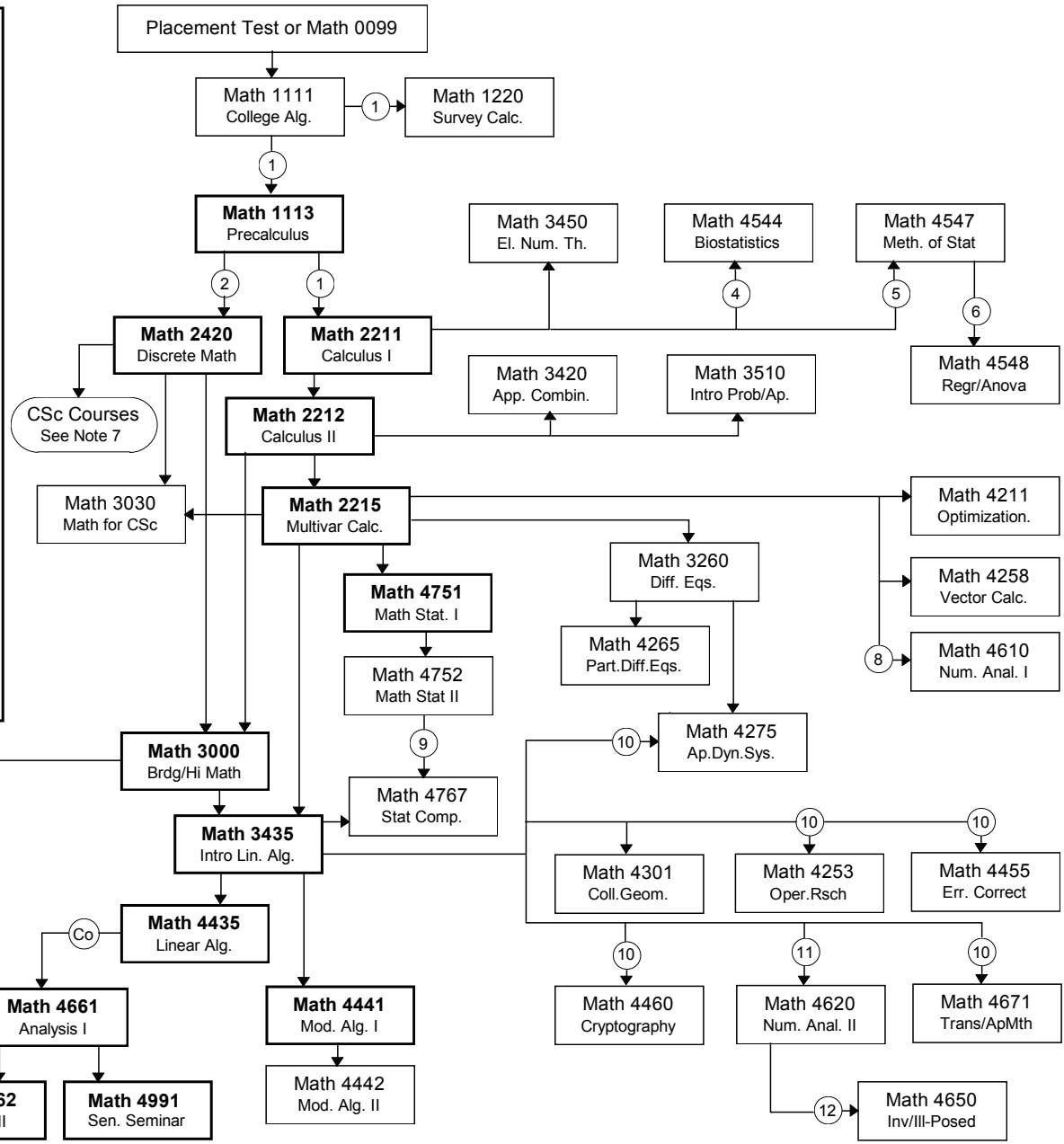
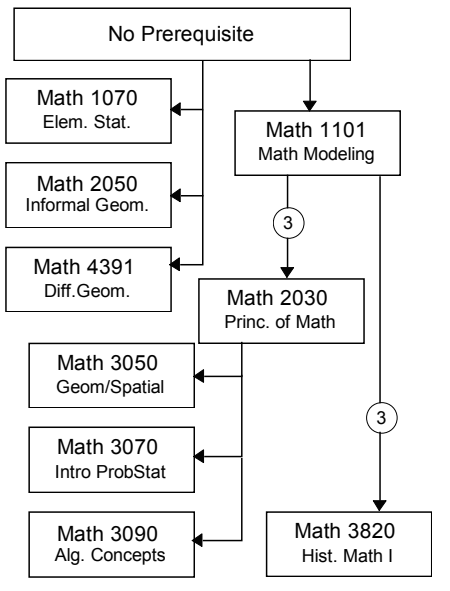
(Revised October 2011)

Department of Mathematics and Statistics — Georgia State University — Course Prerequisites

- A prerequisite (indicated by \longrightarrow) must be passed with a grade of "C" or better before the subsequent course can be taken.
- A corequisite (indicated by $\xrightarrow{\text{CO}}$) must be either passed with a grade of "C" before or can be taken at the same time as the subsequent course.
- If more than one course is indicated as a prerequisite for a course, all must be passed with a grade of "C" or better before the course can be taken
- Any exceptions, alternative courses, or additional restrictions (indicated by $\xrightarrow{\#}$) are explained in the notes on the right side of the page.
- Titles listed are abbreviated. See catalog or departmental website for full titles and descriptions.
- Courses in **boldface** are required in the standard B. S. in Mathematics degree and in many of the concentrations; see catalog or departmental website for details. Besides the required Math 3000 and Math 3435, only one additional 3000-level course can apply to the major courses for the degree, excluding Math 3030 and Math 3070.

Courses with Prerequisites Lower than Math 1111

NOTE: The courses below will **NOT** serve as prerequisites for any other math courses.



NOTES

1. Or Placement Test.
2. Or Placement Test; Math 1220 can replace Math 1113.
3. Or Math 1111, or higher level math course.
4. Or Math 1220; also Biol 1107K, Biol 1108K, or equivalent.
5. Or Math 1220.
6. Math 1220 can replace Math 2211; Math 4752 can replace Math 4547.
7. Math 2420 is a prerequisite for CSc 3410 and for some other upper-level CSc courses.
8. And ability to program in a high-level language.
9. And ability to program in a high-level language; Math 4548 can replace Math 4752.
10. Math 3030 (without Math 3000) can replace Math 3435.
11. And ability to program in a high-level language; Math 3030 (without Math 3000) can replace Math 3435.
12. Math 3030 (without Math 3000) can replace Math 3435; Math 4610 can replace Math 4620.