

## Mathematics and Statistics

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Click the appropriate links for [Mathematics courses](#), [Mathematics Education courses](#), and [Statistics courses](#).

The Department of Mathematics and Statistics offers programs in four areas: mathematics; mathematics secondary education; statistics; and mathematics education for elementary, early childhood, deaf and hard of hearing, and special education. In each of these programs, students are provided with a basic mathematical background which will be utilized in advanced study in one of these areas:

*Mathematics: Liberal Arts*—This program is built on a strong basis of mathematics including analysis and abstract algebra. Each student will develop a program, through advisement, of upper-level mathematics courses according to his or her own interests, which reflect the student's goal: either graduate study or preparation for employment.

*Mathematics: Secondary Education*—In this program, students take mathematics and professional courses which prepare them to meet the educational requirements for the New Jersey certificate to teach mathematics K–12. Students participate in student-teaching experiences in both their junior and senior years.

*Statistics*—This program builds upon mathematical skills acquired in the freshman and sophomore years so that students become equipped with the knowledge necessary to enable them to apply advanced statistical techniques to a wide variety of real-life problems arising in application areas such as business, government, and research. Students are prepared to enter either graduate study or employment as a statistician.

*Mathematics Education—Elementary, Early Childhood, Deaf and Hard of Hearing, and Special Education*—In this program, students take mathematics and professional courses which prepare them to meet the educational requirements for the New Jersey certificate to teach in their respective education field. Students wishing to take the mathematics Praxis test could also be certified to teach mathematics K–12.

## Academic Regulations

*Departmental Grade Prerequisite Requirement*—Majors must earn a minimum grade of C– in a course which is prerequisite to another course in order to register for the subsequent course.

*Graduation Requirements*—A minimum of six course units in the major must be earned in the department. A minimum of four of the final six course units in the major must be earned in the department.

*Course Waiver*—If a student has a strong background in a particular course, then he/she may acquire or receive a course waiver in one of two ways: 1) credit by examination; or 2) waiver of the course through prior equivalent experience. Students given permission to waive a course are required to replace it with an upper-level (300 or 400) major course.

*Calculus Readiness Requirement*—Any student who has not satisfied the College's calculus readiness requirements is not allowed to register for any calculus course offered by the Department of Mathematics and Statistics. The College's calculus readiness requirements are as follows :

### TCNJ Calculus Readiness Course Placement Criteria

<b>SAT-Math score 650 or ACT score 29 or higher</b> and four years of math including Algebra I, Algebra II, Geometry and Trigonometry	Placed into Calculus
<b>SAT-Math score between 600 and 640 or ACT score 27 or 28</b> and four years of math including Algebra I, Algebra II, Geometry and Trigonometry	Allowed to register for Calculus but strongly advised prior to registering for Calculus to take Precalculus, at the college level either at TCNJ (MAT 096) or elsewhere.
<b>SAT-Math score between 550 and 590 or ACT score between 24 and 26</b> and at least two years of math including Algebra and Geometry.	Placed into Precalculus (MAT 096) . Upon completion of MAT 096, a student may take Calculus. ( <i>MAT 096 does not count toward graduation but is considered credit-bearing for financial aid, tuition, and full-time status.</i> )
<b>SAT-Math score below 550 or ACT score below 24</b>	Placed into Intermediate Algebra, MAT 095. ( <i>MAT 095 does not count toward graduation but is considered credit-bearing for financial aid, tuition and full-time status. </i> )

*Note: Precalculus MAT 096 and Intermediate Algebra MAT 095 are offered every semester as well as during the Summer Sessions.*

*Prerequisites*—If a student has not met the exact prerequisites of a course as stated in this Bulletin, but believes that the requirements have been satisfied through equivalent experiences, the student may gain admission to the course with the approval of the department chair.

*Graduate Studies*—Students who plan to continue their math studies in graduate school should take as many of the following courses as is possible: MAT 305/Abstract Algebra, MAT 310/Real Analysis, MAT 315/Topics in Linear Algebra, MAT 320/Complex Analysis, MAT 403/Advanced Calculus, and MAT 405/Topology.

### Program Entrance, Retention, and Exit Standards

Every major program at the College has set standards for allowing students to remain in that program, to transfer within the College from one program to another, and to graduate from a program. The following are the standards for programs in mathematics and statistics. Minimum grades are noted in parentheses:

For students in the mathematics (liberal arts) and secondary education programs or those in the dual major in mathematics and elementary education, early childhood education, special education, or deaf and hard of hearing/elementary education

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- Retention in the program is based on the following performance standards in these “critical content courses”: You must receive a B- or better in either MAT 127 or MAT 128. You must also receive a C or better in either MAT 200 or MAT 205
- Transfer into the program from another program within the College is based upon the following performance standards in these “foundation courses”: A grade of B- or better in MAT 125 or MAT 127 or MAT 128 and a grade of C or better in MAT 200 or MAT 205.
- Graduation requirements: In courses offered by the Departments of Mathematics and Statistics and Computer Science, a grade of C– or better must be earned for the course to satisfy a graduation requirement of the major, with the following exception. You may count two D or D+ grades in 300 or 400 level courses. At most one of these can be earned in a course specifically required for the major. Keep in mind that a course needs a grade of C- or better to be counted as a prerequisite for another course. Students in a mathematics teacher preparation program or who have a dual major in mathematics and elementary, early childhood education, special education, or deaf and hard of hearing/elementary education need a GPA of 2.75 overall.

For students in the mathematics (statistics) program:

- Retention in the program is based on the following performance standards in these “critical content courses”: A grade of B- or better in MAT 125 or MAT 127 or MAT 128 and a grade of C or better in MAT 316 and STA 215.
- Transfer into the program from another program within the College is based upon the following performance standards in these “foundation courses”: A grade of B- or better in MAT 125 or MAT 127 or MAT 128 and a grade of C or better in MAT 316 and STA 215.
- Graduation requirements: In courses offered by the Departments of Mathematics and Statistics and Computer Science, a grade of C– or better must be earned for the course to satisfy a graduation requirement of the major. For 300-or 400-level courses, at most two grades of D or D+ may be counted. Only one of these grades can be earned in required courses; but, a grade of at least C– must be earned in any required course that is a prerequisite for another course that is subsequently taken.

### Study Abroad

One of the opportunities available to students pursuing a degree in Mathematics or Statistics is to study abroad for a semester or a year. Students interested in studying abroad should meet with their faculty advisor early in their college career to plan a curriculum so that they may complete their studies in four years. They will also need to meet with the Director of the [Office of International and Off-Campus Programs](#). The students must receive approval from the chair of the department in order for courses taken abroad to count toward requirements for the major.

### Mathematics Major: Liberal Arts

Requirements for the Major

All Mathematics-Liberal Arts students will be required to take a **minimum of 12** mathematics course units and a 0-course-unit orientation. The 12 course units will consist of the following **seven required** course units:

MAT 099/Orientation to Mathematics and Statistics

0 course units

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MAT 128/Calculus B	1 course unit
MAT 200/Proof Writing through Discrete Mathematics	1 course unit
MAT 205/Linear Algebra: Theory and Applications	1 course unit
MAT 229/Multivariable Calculus	1 course unit
MAT 305/Abstract Algebra	1 course unit
MAT 310/Real Analysis	1 course unit
MAT 320/Complex Analysis	1 course unit

and **five additional** course units. The five additional course units can be any MAT courses at the 300/400 level. Two of these course units must be MAT courses at the 400 level.

In addition, the senior capstone experience requirement is fulfilled by taking MAT 498 (0 course units) in the senior year.

### Additional Required Correlates (two course units)

Any two natural science courses from the list approved by the Department of Mathematics and Statistics, of which at least one is a 200-level course in Physics and the other a course with a lab.

### Mathematics: Liberal Arts Honors

To receive Mathematics-Liberal Arts honors, an Mathematics-Liberal arts student major must complete the following requirements in addition to those required for the Mathematics-Liberal Arts major. They must have a 3.5 GPA in their 300- and 400-level mathematics courses and take either:

- a. An additional 400-level course (which could be an independent study) and a semester of MAT 493/Independent Research II that builds upon a previous 400-level course.
- or*
- b. A full year of MAT 493/ Independent Research II.

Based on their research, students must also write a mathematical paper, read and approved by three members of the department, and give a departmental presentation on it.

### Suggested First-Year Course Sequence: Mathematics: Liberal Arts

#### Fall

FSP First Seminar	1 course unit
MAT 099/Orientation to Mathematics and Statistics	0 course units
MAT 127/Calculus A (if not exempted)*	1 course unit
MAT 200/Proof Writing through Discrete Mathematics	1 course unit
Foreign Language (if not exempted)**	1 course unit

#### Spring

MAT 128/Calculus B	1 course unit
WRI 102/Academic Writing (if not exempted)**	1 course unit
Foreign Language (if not exempted)***	1 course unit
Liberal Learning (arts and humanities or social sciences and history)	1 course unit

*\*It is recommended that students exempted from this course take Calculus B.*

*\*\* It is recommended that students exempted from these courses take other liberal learning courses.*

*\*\*\*It is recommended that students exempted from these courses take other liberal learning courses. Note: Arabic 151 and 152; Chinese 151 and 152; Japanese 151 and 152; Persian 151 and 152; and Russian 151*

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*and 152 are intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.*

### Mathematics: Secondary Education

An overview of the entire secondary-level teacher-preparation sequence can be found in the section of this bulletin for the Department of Educational Administration and Secondary Education.

Students planning to teach high school mathematics should consult with advisors in both mathematics and secondary education in planning their academic program. These plans should take into account requirements for: the major, liberal learning, professional courses, and state certification. To be retained in the program, a student must earn at least a 2.5 cumulative grade point average (CGPA) before enrolling in the junior year education sequence. The student must establish a minimum 2.75 CGPA, and must have completed all required courses in the major in order to be allowed to student teach.

Candidates for a teacher-education certificate must have a 2.75 or higher cumulative grade point average to successfully complete their teacher education program. They also must meet the state hygiene/physiology requirement and pass the appropriate Praxis examination before the New Jersey State Department of Education will issue the appropriate certificate. Teacher-education candidates will receive a “certificate of eligibility with advanced standing” which requires a candidate to be provisionally certified for his or her first year of teaching. After one year of successful teaching, the candidate is eligible for a permanent certificate.

### Requirements for the Major

All Mathematics-Secondary Education students are required to take a **minimum of ten** mathematics/statistics course units, and a 0-course-unit orientation. Ten course units will consist of **eight required** course units and two MAT/STA options:

MAT 099/Orientation to Mathematics and Statistics	0 course units
MAT 200/Proof Writing through Discrete Mathematics	1 course unit
MAT 205/Linear Algebra: Theory and Applications	1 course unit
MAT 229/Multivariable Calculus	1 course unit
MAT 255/Perspectives on the Development of Mathematics	1 course unit
MAT 301/Number Theory	1 course unit
MAT 305/Abstract Algebra	1 course unit
MAT 316/Probability	1 course unit
MAT 351/Geometry	1 course unit

and two MAT/STA options which can be any MAT/STA course at the 300/400 level	2 course units
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### Content Methods and Professional Sequence Courses:

SED 224/Adolescent Learning and Development	1 course unit
EFN 299/School and Communities	1 course unit
SED 399/Pedagogy in Secondary Schools	1 course unit
SPE 323/Secondary Content Literacy in Inclusive Classrooms	1 course unit
EFN 398/Historical and Political Context of Schools	1 course unit
MTT 380/Methods of Teaching Mathematics I	1 course unit
MTT 390/Methods of Teaching Mathematics II	1 course unit
MTT 490/Student Teaching	2 course units
SED 498/Collaborative Capstone for Professional Inquiry	1 course unit

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### Additional Required Correlates:

CSC 220/Computer Science I	1 course unit
Science BIO 185, CHE 201, or PHY 201	1 course unit
STA 215/Statistical Inference	1 course unit

### Quantitative Reasoning Requirements:

MAT 127/Calculus A	1 course unit
MAT 128/Calculus B	1 course unit

### Suggested First-Year Course Sequence: Mathematics: Secondary Education

#### Fall

FSP First Seminar (Arts and Humanities or Social Change in Historical Perspective)	1 course unit
MAT 099/Orientation to Mathematics and Statistics	0 course unit
MAT 127/Calculus A*	1 course unit
MAT 200/Proof Writing through Discrete Mathematics	1 course unit
Liberal Learning (Arts and Humanities or Social Change in Historical Perspective)	1 course unit

#### Spring

MAT 128/Calculus B	1 course unit
WRI 102/Academic Writing (if not exempted)**	1 course unit
STA 215/Statistical Inference	1 course unit
Science BIO 185, CHE 201, or PHY 201	1 course unit

*\*It is recommended that students exempted from this course take Calculus B*

*\*\*It is recommended that students exempted from this course take another liberal learning course or a foreign language. Note: Arabic 151 and 152; Chinese 151 and 152; Japanese 151 and 152; Persian 151 and 152; and Russian 151 and 152 are intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.*

### Mathematics Major: Teacher Preparation for Elementary, Early Childhood, Deaf and Hard of Hearing, and Special Education majors

Students should consult with advisors in both mathematics and in the School of Education in planning their academic program. These plans should take into account requirements for: the majors, liberal learning, professional courses, and state certification. To be retained in the program, a student must earn at least a 2.5 cumulative grade point average (CGPA) before enrolling in the junior year education sequence. The student must establish a minimum 2.75 CGPA, and must have completed all education prerequisites in order to be allowed to student teach.

Candidates for a teacher-education certificate must have a 2.75 cumulative grade point average to successfully complete their teacher education program. They also must meet the state hygiene/physiology requirement, and pass the required Praxis assessment tests before the New Jersey State Department of Education will issue the appropriate certificate. Teacher-education candidates will receive a “certificate of eligibility with advanced standing” which requires a candidate to be provisionally certified for his or her first year of teaching. After one year of successful teaching, the candidate is eligible for a permanent certificate.

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### Requirements for the Major

All Mathematics/Elementary Early Childhood, Deaf and Hard of Hearing, and Special Education students will be required to take a **minimum of ten** mathematics/statistics course units, and a 0 course unit orientation. Ten course units will consist of **nine required** course units, and a MAT/STA option:

MAT	099/Orientation to Mathematics and Statistics	0 course units
MAT	200/Proof Writing through Discrete Mathematics	1 course unit
MAT	205/Linear Algebra: Theory and Applications	1 course unit
MAT	229/Multivariable Calculus	1 course unit
MAT	255/Perspectives on the Development of Mathematics	1 course unit
MAT	301/Number Theory	1 course unit
MAT	305/Abstract Algebra	1 course unit
MAT	316/Probability	1 course unit
MAT	351/Geometry	1 course unit
STA	215/Statistical Inference	1 course unit
and one MAT/STA option which can be any MAT/STA course at the 300/400 level		1 course unit

### Additional Required Correlate:

CSC	220/Computer Science I	1 course unit
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### Quantitative Reasoning Requirements:

MAT	127/Calculus A	1 course unit
MAT	128/Calculus B	1 course unit

### Suggested First-Year Mathematics Course Sequence (Teacher Preparation for Elementary, Early Childhood, Deaf and Hard of Hearing, and Special Education majors)\*

#### Fall

MAT	127/Calculus A	1 course unit
MAT	200/Proof Writing through Discrete Mathematics	1 course unit

#### Spring

MAT	128/Calculus B	1 course unit
STA	215/Statistical Inference	1 course unit

*\*Consult individual major in the School of Education for remaining courses.*

### Elementary Education and M/S/T, Early Childhood Education and M/S/T, and Deaf and Hard of Hearing and M/S/T, with a Mathematics Specialization

The M/S/T interdisciplinary major integrates formal study in mathematics, science, and technology to gain a better understanding of the human-designed world in which we all live. The major consists of eight units of courses drawn from a common “core”, two approved M/S/T elective, and a four-unit “specialization” in one of the M/S/T disciplines. Students in the major receive careful course selection advisement so that they qualify for a middle school endorsement in one of the M/S/T disciplines. **All majors must see the M/S/T academic program coordinator for general advisement.**

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The M/S/T core consists of MAT 127/128 Calculus A/B, three approved science course, ETE 261/Multimedia Design, ETE 271/Structures and Mechanics, TED 460/Integrated M/S/T for the Child/Adolescent Learner, and two M/S/T electives by advisement. The Mathematics Specialization consists of any four MAT courses numbered above the required courses of MAT127-128 (*MAT 200 is a specialization requirement and should be taken before MTT 202*).

### Suggested First-Year Course Sequence: Mathematics: Statistics

Requirements for the Major

Statistics graduates need to have a strong underpinning in mathematics in addition to acquiring all the necessary statistical knowledge and skills. The **12-course** unit sequence consists of the following:

Required Courses: **Seven required** course units and a 0-course-unit orientation:

MAT	099/Orientation to Mathematics and Statistics	0 course units
MAT	200/Proof Writing through Discrete Mathematics	1 course unit
MAT	205/Linear Algebra: Theory and Applications	1 course unit
MAT	229/Multivariable Calculus	1 course unit
MAT	316/Probability	1 course unit
STA	215/Statistical Inference	1 course unit
STA	305/Regression	1 course unit
STA	410/Mathematical Statistics	1 course unit

**Three options** from the following:

STA	303/Design of Experiments
STA	304/Sampling and Non-Parametric Statistics
STA	306/Applied Multivariate Analysis
STA	307/Data Mining and Predictive Modeling
STA	314/Statistical Quality Control

**Two** MAT/STA Options

The senior capstone experience requirement is fulfilled by taking STA 498 (0 course units) in the senior year.

### Additional Required Correlates

CSC	220/Computer Science I	1 course unit
Any natural science course from the list approved by the Mathematics and Statistics department with a lab component		1 course units

### Mathematic-Statistics Honors

To receive Mathematics-Statistics Honors, a Mathematics-Statistics student major must complete the following requirements in addition to those required for the Mathematics-Statistics program:

They must have a 3.5 GPA in their 300-level and 400-level statistics and mathematics courses, and take a semester of STA 493/Independent Research II. Based on this research, students must also write a statistical paper, have it read and approved by members of the Statistics Committee, and give a presentation.

### Suggested First-Year Course Sequence (Mathematics-Statistics)

#### Fall

FSP	First Seminar	1 course unit
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MAT 099/Orientation to Mathematics and Statistics	0 course units
MAT 127/Calculus A	1 course unit
MAT 200/Proof Writing through Discrete Mathematics	1 course unit
Foreign Language (if not exempted)*	1 course unit

*\*Note: Arabic 151 and 152; Chinese 151 and 152; Japanese 151 and 152; Persian 151 and 152; and Russian 151 and 152 are intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.*

### Spring

MAT 128/Calculus B	1 course unit
STA 215/Statistical Inference	1 course unit
WRI 102/Academic Writing (if not exempted)*	1 course unit
Foreign Language (if not exempted)**	1 course unit

*\*It is recommended that students exempted from these courses take other liberal learning (arts and humanities or social sciences and history) courses.*

*\*\*Note: Arabic 151 and 152; Chinese 151 and 152; Japanese 151 and 152; Persian 151 and 152; and Russian 151 and 152 are intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.*

Students interested in completing both Mathematics-Liberal Arts and Mathematics-Statistics programs in four years should consult the department for details.

## Mathematics and Statistics Minors

Students planning to minor should apply to the department as soon as possible. The minor requirements will be defined by the Bulletin description at the time of application. Students must maintain the same mathematics and statistics cumulative average as required for graduation in the major.

A minimum of three course units for the statistics minor and four course units for the mathematics minor must be earned at The College of New Jersey. Only one course taken as a part of the student's major may also be counted toward the student's minor; however, correlate courses for the major may be applied freely to the minor. Multiple minors may overlap by only one course.

### Mathematics Minor

For a mathematics minor, a student must complete (and earn at least a C- in ) five MAT courses numbered 128 or above (except MAT 170, MAT 255, MAT 270), and at least two of these at the 300/400 level.

### Statistics Minor

Required Courses: Two course units

STA 215/Statistics or Statistical Inference
STA 305/Regression Analysis

Three Options:

STA 303/Design of Experiments
STA 304/Sampling and Non-Parametric Statistics
STA 306/Applied Multivariate Analysis
STA 307/Data Mining and Predictive Modeling
STA 314/Statistical Quality Control
MAT 316/Probability
STA 317/Linear Programming

## **Mathematics and Statistics-10**

STA 318/Operations Research  
STA 410/Mathematical Statistics  
STA 492/Internship II in Statistics  
STA 494/Seminar in Statistics

**Total** **Five course units**

## **Actuarial Studies Minor**

Prerequisites: MAT 125 or 127, MAT 128, STA 215 and MAT 229

### Courses for the Minor

Students take five courses (depending on their major—see below) from the following two groups:

- Group A: STA 305/Regression Analysis  
MAT 316/Probability  
STA 318/Operations Research  
STA 410/Mathematical Statistics
- Group B: ECO 102/Principles of Macroeconomics  
FIN 201/Fundamental Financial Methods *and* MKT 201/Marketing  
Principles. Both of these are half-courses.  
FIN 310/Investments  
FIN 410/Portfolio Management and Derivative Securities

### For Students Majoring in Statistics:

Students will select one course from Group A from those required in the statistics program, which are STA 305, MAT 316 and STA 410, and double-count this course toward the minor. They will then take four courses from the remaining five from Groups A and B.

### For Students Majoring in Business:

Students will be advised to take the sequence MAT 125, MAT 128 and MAT 229 to enable them to meet the prerequisites above. They will then choose one course from Group B (which will be the double-counted course), and four courses from Group A. In so doing, students will be studying STA 305 instead of ECO 231/Applied Business Statistics.

### For Students Majoring in Mathematics:

Students may choose five courses from Groups A and B, but it is recommended that MAT 316 and STA 410 are among those selected.

### For Students in Other Majors:

Selections from Groups A and B as advised by the Department of Mathematics and Statistics advisor.

Students who achieve grades of B– or better on ECO 101 and ECO 102 will receive VEE-Economics credit from the Society of Actuaries. Similarly, a grade of B– or better on STA 305 will receive VEE-Applied Statistics credit.

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### Quantitative Criminology Minor

Prerequisites: MAT 125 or MAT 127, STA 215, and one semester of Criminology (CRI 205). Students completing the minor will not be required to complete CRI 100 as the prerequisite for CRI 205. *[Note: Beginning in academic year 2009-2010, courses in Criminology carry the prefix CRI, prior to that, the course prefix was LWJ. Students normally may not take a course twice, once with a LWJ prefix and again with a CRI prefix.]*

#### Courses for the Minor

Students take five courses (depending on their major—see below) from the following two groups:

##### Group A:

STA 303/Design of Experiments  
STA 305/Regression Analysis  
STA 306/Applied Multivariate Analysis  
STA 307/Data Mining and Predictive Modeling  
STA 318/Operations Research

##### Group B:

CRI 306/Research Methods  
CRI 350/Advanced Criminology: Juvenile Delinquency and Justice  
CRI 351/Advanced Criminology: Comparative Criminology  
CRI 352/Advanced Criminology: Race and Crime  
CRI 498/Senior Capstone in Policy Analysis

#### For Students Majoring in Statistics

Students will be able to double-count STA 305 since this is required in the Statistics major. They will then take four courses from the five in Group B.

#### For Students Majoring in Criminology

Students will be required to take the sequence MAT 125 and STA 215 to enable them to meet the prerequisites above. Students will be able to double-count one of the Advanced Criminology courses from Group B (i.e., 350, 351, or 352). Students will then take 4 courses from Group A.

#### For Students Majoring in Mathematics

Students must choose at least two courses from both Groups A and B, and five courses in total.

#### For Students in Other Majors

Selections from Groups A and B as advised by the Department of Criminology and by the Department of Mathematics and Statistics.