[ARCHIVED CATALOG]

Analytics, Minor

Analytics requirements

The minor in Analytics provides students with an introduction to data-intensive decision making using modern statistical techniques and technological tools that are common across a broad set of disciplines including business, technology, mathematics and the sciences.

Students pursuing a minor in Analytics are required to:

- Complete 24 credits.
- Maintain at least a 2.000 overall grade point average in the minor.
- Complete all courses in the minor for a letter grade.
- Complete a minimum of 12 credits for the minor at Chapman University.
- 12 credits (4 courses) must be taken outside the major program of study.
- Complete a minimum of 15 credits of upper-division credit.

lower-division requirements (9 credits)

MGSC 220 - Foundations of Business Analytics

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Prerequisite, MGSC 209 or MATH 203 or PSY 203, with a minimum grade of C-. This course focuses on building models and describing data in spreadsheets to solve business problems. Topics in descriptive, predictive and prescriptive analytics are covered including data visualization, multiple regression, simulation and linear optimization. Emphasis is placed on theory, application of theory using appropriate software and on managerial interpretation of results. Letter grade. (Offered every semester.) **3 credits**

CPSC 230 - Computer Science I

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Prerequisite, MATH 100. Students are introduced to problem-solving methods and algorithm development through an interactive and easy-to-learn programming language, Python. Letter grade with Pass/No Pass option. (Offered every semester.) **3 credits**

one of the following

MATH 203 - Introduction to Statistics | *

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Prerequisite, MATH 100 or equivalent. This course provides a progressive, detailed, and practical introduction to essential topics in classical statistics. The main concepts covered in this class include the following: design of experiments and sampling, descriptive statistics methods, correlation and regression analysis, probability and probability distribution, sampling distributions, and inferential statistics methods. This course is intended for students in a wide variety of areas of study so a variety of examples from different fields are used to illustrate the concepts. The course is taught in an interactive setting where students will learn how to use statistical software while learning introductory statistics concepts. Some sections of this course may be offered as hybrid courses or online only. Letter grade with Pass/No Pass option. (Offered every semester.) **3 credits**

PSY 203 - Statistics for Behavioral Sciences

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Prerequisites, MATH 100, MATH 100L , PSY 101, or equivalents. The course covers descriptive and inferential statistics, the rationale of hypothesis testing, a survey of the common parametric and nonparametric statistical tests, and the calculation and interpretation of statistical indices and applications. Letter grade with Pass/No Pass option. (Offered every semester.) **3 credits**

MGSC 209 - Introductory Business Statistics

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Prerequisite, MATH 109, or MATH 110, with a minimum grade of C-. Emphasis on the use of statistics as an aid in reaching business decisions. Central tendency and dispersion, probability theory; discrete and normal distributions, sampling theory, sampling distributions, and statistical inference in business-related problems. Testing hypotheses in large and small samples. Correlation and regression analyses. Letter grade. (Offered every semester.) **3 credits**

upper-division requirements (9 credits)

MGSC 310 - Statistical Models in Business Analytics **

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Prerequisite, MGSC 220 with a minimum grade of C-. A rigorous introduction to descriptive and inferential statistics in analytics with applications in accounting, finance, marketing and operations. The course focuses on data mining: logistic regression, nearest neighbor, decision trees, naïve Bayes and others, following a review of basic introductory statistical methods. The course introduces theories and concepts in estimation including choice of technique, model choice and false discovery. Students are required to implement and interpret modeling scripts in using R statistical software. Letter grade. (Offered every year.) **3 credits**

CPSC 392 - Introduction to Data Science

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Prerequisites, CPSC 230, and MATH 203 or MATH 303 or MGSC 209. This course provides a survey of algorithms, tools, and techniques for computing with Big Data. Students will be exposed to fundamental concepts in data mining, machine learning, and information retrieval systems, with special emphasis on statistical techniques for data visualization and analysis. Recent advances in high performance computing, such as map-reduce, will be presented in the context of Big Data. Students will apply data mining algorithms to data sets from biology, chemistry, social media, and industry. Letter grade with Pass/No Pass option. (Offered every semester.) **3 credits**

MGSC 410 - Applied Business Analytics

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Prerequisites, MGSC 310, CPSC 392, with a minimum grade of C- in each prerequisite. This course provides a hands-on opportunity for students to integrate and apply the analytics skills and knowledge learned throughout the course to real world data. The course will reinforce the methods and techniques typically used in analytics including data preparation, building and evaluating wide variety of models and interpreting and presenting the results. Students work in teams on a large scale analytics project. At the end of the course, students submit a report summarizing their analyses and study outcomes, and present their results to the class. Letter grade. (Offered every year.) **3 credits**

upper-division electives (6 credits)

BIOL 302 - Introduction to Bioinformatics

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Prerequisites, BIOL 208 and either CPSC 230 or CPSC 292. Students will learn how to use computer programming techniques to solve problems in biology. Students will learn the structure and capabilities of the Biopython library and will learn how to use it to automate searches of biological databases and to manipulate nucleotide and

protein sequences. Data representation techniques and algorithms for sequence alignment, phylogenetic prediction, learning protein structure, and protein classification/clustering will be explored. Letter grade. (Offered spring semester, alternate years.) **3 credits**

MATH 303 - Biostatistics

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Prerequisite, MATH 101 or equivalent, MATH 109 with a grade C or above. This course will provide a comprehensive introduction to various statistical methods, emphasizing applications in biology, medicine, and public health. Main concepts such as descriptive statistics, estimation of statistical parameters, statistical tests of significance, analysis of variance, and regression analysis will be studied. Examples and real-life data sets will be provided to clarify the concepts and underline connections with related topics and current research. Computations will be done using the statistical software, R. Letter grade. (Offered every semester.) **3 credits**

CPSC 308 - Enterprise Data Management

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Prerequisite, CPSC 230, or CPSC 236. CPSC 308 is an introductory course on data management, with emphasis on database systems for organizations. Students will learn the fundamentals of data storage and retrieval, gaining hands-on experience with the Structured Query Language (SQL) and a contemporary relational database management system. Students will also be exposed to advances in NoSQL technologies, which provide alternative storage mechanisms for noisy and unstructured data. Students majoring in Computer Science, Software Engineering, or Computer Information Systems may not use CPSC 308 to fulfill major requirements. (Offered spring semester.) **3 credits**

CPSC 350 - Data Structures and Algorithms

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Prerequisite, CPSC 231 or CENG 231. Students study core data structures and algorithms, such as arrays, stacks, lists, queues, trees, hash tables, graphs; search and sort. Students engage on projects that involve individually chosen advanced data structures and algorithms. The focus is on applications of data structures and algorithms, utilization of existing practical data sets, and performance trade-offs. Letter grade. (Offered every semester.) **3 credits**

MATH 360 - Probability Theory

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Prerequisite, MATH 116 or MATH 210. This course introduces the fundamental concepts of probability theory. Topics include counting techniques, probability, conditional probability, Bayes theorem, multivariate distributions, discrete and continuous probability distributions, functions of random variables, marginal distributions, Central Limit Theorem and sampling distributions. This course is a prerequisite for Mathematical Statistics. Letter grade. (Offered fall semester, alternate

years.) **3 credits**

MATH 361 - Mathematical Statistics

Prerequisite, MATH 360. This course introduces the fundamental concepts in statistics. Topics include modes of convergence, maximum likelihood, UMVUE, Rao-Kramer theorem, sufficiency and completeness, Lehmann-Scheffe theorem, confidence intervals, hypothesis testing, generalized likelihood ratio test, tests for genetic association, contingency tables, linear models. Letter grade. (Offered spring semester, alternate years.) **3 credits**

CPSC 393 - Machine Learning

Prerequisite, CPSC 392. This course provides a survey of algorithmic techniques for machine learning, including statistical techniques for pattern recognition. Topics include neural networks, deep learning, support vector machines, and kernel methods. (Offered as needed.) **3 credits**

MGSC 406 - Advanced Experimental Design and Statistics

Prerequisites, MATH 203 or MGSC 209 or equivalent, and advanced standing. Statistics as employed in the construction and optimization of experimental designs and subsequent analysis of data collected. Topics will include between-designs; one- and two-way ANOVA from a linear modeling and least squares perspective; power planning; general tests of contrasts; within-designs, and repeated measures designs. Letter grade. (Offered spring semester.) **3 credits**

CPSC 408 - Database Management

Prerequisite, CPSC 350. Students learn data management concepts and the representation and structure of data in the context of applications and system software. The emphasis is on design of databases and developing applications in a client-server environment using SQL as the query language. Letter grade with Pass/No Pass option. (Offered every semester.) **3 credits**

CPSC 435 - BioMedical Informatics

Prerequisite, CPSC 230. Students are introduced to contemporary research topics in medical informatics, including computational techniques for the collection, management, retrieval, and analysis of biomedical data. Letter grade with Pass/No Pass option. (Offered as needed.) **3 credits**

OR

ECON 452 - Econometrics

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Prerequisites, ECON 200, ECON 201, and MATH 109 or MATH 110, and MGSC 209 or MATH 203, with a minimum grade of C- in each prerequisite and ACBE major, or computational science, or economics, or mathematics minor, or enrollment in the Applied Statistical Analysis Certificate program. Mathematical and statistical tools to measure economic phenomena. This will involve mathematical formulation of economic theories and statistical inference relating economic theory to empirical analysis. Letter grade. (Offered spring semester.) **3 credits**

total credits 24

*Mathematics majors may satisfy this requirement with MATH 361. Biological Sciences majors may satisfy this requirement with MATH 303.

**Economics majors may satisfy this requirement with ECON 452.