Graduate Programs in Data Science and Engineering

University of Maine

Online Model Curricula

Spring 2023

Numerous course paths exist for earning the ***MS in Data Science and Engineering***. Many course selection variations exist based on the specific backgrounds and interests of each student and whether prerequisites have been met through previous coursework.

The model curriculum listed below was developed using courses that are currently available online. If a course is offered online, it is typically offered simultaneously on-campus. That is, a student may enroll typically in either the online or on-campus section of the same course. Thus, all of the courses listed here are also available for on-campus students.

Further, in the model curriculum below, the listing does not include online courses that require prerequisites that would be met typically by students only with specific undergraduate degrees. The model curriculum is suggested as a starting point for those that have the minimum qualifications to successfully pursue a graduate degree in data science and engineering. It also assumes the student will be pursuing an all coursework degree rather than a thesis.

It is highly recommended that you plan out all ten courses you intend to include in your MS Program of Study prior to starting your graduate course work. Do this with your faculty adviser. This will help ensure that the courses you desire to take will be available when you want them and any prerequisites have been met. Courses may be planned out and approved in advance using the Master's and CAS Program of Study.

Those with undergraduate degrees in computer science, engineering or math likely qualify to take a much broader range of courses than are listed in the following limited model curriculum. To select from all on-campus and online courses for which you may qualify and that you may desire to take, consult the full listing of courses. Further, also consider the full range of both research-based and coursework-only DSE graduate programs.

Graduate students accepted into the program, whether participating online or on-campus, may also want to consider applying for and earning one or more graduate certificates as focus areas within their master's degree program. Courses typically double count for both graduate credentials if appropriately selected. Courses may be planned out and approved in advance using the Certificate Program of Study.

Requirements for the MS Data Science and Engineering

(Coursework Only Option) The candidate must complete 30 credits consisting of:

(a) **Required Course:** DSE 510 Practicum in Data Science and Engineering (3cr)
(b) 12 course credits from at least four of the five **Theme Areas**
(c) 15 further course credits from within the **Foundation Courses**, **Theme Areas**,

or **Domain Specializations**
(d) At least one course is recommended to include a **substantial practical experience**.
Options include DSE589 Graduate Project, DSE 590 Information Systems Internship, or a
course from an approved list.

Model Curriculum for the MS Data Science and Engineering

(Coursework Only Option, pursued Online in Entirety)

The prerequisites listed in the tables below are summaries. Please consult the course
descriptions at https://umaine.edu/dse/graduate-programs/dse-program-course-descriptions/ for
the detailed prerequisites. For all courses it is assumed that the student has been formally
admitted into the MSDSE or Graduate Certificate in DSE program.

<mark>*** - indicates course is offered online in Summer/Fall 2023 and Spring 2024</mark>

(1) Foundation Courses

Take these courses early if you need them and as recommended by your adviser. These will
count toward the ten graduate courses required.

Fall			Spring		
Foundation	*Course*	*Prereq*	*Foundation*	*Course*	*Prereq*
Statistics	DSE 501 **Statistical** Foundations of Data Science and Engineering ***	college level statistics	**Data Systems**	DSE 503 (ECE 598) **Systems Foundations** for Data Science and Engineering ***	SIE507
	STS437: Statistical Methods in Research			COS598 Introduction to Data Science***	Progrmg
	ECE 515: Random Variables and Stochastic Processes				
	DSC550: Data Mining***	(UMA)			
Programming	DSE502 **Programming** Foundations for Data Science and Engineering ***	none			

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Summer		
Foundation	**Course**	**Prereqs**
Programming	CIS 449 Introduction to Programming and Data Analysis ***	UMA

(2) Required Courses

Take DSE 510 in the Spring of your first year.

Fall		Spring	
Course	*Prereq*	*Course*	*Prereq*
		DSE 510 (SIE 598) Practicum in Data Science ***	DSE502

(3) Recommended Practical Courses: (since Spring 2023, practical courses are recommended, not required)

Fall		Spring	
Course	*Prereq*	*Course*	*Prereq*
DSE 589 Graduate Project **or** DSE 590 Information Systems Internship **or** other approved practical experience course	9 previous program credits	DSE 589 Graduate Project **or** DSE 590 Information Systems Internship **or** other approved practical experience course	9 previous program credits

(4) Theme Area Courses

Take a minimum of 1 course in at least 4 out of the 5 theme areas.

Theme 1: Data Collection Technologies
Theme 2: Data Representation and Management
Theme 3: Data Analytics
Theme 4: Data Visualization and Human Centered Computing
Theme 5: Data Security, Preservation, and Reuse

Fall			Spring		
Theme Area	Course	Prereq	Theme Area	Course	Prereq
1			1	BUA 682 Data Pre-processing for Business Analytics ***	Stats & progrmng

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2	BUA 681 Data Management & Analytics***	Stats & programming	2	SIE 557 Database Systems Applications ***	programming
	SIE 558 Real-time Sensor Data Streams ***				
3	EHD 573 Statistical Methods in Education 1		3	BUA 684 Business Data Mining and Knowledge Discovery ***	Stats & progrmng
	COS 475 Machine Learning***	USM		COS 432 Deep Learning***	USM
				COS 575 Machine Learning ***	MAT 126, MAT 127, STS 232
				EHD 573 Statistical Methods in Education 1 ***	
4	SIE 515 Human Computer Interaction***		4	BUA 683 Information Visualization ***	Stats & progrmng
	SIE 517 Spatial Interaction Design				
5	COS 535 Information Privacy Engineering ***	Software engineering	5	CYB 501 Cybersecurity Fndmtls ***	UMA
	DIG 500 Introduction to Digital Curation***			CYB 552 Cybersecurity Investigations ***	UMA
	CYB 501 Cybersecurity Fndmtls ***	(UMA)			

Summer		
Theme Area	**Course**	**Prereqs**
3	BUA 601 Strategic Data Analysis ***	Stats
	BUA 680 Foundations of Business Intelligence & Analytics ***	Stats
4	BUA 683 Information Visualization ***	Stats
5	DIG 510 Metadata Systems ***	
	CYB 552 Cybersecurity Investigations ***	UMA

(5) Domain Courses

The remainder of the ten required courses may consist of any course above not yet taken or selected from among any of the following domains.

Domain A: Spatial Informatics
Domain B: Bioinformatics / Biomedicine
Domain C: Business Information
Domain D: Social and Behavioral Data Science Domain
E: Engineering Analytics

Some of the listings below may require a course to be completed first in one of the above previous categories.

Fall			Spring		
Domain	*Course*	*Prereq*	*Domain*	*Course*	*Prereqs*
A	SIE 509 Principles of Geographic Information Systems ***		A	SIE 505 Formal Foundations for Information Science ***	
	SIE 512 Spatial Analysis ***			SIE 510 GIS Applications ***	
	SIE 555 Spatial Database Systems ***			SIE 516 Interactive Technologies for Solving Real World Problems ***	
	ANT 521 Geographic Info Systems 1 ***	UMM		CIS 461 Spatial-Temporal Info Sci	UMA
	ANT 522 Geographic Info Systems 2 ***	UMM		GEO 605 Remote Sensing ***	USM
				ANT 521 Geographic Info Systems 1 ***	UMM
				ANT 522 Geographic Info Systems 2 ***	UMM
				GIS 428 Web-Based Maps, Applications & Services ***	
B			B	BMB 502 Introduction to Bioinformatics (Synchronous) ***	Molecular & Cellular Biology
C	BUA 680 Foundations of Business Intelligence***		C	BUA 680 Foundatns of Business Intelligence ***	

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	BUA 685 Problem Solving and Decision Analysis***	Stats, ecn princpls & programming		BUA 684 Business Data Mining & Kowldg Discovery ***	
				BUA 686 Predictive Analytics & Business	Summer
D	None		D	HTY 665 Digital and Spatial History	
E	Some online courses for ECE students		E	ECE 584 Estimation Theory	Summer

ADDITIONAL ONLINE COURSES FOR THOSE WITH SPECIALTY BACKGROUNDS

The online courses listed below may be appropriate for students possessing substantial *specialty prerequisite courses* prior to entering the *MS Data Science and Engineering* program. Such candidates may be able to choose from among the following without pursuing substantial additional prerequisite work. These courses fit various *Theme Areas* and *Domains* as listed at https://umaine.edu/dse/graduate-programs/graduate-courses/

Fall		Spring	
Course	Prereqs	Course	Prereqs
ECE 515 Random Variables and Stochastic Processes	ECE 316 or equivalent	ECE 585 Foundations of Wireless Communications	ECE 484
ECE 583 Coding and information Theory	ECE 515	EHD574 Statistical Methods in Education II ***	EHD 573
SIE 585 Formal Ontologies: Principles and Practice	SIE 505	DIG 550 Digital Preservation ***	DIG 500, 510, & 540
SVT 437 Practical GPS	SVT 341	SVT 532 Survey Strategies in Use of Lidar ***	SVT 331
SVT 531 Advanced Digital Photogrammetry	SVT 331		
GIS 420 Remote Sensing & Image Analysis (UMM)	ANT 522		
CIS 450 Data Mining (UMA)	CIS 225, 352, 360, or 449		

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