APC 23 (MATH):   **Add new course MATH 295: Math for Machine Learning**

Effective Date: Fall 2024

1.   **Add:**   On page 242, new course, **MATH 295, Math for Machine Learning:**

   295   Math for Machine Learning (4)
   Introduces the essential tools of calculus, linear algebra, probability, and statistics used in
   machine learning. Topics include numerical differentiation and integration, optimization,
   linear systems, distributions, and regression. Applications in machine learning are explored.
   Prerequisite: MATH 191 and CSCI 182 or 183 or 185, or permission of instructor. Spring.

Impact: The addition of MATH 295 will have a small impact on teaching resources in the Department of
Mathematics and Statistics. The Department of Computer Science is proposing to require MATH 295 for
their major. There were 26 computer science graduates in 2022-2023 and 28 in 2021-2022. Offering two
sections of MATH 295 each spring will be sufficient initially to serve both the data science minor and the
computer science major. Computer science majors currently need to take STAT 185 or STAT 225, but
this will be replaced by MATH 295. Therefore, we expect that we will offer one or two fewer sections of
STAT 185 each spring. Moreover, two new faculty joined the Department of Mathematics and Statistics
this year, which gives us the capacity to offer an additional course each year. We have four faculty
members in the Department of Mathematics and Statistics who have expressed interest in teaching this
course.

Math majors are required to take Calc I through Calc III and Linear Algebra and therefore would likely
not take MATH 295. Math majors completing the minor may choose to take MATH 295, but it would not
count toward the major since electives must be at the 300-400 level.

A faculty member will need to take the lead and work collaboratively with computer science to develop
MATH 295. The Chair of the Department of Mathematics and Statistics will seek support through
Academic Affairs and UNC Asheville's faculty funding opportunities to support these efforts.

There is no specialized space or material needs for this course. The course can be scheduled in one of the
allocated classrooms for the Department of Mathematics and Statistics, which typically include RRO 210,
211, 212, and 213. The class will meet for four contact hours each week, and students will receive four
credits. The instructional format will include a combination of lecture and active learning activities. The
course will not be part of the UNC Common Numbering System.

Student Learning Outcomes
After completing this course, students should be able to:
   ● Demonstrate understanding of basic mathematical concepts in machine learning, relating to
     calculus, linear algebra, and probability.
   ● Use computational tools to apply these methods in basic machine learning applications.

Rationale: This course is required for the proposed data science minor. Data science methods use tools
from calculus, linear algebra, probability and statistics. Instead of requiring full semester courses in each
of these topics, this course will provide the necessary mathematical foundation for data science students.
In addition to serving the data science minor, the Department of Computer Science is proposing to add
this course as a requirement for the computer science major. Computer science students are required to
take a computer science course in the data science category, and MATH 295 will serve as a prerequisite
for these courses. This prerequisite will alleviate the need to spend multiple classes introducing basic
concepts from calculus and linear algebra in these upper level computer science courses. Moreover, this
prerequisite has the potential for greater student success by providing students with a strong mathematical

foundation for these upper level computer science courses. The proposed content for MATH 295 aligns with similar courses at a variety of institutions (e.g., Math Methods for Data Science at University of Michigan, Math for Data Science at UNC Chapel Hill, Mathematics for Data Science I at University of Adelaide, Mathematics for Machine Learning and AI at Sinclair Community College)