Computational and Applied Mathematics and Statistics, Operations Research Track, BS

The CAMS Operations Research major gives students skills to build mathematical models of complex systems using tools introduced in various Mathematics, Business, Computer Science, and Data Science classes. The required classes build foundational skills in model building, linear programming, stochastic modeling, probability, and statistics. Elective courses include supply chain optimization, lean six sigma, machine learning, graph theory, mathematical statistics, and statistical learning.

Minimum Course Pre-requisites

- MATH 111 - Calculus I *Credits: (4)*
  or MATH 131 - Calculus I for Life Sciences *Credits: (4)*
- MATH 112 - Calculus II *Credits: (4)*
  or MATH 132 - Calculus II for Life Sciences *Credits: (4)*

Note: other prerequisite courses may be needed depending upon elective courses selected.

Major Writing Requirement

The upper-division writing requirement is satisfied by one of the following ways:

- Completion of MATH 352 or MATH 455 or MATH 459 with a grade of C- or better, or
- CAMS 495 and CAMS 496 which requires the writing of an Honors thesis.

Major Computing Requirement

Proficiency in a high-level programming language and fundamental concepts in data structures at the level of CSCI 141 and CSCI 241 is required. This is normally done by taking and passing these courses.

- CSCI 141 - Introduction to Programming *Credits: (4)* or
  DATA 141 - Programming for Data Science *Credits: (4)*
  and
- CSCI 241 - Data Structures *Credits: (3)*

Major Mathematics Requirement

Proficiency in linear algebra and multivariable calculus at the level of MATH 211 and MATH 212 or MATH 213 is required. This is normally done by taking and passing these courses.

- MATH 211 - Linear Algebra *Credits: (3)*
  and
- MATH 212 - Introduction to Multivariable Calculus *Credits: (3)* or
  MATH 213 - Multivariable Calculus for Science and Mathematics *Credits: (4)*

Operations Research and Statistics Requirements

- BUAD 349/CAMS 210: Overview of Operations Research *Credits: (3)*
- MATH 323: Operations Research: Deterministic Methods *Credits: (3)*
- MATH 424: Operations Research: Stochastic Models *Credits: (3)*
- MATH 351: Probability and Statistics for Scientists *Credits: (3)* or
  MATH 451: Probability *Credits: (3)*

Operations Research Electives (choose six courses for 18 credits)

- BUAD 460: Big Data Analytics with Machine Learning
- BUAD 461: Lean Six Sigma Toolkit
- BUAD 463: Supply Chain Analytics
- BUAD 467: Predictive Analytics
- BUAD 468: Prescriptive Analytics
- MATH 332: Graph Theory
- MATH 352: Statistical Data Analysis
- MATH 353: Advanced Statistical Data Analysis
- MATH 408: Matrix Analysis
- MATH 452: Mathematical Statistics
- MATH 455: Statistical Learning
- MATH 459: Topics in Statistics: Survival Analysis
- CSCI 416: Introduction to Machine Learning
- CSCI 420: Neural Networks
- CSCI 421: Data Base Systems
- CSCI 426: Simulation
- DATA 302: Data Bases
- Any CSCI course numbered CSCI 6X8 for undergraduate credit with appropriate approvals

Note:

With approval from the Operations Research Track director and/or the CAMS director, students may petition to replace one elective requirement with one or more independent study or research credits, including CAMS 495-496 Honors, which must total 3 credits. Permission may be granted if the research content is considered equivalent to the elective requirement.