DATA SCIENCE

Master of Science in Data Science
Revised 11/8/2024

mdsprogram@umich.edu

Pre-Core (17-19 Credits)

Course #	Course Title	Cr	Notes
MATH 403	Introduction to Discrete Mathematics	3	First Fall semester
EECS 402	Programming for Scientists and Engineers	4	First Fall semester
EECS 403	Graduate Foundations of Data Structures and Algorithms	4	Enforced Prerequisites: MATH 403 and EECS 402
BIOSTATS 601 *or*	Probability and Distribution Theory	4	
MATH/STATS 425 *or*	Introduction to Probability	3	
STATS 510	Probability and Distribution	3	
BIOSTATS 602 *or*	Biostatistical Inference	4	
STATS 426 *or*	Introduction to Theoretical Statistics	3	Enforced Prerequisite: STATS 425 or equivalent
STATS 511	Statistical Inference	3	Enforced Prerequisite: STATS 510

Expertise in Data Management and Manipulation (7-8 Credits)

Course #	Course Title	Cr	Notes
EECS 484 *or*	Database Management Systems	4	Enforced Prerequisite: EECS 403
CSE 584	Advanced Database Systems	4	
EECS 485 *or*	Web Systems	4	EECS 485 available to MDS students in Spring term only
EECS 486 *or*	Information Retrieval and Web Search	4	
CSE 549/SI 650 *or*	Information Retrieval	3	
SI 618 *or*	Data Manipulation and Analysis	3	
STATS 507	Data Science and Analytics using Python	3	

Expertise in Data Science Techniques (6-8 Credits)

Course #	Course Title	Cr	Notes
BIOSTAT 650 *or*	Applied Statistics I: Linear Regression	4	Enforced Prerequisite: BIOSTAT 601 or equivalent
STATS 500 *or*	Statistical Learning I: Regression	3	
STATS 513 *or*	Regression and Data Analysis	3	
BIOSTAT 626 *or*	Machine Learning for Health Sciences	3	Enforced Prerequisite: BIOSTAT 601 or equivalent
EECS 545 *or*	Machine Learning (CSE)	3	
EECS 553 *or*	Machine Learning (ECE)	3	
EECS 476 *or*	Data Mining	4	
CSE 576 *or*	Advanced Data Mining	4	
SI 670 *or*	Applied Machine Learning	3	
SI 671 *or*	Data Mining: Methods and Applications	3	
DATASCI 415 *or*	Data Mining and Statistical Learning	4	Enforced Prerequisite: MATH/STATS 425 or STATS 426 or equivalencies
STATS 503	Statistical Machine Learning	4	

Capstone (3-4 Credits)

- Please refer to [MDS Capstone Guidelines](#) for details.

Course #	Course Title	Cr	Notes
BIOSTAT 610 *or*	Reading in Biostatistics	*	
BIOSTAT 698 *or*	Modern Statistical Methods in Epidemiologic Studies	4	
BIOSTAT 699 *or*	Analysis of Biostatistical Investigations	4	
CSE 599 *or*	Directed Study	*	
SI 691 *or*	Independent Study	*	
SI 699-xx5	Big Data Analytics	3	
STATS 504 *or*	Practice and Communication in Applied Statistics	3	Enforced Prerequisite: STATS 500 and STATS 503 or
STATS 750	Directed Reading	*	equivalencies

Electives (9 Credits minimum) - 1 course of 3 credits or more from each category.

- Electives must include at least 2 advanced graduate courses (500-level or above in LSA and CoE, or 600-level or above in UMSI and SPH).
- CSE/ECE 598 Special Topics will have specific sections approved on a semesterly basis according to their category.

Principles of Data Science

BIOSTAT 601 (Probability and Distribution Theory) | BIOSTAT 602 (Biostatistical Inference) | BIOSTAT 617 (Sample Design) | BIOSTAT 626 (Machine Learning Methods) | BIOSTAT 680 (Stochastic Processes) | BIOSTAT 682 (Bayesian Analysis) | ECE 501 (Probability and Random Processes) | ECE 502 (Stochastic Processes) | EECS 545 (Machine Learning (CSE)) | ECE 551 (Matrix Methods for Signal Processing, Data Analysis, and Machine Learning) | EECS 553 (Machine Learning (ECE)) | ECE 559 (Optimization Methods for SIPML) | ECE 564 (Estimation, Filtering, and Detection) | SI 670 (Applied Machine Learning) | DATASCI 451 (Introduction to Bayesian Data Analysis) | STATS 470 (Introduction to Design of Experiments) | STATS 510 (Probability and Distribution Theory) | STATS 511 (Statistical Inference) | STATS 551 (Bayesian Modeling and Computation)

Data Analysis

BIOSTAT 651 (Generalized Linear Models) | BIOSTAT 653 (Longitudinal Analysis) | BIOSTAT 666 (Statistical Models and Numerical Methods in Human Genetics) | BIOSTAT 675 (Survival Time Analysis) | BIOSTAT 685/STATS 560 (Non-Parametric Statistics) | BIOSTAT 695 (Categorical Data) | BIOSTAT 696 (Spatial Statistics) | ECE 556 (Image Processing) | STATS 414 (Topics in Applied Data Analysis) | STATS 501 (Applied Statistics II) | STATS 503 (Statistical Machine Learning) | STATS 509 (Statistics for Financial Data) | STATS 531 (Analysis of Time Series) | STATS 600 (Linear Models) | STATS 601 (Analysis of Multivariate and Categorical Data) | STATS 605 (Advanced Topics in Modeling and Data Analysis) | STATS 700 (Topics in Applied Statistics)

Computation

BIOSTAT 615 (Statistical Computing) | BIOSTAT 625 (Computing with Big Data) | EECS 481 (Software Engineering) | EECS 485 (Web Systems) | EECS 486 (Information Retrieval and Web Search) | EECS 504 (Computer Vision) | EECS 542 (Advanced Topics in Computer Vision) | CSE 548/SI 649 (Information Visualization) | CSE 549/SI 650 (Information Retrieval) | CSE 572 (Randomness and Computation) | CSE 586 (Design and Analysis of Algorithms) | CSE 587 (Parallel Computing) | CSE 592 (Artificial Intelligence) | CSE 595/SI 561 (Natural Language Processing) | SI 564 (SQL and Databases 1.5 credits) + SI 644 (Advanced SQL and Databases 1.5 credits) | SI 608 (Networks) | SI 618 (Data Manipulation and Analysis) | SI 630 (Natural Language Processing: Algorithms and People) | SI 664 (Database Application Design) | SI 671 (Data Mining: Methods and Applications)| DATASCI 406 (Computational Methods in Statistics and Data Science) | STATS 506 (Computational Methods and Tools in Statistics) | STATS 507 (Data Science and Analytics using Python) | STATS 551 (Bayesian Modeling and Computation) | STATS 606 (Computation and Optimization Methods in Statistics)

Program Notes:

- Each course cannot satisfy more than 1 requirement.
- The cumulative GPA must be a B (3.0) or better, as required by Rackham Graduate School.
- At least 25 units of graduate-level coursework must be completed during residency in the Data Science program. Of these 25, 18 must be at the advanced graduate level (500-level or above in LSA and CoE; 600-level or above in UMSI and SPH).
- Program requirements on page 1 may be fulfilled by approved course waivers from having taken equivalent classes in prior education with grades B- or better. Waiver requests are considered for admitted students before the start of the program.