

Data Science Program Guide

Data Science is a rapidly growing field providing students with exciting career paths, and opportunities for advanced study. The Data Science major gives students a foundation in those aspects of computer science, statistics, and mathematics that are relevant for analyzing and manipulating voluminous and/or complex data. Students majoring in Data Science will learn computer programming, data analysis and database systems, and will learn to think critically about the process of understanding data. The Data Science major is a rigorous program that covers the practical use of Data Science methods as well as the theoretical properties underpinning the performance of the methods and algorithms.

1. Declaring

Students will need to follow the Statistics Department's Declaration Process which includes logging on to the Canvas site and follow directions there.

To declare the major, students must have completed the introductory data science, introductory programming, calculus I and calculus II prerequisites, with a grade of C or better. The remaining prerequisites (linear algebra and calculus III) can be taken after declaration.

2. Grade Requirements

A grade of C or higher is required in the prerequisite courses, Data Science program core, required courses, advanced technical electives and capstone.

3. Minor and Double Major Regulations

Students in LSA may double major in Computer Science and Data Science. Students majoring in Data Science are not eligible to minor in Data Science, Statistics or Computer Science.

4. Program Requirements. ***For students declaring Winter 2024 or later:

Prerequisites

Introductory data science: DATASCI 101 / STATS 206 (recommended) or STATS 250 or STATS 280 or IOE 265 or ECON 451.

Introductory programming: EECS 180 or 183.

Calculus I: MATH 115 or 120 or 185 or 275 or 295.

Calculus II: MATH 116 or 121 or 186 or 276 or 296.

Calculus III: MATH 215 or 285 or 296.

Linear algebra: MATH 214 or 217.

Program Core

- (4) EECS 203 Discrete Math (Math 465 also accepted)
- (4) EECS 280 Programming and Introductory Data Structures
- (4) EECS 281 Data Structures and Algorithms
- (4) STATS/DATASCI 413: Applied Regression Analysis

Statistical Theory | Choose **one** of the following:

- (3) STATS 412: Introduction to Probability and Statistics
- (3) STATS/MATH 425: Introduction to Probability
- (3) STATS 426: Introduction to Theoretical Statistics

Additional Required Courses

(4) STATS 415 Data Mining **/or/** (4) EECS 445 Machine Learning

(4) EECS 484 Database Management Systems **/or/** (4) EECS 485 Web Database and Information Systems

At least one course in each of the following categories (The same course cannot count in more than one category).

One course from the **Applications electives** list. A list of approved courses is available [here](#).

One course from the **Advanced technical electives** list. A list of approved courses is available [here](#).

One course in **Advanced statistical analysis** from the following list:

- STATS/DATASCI 306
- STATS/DATASCI 315
- STATSDATASCI 415
- STATS 426
- STATS 449
- STATS/DATASCI 451
- STATS 470
- STATS 480
- STATS/DATASCI 485
- BIOINF 545/BIOSTAT 646/STATS 545
- BIOINF 547/MATH 547/STATS 547
- STATS/DATASCI 531

Additional **application electives, advanced technical electives, or advanced statistical analysis electives**, as needed, to satisfy the **42 credits** for the major.

Capstone experience (4 credits)

Any path to meeting the capstone requirement other than pre-approved regular courses (listed in section 11) must be pre approved by a Data Science advisor.

Program Requirements. *For students who declared in Fall 2023 or earlier:**

Prerequisites

(4) EECS 183 Elementary Programming Concepts

(4) MATH 115 Calculus I, (4) MATH 116 Calculus II, [(4) MATH 215 Calculus III /or/ (4) MATH 205 Calculus of Several Variables]

(4) MATH 214 Linear Algebra and Differential Equations /or/ MATH 217 Linear Algebra

Program Core (19 credits)

(4) EECS 203 Discrete Math (Math 465 also accepted)

(4) EECS 280 Programming and Introductory Data Structures

(4) EECS 281 Data Structures and Algorithms

(3) STATS 412 Introduction to Probability and Statistics.

(4) STATS 413 Applied Regression Analysis

Required Courses (11 credits)

(4) STATS 415 Data Mining /or/ (4) EECS 445 Machine Learning

(4) EECS 484 Database Management Systems /or/ (4) EECS 485 Web Database and Information Systems

(3) Data Science Applications Elective

Advanced Technical Electives (8 credits)

Eight credits (8) of Advanced Technical Electives

Capstone experience (4 credits)

Any path to meeting the capstone requirement other than pre-approved regular courses (listed in section 9) must be pre approved by a Data Science advisor.

The information below pertains to all DS majors (regardless of requirement term):

5. Honors Program

Any LSA Data Science student with a current grade point average of at least 3.4 may apply for admission to the LSA Data Science Honors major program. The application is made through a Statistics Department undergraduate advisor. Students in the Honors program must complete the regular major program with

an overall GPA of at least 3.5. In addition, LSA Data Science Honors majors must elect the Senior Honors Seminar (STATS 499) and complete a project or thesis under the direction of a member of the Statistics Department or EECS faculty.

6. Approved DS Advanced Technical Electives

There is overlap between the lists of approved Advanced Technical Electives, Application Electives and Capstone courses. Students may not double-count a course in multiple categories. Additionally, students should consult with online course guides and departments offering the courses for questions regarding course availability and eligibility for enrollment.

7. Approved DS Application Electives

Courses with an applied data science topic, taught at an advanced technical level, will be considered on request by the data science advising team.

8. Approved DS Capstone Courses

Capstone Alternative - Multidisciplinary Design Project (MDP)

Students may use a [Multidisciplinary Design Project \(MDP\)](#) to fulfill the capstone requirement in the Data Science major.

Due the last day of class in the second MDP term, students taking an MDP project for DS capstone must upload materials and fill out the [Google Form](#).

- Design Review 3 Report
- Design Review 3 Presentation
- The 3 in 3 slides or poster the team produced for the MDP Design Expo.
- A 500-word summary of the major components of the project the student was a major contributor on and how those components related to data science.
- Students can make an advising appointment with the DS-LSA advising chair or DS-ENG CPA for questions about this summary.

Capstone Alternative - Internship as Capstone

Students completing a summer internship, could take STATS 489 either over spring or fall term.

1) Submit a proposal for the capstone project to the program coordinators (statsugradprogram@umich.edu). Once this is approved, a section of STATS 489 will be set up for your capstone report.

2) You will need to work with a UM faculty member, usually in Stats or CSE, who will be the instructor of record for STATS 489, and you should keep in touch with them about your progress. Ideally, this is a faculty member whose research area is similar to that of the internship. A faculty DS advisor can also take on this role. Make an advising appointment with a faculty advisor if you want to pursue this route.

3) You will submit a final report on your internship project for STATS 489. It might also be helpful to look at previous honors theses at <https://lsa.umich.edu/stats/undergraduate-students/undergraduate-research-opportunities-.html>. An honors thesis has different expectations to an internship capstone report, but both are academic writing describing a sustained project.

9. EECS Repeat Policy

The EECS Department has a repeat policy for EECS 203, EECS 280 and EECS 281. The information below is directly from the [EECS Department website](#).

Students are limited to attempting each of the three 200-level courses (EECS 203, EECS 280, EECS 281) at most twice. An attempt includes, but is not limited to, a notation of any letter grade (“A-F”), withdraw (“W”), Pass/Fail (“P”/“F”), Transfer (“T”), or Incomplete (“I”) posted on your U-M transcript. Any attempts from WN20 through SS21 terms are not counted in this limit. If you are seeking a third (or higher) attempt in EECS 203, EECS 280, or EECS 281, please [submit a petition](#) and include the following information: why your prior attempts were unsuccessful, and concrete steps you will take and changes you will make to succeed in your potential next attempt at the course. **Please note:** an advising appointment to discuss your plan is required in addition to submitting a petition.

If you currently have an Incomplete grade due to an Honor Code violation, you may proceed with the EECS coursework via override. Please [submit an override request](#) to enroll in courses that your Incomplete grade serves as a prerequisite to. If you receive a final grade below a C after an Honor Code violation, you are required to retake the course for a C or higher letter grade. This retake can be done alongside later EECS coursework, even if your failed class typically serves as a prerequisite. If an override is needed, please [submit one here](#) and attach any communication about your Honor Code decision in the form. **Please note:** Incompletes and grades below a C will not fulfill CSE pre-declaration requirements.

10. Advising

Students may make an appointment with a faculty advisor or an undergraduate program coordinator during the academic year. Students may also attend open advising with an undergraduate program coordinator. Open advising is intended to answer quick questions and

not be more than a 10 minute conversation. Information about making appointments and open advising can be found on the Statistics Department website [Advising page](#).

11. EECS Workload Survey

The Computer Science Department conducts a student survey every other year to find the opinions of the students who took the course and what they perceived the workload to be. These surveys can be found at this [link](#). These are for EECS classes only.

12. Double major in Data Science-LSA and Computer Science-LSA

Students may double major in Data Science-LSA and Computer Science-LSA. Students may double count classes, but must have at least 14 approved credit hours that are not double counted. If you are planning this double major, you should make an appointment with advisors in both Statistics and Computer Science to discuss your path.

[Find the form below on the Statistics website.](#)



Dual CS-LSA & DS-LSA Majors

Electrical Engineering & Computer Science Dept.
 Undergraduate Advising Office
 2808 BBB Bldg., ugadmin@eecs.umich.edu, 734.763.6563

Students pursuing a double major with Data Science and Computer Science through the College of Literature, Science & the Arts should be mindful of the following policies and potential opportunities for double-counting.

Course Double-Counting and Overlap Restrictions

1. Double CS/DS majors must complete an additional 14 credits of technical coursework beyond the Data Science requirements to offset overlap between the two majors. See below to learn how to count these credits.
2. Capstone courses approved for CS-LSA are not necessarily approved to count for the Data Science program. Check lsa.umich.edu/stats/undergraduate-students/undergraduate-programs/majordatascience/data-science-electives.html (DS-LSA website) for the current list of approved courses, and schedule an appointment with a DS advisor (through the Stats dept.) to discuss your DS Capstone. The same is true for upper-level technical electives; while there is some overlap, it is not all-encompassing. Always check the correct program's list of approved electives.

Counting the 14 Credits of Additional Technical Coursework

To satisfy the DS-LSA program requirements, students must account for 14 credits of additional technical coursework, above and beyond the DS-LSA program requirements. The following guidelines govern the counting of such credits. Further information and clarification can be sought during an advising appointment with the DS-LSA advising staff in Statistics.

1. Courses satisfying requirements in both the CS-LSA program and the DS-LSA program are not eligible. A course used to satisfy a requirement in the CS-LSA program—but NOT the DS-LSA program—is eligible, so long as it also satisfies the remaining conditions below.
2. Courses must qualify as Flexible Technical Electives, according to the approved list on the DS-Engineering website (eecs.umich.edu/eecs/undergraduate/data-science/), or as Advanced Technical Electives.
3. Courses must be taken for a grade, and passed with a C or higher. Pass/Fail courses are not permitted to count for this requirement.
4. Courses are subject to the 4-credit limit on Independent/Directed Study courses; no more than 4 credits of this requirement may be obtained through independent/directy study courses. These courses are noted on the Flexible Technical Electives list, but can be clarified through an advising appointment to avoid confusion.

The chart below may be used as a planning tool to identify eligible courses for the requirement. EECS 370 and EECS 376 have been filled in since they are required for the CS-LSA major, but typically aren't used for DS-LSA.

Course Subject (i.e. EECS)	Course Number (i.e. 405)	Credits	Found on approved technical electives list(s)?	Used for DS LSA req's.?	Indp't/ Directed Study Course?	Grade Received
EECS	370	4	X	No	No	
EECS	376	4	X	No	No	