



Dana Center
Mathematics
PATHWAYS



The University of Texas at Austin
Charles A. Dana Center

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Mathematics for criminal justice:

Recommendations from professional organizations and sample requirements from institutions of higher education

The state of criminal justice education and careers in the United States

The criminal justice major and related majors are increasingly popular among college students. These programs and degrees are listed under a variety of different names and have a range of foci, from the academic study of deviance and crime to preparation for police officers. Broadly considered, the programs are experiencing rising enrollment and an increasing number of credentials conferred. In the 2012-13 academic year, the “homeland security, law enforcement, and firefighting” category ranked among the top ten degrees, with more than 60,000 bachelor’s degrees awarded (Sloan & Buchwalter, 2017).

We provide these briefs to inform institutional discussions about the modernization of mathematics course requirements.

Each brief examines what constitutes relevant math for various majors (thus far, nursing, communications, criminal justice, social work, elementary teacher education, and business) by examining professional organization recommendations and institutional requirements.



The number of bachelor's degrees earned in criminology has also risen. Concurrently, demand for postsecondary faculty for criminal justice and law enforcement programs is increasing, with the number of new positions growing faster than average (U.S. Bureau of Labor Statistics, 2016).

Researchers believe that the strong attraction to college-level criminal justice programs is likely driven by two factors: the appeal created by enormously popular crime-oriented television shows, and the abundant and diverse employment opportunities in the field, many of which are well-paying (Sloan & Buchwalter, 2017). Degrees in criminology or criminal justice can lead to many occupations and job titles in different industries, the most well-known of which are police officers, detectives, and probation officers. There are also many positions for individuals with criminal justice degrees in homeland security (an umbrella term referring to national safety efforts) and in the private security industry. All of these occupations are projected to grow at least as quickly as the average growth rate for all occupations (6-7 percent) in the next several years (U.S. Bureau of Labor Statistics, 2018a, 2018b).

It is likely that the high number of reported degrees is actually an underestimate of student interest in the broader field of crime-related studies. Criminology is often embedded as an optional concentration in another major, such as sociology. Degrees are also conferred each year in the related field of forensics—a broad term that denotes the application of science to criminal investigations—that includes forensic psychology, forensic chemistry, and other subdisciplines. Some of these degrees fall within the social sciences, while others do not.

Thus, there are a variety of programs and degrees related to criminal justice, and they each have different course requirements. Even when examining one specific major, researchers have found curricular variation. A recent study of criminal justice bachelor's degree programs at 670 colleges found significant differences across the curricula, including required credits and courses for the degree, and how those courses were distributed among requirements and electives (Sloan & Buchwalter, 2018). Math was one area of inconsistency.

Considering the increasing consensus that higher education institutions should offer multiple mathematics pathways and align math requirements with specific programs of study (Getz & Ortiz, 2016), this brief explores the recommended math courses and content for criminal justice and other related majors. (The brief will not address math for forensics, as the degree requirements in mathematics and science are very different depending on the particular forensics subdiscipline.)

Recommendations from professional organizations of criminal justice and mathematics

As far back as 1984, the Joint Commission on Criminology and Criminal Justice Education and Standards, which represents the American Society of Criminology and the Academy of Criminal Justice Sciences, recommended that degree programs require research methods and statistics (Ward & Webb, 1984 as cited in Bushway & Flower, 2002).

More recently, the Academy of Criminal Justice Sciences (ACJS), an international professional association that promotes criminal justice education, research, and policy analysis, issued standards for criminal justice programs at both the associate and bachelor's degree levels. First adopted in 2005 and amended in 2018, the standards provide guidance for the accreditation process for criminal justice and criminology programs. The ACJS identifies required content areas in the criminal justice and criminology curriculum for all associate and bachelor's degree programs. Research and analytic methods, for example, should include “[q]uantitative—including statistics—and qualitative, methods for conducting and analyzing criminal justice/criminology research in a manner appropriate for undergraduate students” (ACJS, 2018).

The American Sociology Association, in its 2010 *Report of the ASA Task Force on Sociology and Criminology Programs*, also supports statistics as a requirement for criminal justice students:

When a criminal justice program is housed with sociology, all criminal justice students, whether sociology majors with a concentration, track, or minor in criminal justice or criminal justice majors, should follow the spine model and be required to take the core courses for a sociology major—introductory, theory, methods and statistics, and a capstone. (p. 37)

The report also notes that stand-alone criminal justice programs (those not housed in sociology) often require students to take the sociology department's statics courses.

These recommendations are supported and validated by statements published by two national math associations: the Mathematical Association of America (MAA) and the American Mathematical Association of Two-Year Colleges (AMATYC). Both associations have issued position statements on the math content most needed by students in social sciences fields.

Recommendations from an MAA convening of faculty from sociology, criminology/criminal justice, political science, and psychology include the following:

... mathematics faculty can better prepare social science students by emphasizing conceptual understanding, proportional reasoning, standard equations (e.g., equation of a line), and basic arithmetical skills. . . . Social scientists also agree on the importance of introducing students to some basic statistical methods including measures of central tendency, variables, co-variation and standard deviation. Developing an understanding of graphical representation and interpretation, including use and manipulation of spreadsheets, also should be emphasized to enhance quantitative literacy in social science students. (Johnson & Grant, 2011, p. 33)



The AMATYC *Statement on Mathematics for Students in Two-Year Terminal Programs* (n.d.) asserts that:

Content should emphasize occupational mathematics skills directly related to the knowledge base needed for students entering the workforce. Traditional intermediate and college algebra courses generally do not meet this goal as they are designed to be prerequisites for the calculus sequence.

Indeed, another report by AMATYC (2018) finds that the number of undergraduate enrollments in statistics has risen dramatically. In two-year colleges in particular, this increase is likely related to the institutions' re-examination of math requirements and their alignment with students' programs of study.

Finally, the MAA also contends that undergraduate mathematics curricula should contribute to preparing students for the workforce:

Departments must engage partners from inside and outside academia in STEM and non-STEM fields to ensure that the applications taught are realistic and that the skills students take from courses are valued by stakeholders. Our community must prepare graduates who are career-ready and focus intentionally on workplace skills early in their programs. . . . Data skills, in particular, are increasingly attractive to employers. (Saxe & Braddy, 2015, p. 20)

Current state of mathematics course requirements for criminal justice

Professional organizations make it clear that statistics, including general research and data skills, is the most appropriate mathematics content area for students in criminal justice programs. However, statistics is not yet a universally, nor even a commonly, required course for criminal justice majors. A study of 670 U.S. colleges and universities that offer a bachelor's degree in criminal justice found that only 40 percent required statistics (Sloan & Buchwalter, 2018). While the study did not note which other math courses, if any, were required instead of statistics, it did emphasize extreme curricular variability across the programs as well as among the categories of institutions—public, private non-profit, and private for-profit—offering these programs.

Even programs certified by the Academy of Criminal Justice Sciences, which clearly states the inclusion of statistics in its certification standards, demonstrate variation in mathematics requirements. Table 1 provides examples of certified programs that require statistics but also show a range in the number of courses and credits needed for the degree. For example, the University of Scranton's program requires one combined, three-credit research methods and statistics course, while the University of Tampa requires a four-credit research course as a pre-requisite to the four-credit statistics course. Variation can even be found within a single institution's requirements. For example, the City University of New York's John Jay College of Criminal Justice has different mathematics requirements between its Bachelor of Arts and Bachelor of Sciences Criminal Justice degrees.

It is noteworthy that some statistics courses in Table 1 have other mathematics courses as pre-requisites. Those courses are often algebra-intensive rather than statistics-focused, although in some cases, the pre-requisite is open to student choice from a variety of gateway college math courses. Again, universally including algebra-based pre-requisites is contrary to the MAA and AMATYC recommendations summarized above. Departments of criminal justice should revisit their mathematics course requirements, focusing special attention to pre-requisites and whether they are appropriate for the major.



Table 1. Examples of Mathematics Courses Required for Criminal Justice Bachelor’s Degree Programs

Name of Degree Program	Institution	Required Course(s)
B.S. in Criminal Justice*	University of Scranton	<p>S/CJ 211 - Research Methods and Statistics for the Social Sciences (3 credits)</p> <p>An introduction to the techniques social scientists use to formulate, gather and analyze information. Focus is on research design starting with topic formation and ending with basic descriptive and inferential data entry and analysis. Specific research design formats will include program evaluation, survey, secondary data sources, and experimental designs.</p>
B.S. in Criminal Justice*	North Carolina Central University	<p>MATH 1110 - Elementary Statistics (3 credits)</p> <p>An introductory statistics course designed to give students a better understanding of statistical concepts and their numerous applications as well as their limitation. Analysis will stress graphical methods of exploratory data analysis and the use of technology such as Microsoft Excel to compute means, variances, correlation coefficients, and regression lines. An introduction to statistical inference for means will also be included.</p> <p>This course requires completion of or placement out of an introductory College Algebra course.</p> <p>CRJU 4060 - Statistical Methods in Criminal Justice (3 credits)</p> <p>A statistics course that develops an understanding of statistical methods and procedures with an emphasis on criminal justice research and data analysis. A variety of statistical techniques will be discussed as well as their application in social science research.</p> <p>CRJU 4061 - Statistical Methods in Criminal Justice Laboratory (1 credit)</p> <p>Must take with corresponding CRJU 4060 course. Computer laboratory designed to enhance classroom instruction through interpreting, comprehending and using data from an applied perspective.</p>

* Program certified by the Academy of Criminal Justice Sciences



Name of Degree Program	Institution	Required Course(s)
<p>B.A. in Criminal Justice* (Specializations in Administration of Justice, Criminology and Criminal Justice Theory, Forensic Psychology, and Forensic Science)</p>	<p>Seattle University</p>	<p>CRJS 3010 - Criminal Justice Research Methods (5 credits)</p> <p>Overview of social science research methods, applied statistical techniques, and statistical software used in criminology and criminal justice. The course is divided into two components: (1) Research design and the research process and (2) Introduction to computer data analysis using SPSS. Focus on the research process including design, literature review, data collection, sampling, data analysis, and presentation. Required for all criminal justice majors.</p> <p>CRJS 3020 - Criminal Justice Statistics (5 credits)</p> <p>Survey of statistical methods used in the criminal justice field. Focus on the scientific method, hypothesis testing, descriptive and inferential statistics. Topics include measures of central tendency, probability theory, confidence intervals, frequency distributions, correlation and regression, sampling procedures and distributions, hypothesis testing, contingency tables, measures of association, and chi square, t-tests, analysis of variance, and interpreting research results. Students will develop a tool box to critically examine the value, validity, and appropriate use and interpretation of statistics in criminal justice. Required for all criminal justice majors.</p> <p>The pre-requisite for this course is completion of UCOR 1200, which is not a course, but rather a core curriculum category that can be met by one of several math courses, including College Algebra for Business, Precalculus: Algebra, Elements of Calculus for Business, Calculus for Life Sciences, Calculus 1, Calculus 2, and Statistics for Life Sciences.</p>

* Program certified by the Academy of Criminal Justice Sciences



Name of Degree Program	Institution	Required Course(s)
B.S. in Criminology and Criminal Justice*	University of Tampa	<p>CRM 240 Research Methods (4 credits) An introduction to the quantitative and qualitative methodologies of the social sciences, including overviews of philosophy of science and research ethics, research design issues such as sampling and measurement, and methods of data collection (i.e., survey, experimental and evaluation research). Additionally, students will gain experience in reviewing scholarly literature, designing a research project in criminal justice/criminology, and writing for an academic audience utilizing the APA format. Through those goals, students will become both consumers and producers of research.</p> <p>CRM 245 Statistics in Criminology and Criminal Justice (4 credits) This course serves as an introduction to descriptive and inferential statistics and the computer analysis of criminology and criminal justice data. Course content includes basic procedures of hypothesis testing, correlation and regression analysis and the analysis of continuous and binary dependent variables. Emphasis is placed on the examination of research problems and issues in the field of criminology and criminal justice. This is primarily a lecture course, with some in-class and out of class lab work.</p> <p>MAT 155 Finite Mathematics for Liberal Arts or MAT 160 College Algebra (4 credits) required within the first two years of enrollment as part of the “Baccalaureate Experience” (gen ed) curriculum.</p>

* Program certified by the Academy of Criminal Justice Sciences

Name of Degree Program	Institution	Required Course(s)
B.A. in Criminal Justice	John Jay College of Criminal Justice	<p>CJBA 240, 241 Quantitative Inquiry of Problems in Criminal Justice (2 semesters, 6 credits)</p> <p>This course provides a foundation to quantitative inquiry and problem solving in criminal justice. Specific attention is paid to analyzing administrative and observational data about crime, punishment, and justice. The basics of statistical analysis, data production, data manipulation, procedures for displaying data for quantitative inquiry, problem solving, and analysis are covered. The course will include the use of software applications for data manipulation.</p> <p>This course has a pre-requisite of MAT 108 Social Science Math (or higher-level math, e.g., MAT 141 Pre-Cal) required for the Math and Quantitative Reasoning area of the Gen Ed Program's Required Core.</p>
B.S. in Criminal Justice	John Jay College of Criminal Justice	<p>CJBS 250 Research Methods and Statistics for Criminal Justice (3 credits)</p> <p>This course will present the research process, types of studies, appropriate descriptive statistical techniques and guidelines for formulating research questions and testable hypotheses. It will also review how to decide on an appropriate population for study, how variables are constructed, and how data are collected and organized, and discuss sampling methods and sample size. A variety of research methods will be covered, including experimental, quasi-experimental and survey methods, as well as other forms of data collection and the use of existing databases. Students will also be exposed to qualitative methodologies including ethnography, observation, content-analysis, and interviewing techniques.</p> <p>This course has a pre-requisite of MAT 108 Social Science Math (or higher-level math) or STA 250 Principles and Methods of Statistics; MAT 108 is a pre-requisite for STA 250.</p>

Sources: John Jay College of Criminal Justice *2018-2019 Undergraduate Bulletin*; North Carolina Central University *College Undergraduate Catalog 2017-2018*; Seattle University *2018-2019 Undergraduate Catalog*; University of Tampa *Catalog 2018-2019*; The University of Scranton *Undergraduate Catalog 2018-2019*.

Conclusion

Institutions of higher education is increasingly differentiating mathematics requirements by field of study. Professional associations for criminal justice and for mathematics agree that statistics is the appropriate math course for criminal justice and criminology degrees. Given the popularity of criminal justice-related programs and degrees, as well as the diversity of careers and opportunities for advancement open to those who earn these degrees, it is critical that the curriculum be aligned to the skills needed by the graduates. However, research shows that significant variation in required mathematics coursework still exists among these programs and that algebra-focused pre-requisites remain common.

This summary of current trends and the recommendations by professional associations provides important information for criminal justice degree programs to review and work to ensure that their mathematics requirements best serve the needs of their students.



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