

DATA SCIENCE AND ANALYTICS MS

The Master of Science in Data Science and Analytics is open to students with a bachelor's degree who have a strong interest in pursuing a programming approach to solving problems using data. The MS is a joint effort between the Department of Mathematics and Statistics and the Department of Computer Science to create a blended curriculum providing a relevant and applicable treatment to the evolving and complex field of data science.

We believe that data science is useful for everyone, and anyone can learn the mathematics, statistical, and programming skills needed to tell a compelling story with data, whether for business operations, public policy, or environmental research. Students lacking preparation in one or more areas can take the required prerequisite courses after being admitted.

With tracks in applied analytics and machine learning, graduates will be able to seek a variety of data-centric careers such as data analyst, data or research manager, data scientist, machine learning engineer, or quantitative research analyst in an application field of their choosing.

Requirements for the MS in Data Science and Analytics

Completion of all requirements as established by the departmental graduate committee, the Graduate Advisory Committee, and Graduate Studies include:

- Completion of an approved program consisting of at least 34 units of work as follows:
 - At least 18 of the units required for the degree in 600-level courses.
 - The required core courses (25 units).
 - The required courses in either the track in machine learning or the track in data analytics (9 units).
- Culminating Activity: Completion and final approval of an independent data science project resulting in an acceptable product as specified by the student's Graduate Advisory Committee. This includes the following items:
 - A formal written description of the project must be submitted to Graduate Studies for approval and accession to the library.
 - Presentation of the student's master's project at a seminar. This seminar will usually be given during the semester in which the student plans to complete the degree requirements.
- Approval by the departmental graduate committee and the Graduate Council on behalf of the faculty of the University.

Course	Title	Units
Core Requirements		
CSCI 605	Data Structures and Algorithms for Data Science	3
ERTH 600	Graduate Seminar I	1
MATH 456	Applied Statistical Methods II	3
MATH/CSCI 485	Advanced Topics in Data Science	3
MATH 500	Data Science Seminar ¹	1
MATH/CSCI 608	Data Science for Graduate Studies	3
MATH 615	Data Analysis for Graduate Research	3
MATH 651	Probability and Statistics for Data Science	3

MATH 699P	Master's Project ²	1-3
or CSCI 699P	Master's Project	

Track Courses	
Select one of the following tracks:	9
Machine Learning (p. 1)	
Applied Analytics (p. 1)	
Total Units	34

¹ Take two units of MATH 500 Data Science Seminar.

² Take four units of CSCI 699P Master's Project or MATH 699P Master's Project.

Track Course Requirements

Students are expected to declare their intended track with the Graduate Coordinator by the end of their second semester. Students must hold classified graduate standing before declaring their intent. Electives chosen to fulfill program requirements must be approved by the graduate committee. The same policies apply to both tracks.

Machine Learning Track: 9 units

Students who declare the machine learning track must have additional background preparation at a C or higher in the areas of multivariate calculus, linear algebra, and computer science. Equivalent courses at Chico State are:

- MATH 220 Analytic Geometry and Calculus
- MATH 235 Elementary Linear Algebra
- CSCI 211 Programming and Algorithms II

Course	Title	Units
Foundation		
CSCI 611	Applied Machine Learning	3
CSCI 644	DevOps Engineering	3
Electives		
Select three units of approved 500/600 level Computer Science (CSCI) courses		3
Total Units		9

Applied Analytics Track: 9 units

Students who do not declare the machine learning track are placed in the applied analytics track.

Course	Title	Units
Foundation		
MATH 589	Field Experience in Statistics and Data Science	3
Electives		
Select two approved 600 level domain electives		6
Total Units		9

Culminating Activity

The candidate shall complete a data science project based on the original ideas developed by the student and agreed to by the student's graduate advisory committee.

- Approval of project: The proposed project must be approved by the graduate advisory committee before the student begins research.

2. Project proposal: The proposal includes a literature review, a statement of the problem and purpose or hypothesis of the research, research design, and methods to be used. The proposal is a formal document that must have appropriate attention given to matters of format, documentation, and quality of writing.
3. Registration in MATH 699P/CSCI 699P and MATH 500.
4. Project paper: This is a continuation of the approved project proposal that includes details on methods, findings, and recommendations.
5. Project presentation: Students will present their projects as part of MATH 500.
6. Oral defense: The candidate's graduate advisory committee shall conduct an oral defense of the project.

Graduate Grading Requirements

All courses in the major (with the exceptions of Independent Study - 697 and Master's Project - 699P) must be taken for a letter grade, except those courses specified by the department as ABC/No Credit (400/500-level courses), AB/No Credit (600-level courses), or Credit/No Credit grading only. A maximum of 10 units combined of ABC/No Credit, AB/No Credit, and Credit/No Credit grades may be used on the approved program (including 697, 699P, 699T, and courses outside the major). While grading standards are determined by individual programs and instructors, it is also the policy of the University that unsatisfactory grades may be given when work fails to reflect achievement of the high standards, including high writing standards, expected of students pursuing graduate study.

Students must maintain a minimum 3.0 grade point average in each of the following three categories: all coursework taken at any accredited institution subsequent to admission to the master's program; all coursework taken at Chico State subsequent to admission to the program; and all courses on the approved master's degree program.

Students whose grade point average falls below 3.0 will be put on academic probation and after one additional semester without improvement may be disqualified from the program.

Continuous enrollment is required. At the discretion of the academic program, a maximum of 30 percent of the units counted toward the degree requirements may be special session credit earned in non-matriculated status combined with all transfer coursework. This applies to special session credit earned through Open University, or in courses offered for academic credit through Professional & Continuing Education. This also applies to coursework completed for a preliminary teaching credential at Chico State. Correspondence courses and UC Extension coursework are not acceptable for transfer.

Graduate Time Limit

All requirements for the degree are to be completed within five years of the end of the semester of enrollment in the oldest course applied toward the degree. See Master's Degree Requirements (<https://csuchico-test.courseleaf.com/graduate-requirements/masters-degree-requirements/>) for complete details on general degree requirements.

Due to the rapid changes in the field of data science, the Department of Mathematics and Statistics requires all candidates to complete the program in five years, including projects. No course validation will be allowed and no program extensions will be granted.

Graduate Requirement in Writing Proficiency

All students must demonstrate competency in writing skills as a requirement for graduation. Data science and analytics students will demonstrate their writing competence by passing EARTH 600 and MATH 500, both with a grade of B- or higher.

Admission Requirements

To be admitted, students must hold an acceptable baccalaureate from an accredited institution or an equivalent approved by Graduate Studies. Bachelor's degrees in statistics, computer science, or any heavy data analytic field are recommended.

Students can be admitted in either classified or conditionally classified standing. No more than nine units can be taken before admission to classified status.

Prerequisites for Admission to Conditionally Classified Status

1. Meet all of the Graduate Studies requirements as specified in Graduate and Postbaccalaureate Admission Requirements (<https://catalog.csuchico.edu/graduate-requirements/graduate-postbaccalaureate-admission-requirements/>) in the *University Catalog*.
2. Submission of all attachments required by the application.
3. Approval by the department and the Office of Graduate Studies.
4. Completion of background preparation in the areas of mathematics, statistics, and computer science. Equivalent courses at Chico State are:
 - a. MATH 105 Introduction to Statistics
 - b. CSCI 101 Introduction to Computer Science
 - c. MATH 109 Survey of Calculus or MATH 120 Analytic Geometry and Calculus

Proficiency in the above areas is most often demonstrated through completion of prerequisite coursework with a C or higher within the prior five years. A waiver of prerequisites may be available, subject to approval by the Graduate Coordinator.

Prerequisites for Admission to Classified Status

In addition to the requirements listed above, students who have the following additional background knowledge (at a C or higher) will be at an advantage in selection for admission to the program and optimal progress toward the degree if admitted.

1. MATH 121 Analytic Geometry and Calculus
2. MATH 315 Applied Statistical Methods I
3. MATH 130 Introduction to R and MATH 131 Introduction to Python

Prerequisite courses taken for advancement to classified status will not be used toward the MS.

The Admissions Committee seeks motivated and mature candidates who demonstrate strong leadership skills and academic performance. In particular, the committee reviews the following:

1. Motivation to pursue graduate study in a data science or analytics, as well as personal qualities essential to academic and professional

success, including interpersonal skills, leadership, and both verbal and visual communication skills.

2. Collegiate-level scholastic achievements, including relevant undergraduate and graduate record with respect to course content and grades.

Advancement to Candidacy

In addition to the requirements listed above:

1. Completion of the Graduate Requirement in Writing Proficiency EARTH 600 and MATH 500.
2. Completion of 18 units from the core courses.
3. Have declared a track.
4. Establishment of a graduate advisory committee.
5. Development of an approved program in consultation with the Graduate Coordinator and the graduate advisory committee.
6. An approved project proposal in consultation with the graduate advisory committee. The proposal must be signed by all committee members, the student, and the Graduate Coordinator by the end of the semester that classified status is granted.