DATA SCIENCE/ECONOMICS

(Concurrent degree with the College of Arts, Sciences, and Letters)

Students with an interest in both areas of Data Science and Economics can pursue a concurrent BS program to earn two BS degrees at the same time:

- BS degree in Data Science (http://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/data-science/)
- BS degree in Economics (http://catalog.umd.umich.edu/undergraduate/college-arts-sciences-letters/economics/)

The concurrent degree program requires specified coursework with a minimum of 15 additional credit hours beyond the 120 credit hours required for the BS-DATA or the BS-ECON alone.

Data scientists, empowered by economic theories and methodologies, can refine their models, make more accurate predictions, inform policy decisions, and contribute to a deeper understanding of complex economic systems. Economists, empowered by data science, can construct complex models and analyze and interpret Big data.

Dearborn Discovery Core

Please see the Dearborn Discovery Core (General Education) (http://catalog.umd.umich.edu/undergraduate/gen_ed_ddc/) webpage or additional information.

A candidate for the Bachelor of Science in Data Science and the Bachelor of Science in Economics concurrently is required to fulfill the requirements for the Dearborn Discovery Core, as well as CASL requirements (two-semester sequence of foreign language).

Major Requirements

Code	Title	Credit Hours
Data Science Prerequisites		
COMP 105	Writing & Rhetoric I	3
COMP 270	Tech Writing for Engineers	3
MATH 115	Calculus I	4
MATH 116	Calculus II	4
MATH 215	Calculus III	4
MATH 227	Introduction to Linear Algebra	3
CIS 1501	CS I for Data Scientists	4
CIS 2001	CS II for Data Scientists	4
One course from the following:		3-4
CIS 275	Discrete Structures I	
MATH 276	Discrete Math Meth Comptr Engr	
MATH 315	Applied Combinatorics	
Select one laboratory science sequence from the following:		8
BIOL 130 & BIOL 320	Intro Org and Environ Biology and Field Biology	
CHEM 134 & CHEM 136	General Chemistry IA and General Chemistry IIA	
GEOL 118 & GEOL 218	Physical Geology and Historical Geology	
PHYS 125 & 125L & PHYS 126 & PHYS 126L	Introductory Physics I and Introductory Physics I Lab/Dis and Introductory Physics II and Intro Physics II Lab/Dis	
PHYS 150 & 150L & PHYS 151 & PHYS 151L	General Physics I and General Physics I Lab/Dis and General Physics II and General Physics II Lab/Dis	
Economics Prerequisites		
ECON 201	Prin: Macroeconomics	3
ECON 202	Prin: Microeconomics	3
CASL Requirements		
Foundations - any one FNDS or CPBL 101, 102, 103, 104		4
Foreign Language - Select a two course sequence from the following: [6]		8
ARBC 101 & ARBC 102	Introduction to Arabic Language and Culture 1 and Introduction to Arabic Language and Culture 2	
FREN 101 & FREN 102	French Language & Culture I and French Language & Culture II	
GER 101 & GER 102	Beginning German I and German Language and Culture II	
SPAN 101 & SPAN 102	Spanish Language & Culture I and Spanish Language & Culture II	
Data Science Core		
CIS 350	Data Struc and Algorithm Anlys	4
CIS 375	Software Engineering I	4
ECE 3100	Data Science I	4
CIS 3200	Data Science II	4
CIS 422	Massive Data Management	4
ENGR 400 or ENT 400	Appl Business Tech for Engr Entrepreneurial Thinking&Behav	3
HHS 470	Information Science and Ethics	3
STAT 305	Introduction to Data Science for All	3
STAT 325 or IMSE 317	Applied Statistics I Eng Probability and Statistics	4
STAT 430	Applied Regression Analysis	3
CIS 4971	Cap Sem for Data Sci I	2
CIS 4972	Cap Proj for Data Sci II	2
Economics Core [1]		
ECON 301	Intermediate Macroeconomics [2,3,4]	4
ECON 302	Intermediate Microeconomics [2,3,4]	4
Data Science Applications - Economics Electives		
Students should complete 20 credit hours of ECON 300/400/4000 electives, not counting the core classes ECON 301, ECON 302, ECON 305. [5]		20
Data Science Electives		
Choose one course from the list below. It is recommended that students take CIS 479 that also fulfills DDC Intersection requirement.		3-4
CIS 306	Discrete Structures II	
CIS 411	Introduction to Natural Language Processing	
CIS 412	Introduction to Quantum Computing	
CIS 425	Information Systems	
CIS 439	Text Mining and Information Retrieval	
CIS 446	Wireless & Mobi Comp Security	

CIS 449	Intro to Software Security
CIS 479	Intro to Artificial Intel
CIS 481	Computational Learning
CIS 482	Trustworthy Artificial Intelligence
CIS 483	Deep Learning
CIS 489	Edge Computing
CIS 4851	Data Security and Privacy
DS 426	Introduction to Simulation
ECE 428	Cloud Computing
ECE 434	Introduction to Machine Learning
ENGR 399	Experiential Honors Prof. Prac
ENGR 492	Exper Honors Directed Research
ENGR 493	Exper Hnrs Dir Dsgn
IMSE 3005	Intro to Operations Research
IMSE 421	Eng Economy and Dec Anlys
IMSE 440	Applied stat models in engin
IMSE 4585	Simulation in Systems Design
IMSE 4795	Prod, Inven Control & Lean Mfg
MATH 325	Probability
MATH 420	Stochastic Processes
MATH 425	Statistical Inference
MATH 435	Mathematics of Finance
MATH 462	Mathematical Modeling
MATH 472	Introduction to Computational Mathematics
MATH 473	Matrix Computation
STAT 327	Statistical Computing
STAT 431	Machine Learning and Computational Statistics
STAT 440	Design and Analysis of Experiments
STAT 450	Multivariate Stat Analysis
STAT 460	Time Series Analysis
General Electives	
Any 100 to 400 level course, (that is, courses not on the No Credit list, which is found at the end of the CECS Student Handbook), as needed to get a minimum of 135 credits for graduation.	6
Total Credit Hours	**135-137**

1 ECON 305 requirement for Economics major is fulfilled by taking IMSE 317 or STAT 325.

2 MATH 104,MATH 105,MATH 113,MATH 115, or equivalent are prerequisites to these courses.

3 Core courses ECON 301and ECON 302 should be taken no later than the junior year.

4 Only one of the two courses may be transferred to UM-D.

5 Only 4 credits of economics internship (ECON 398), can be applied to the major requirement.

6 The foreign language requirement can be met by:

- Successfully completing a two-semester beginning language sequence at UM-Dearborn, or
- Transferring the equivalent of 8 semester hours of a beginning language sequence from another college or university, or
- Successfully completing a 3- or 4-semester hour foreign language course (this course cannot be taught in English) at the 102 level or higher, or
- Having completed at least 3 years (in the same language) of foreign language in high school with a grade of C or better in the final course, or
- Having completed the equivalent of a high school diploma at a school that used a language other than English for instruction. (Appropriate documentation attesting to the language of instruction and graduation from the high school program is necessary, and official English translations of foreign transcripts must be provided), or
- Passing an oral and written proficiency exam.

A student with prior knowledge of Arabic, French, German or Spanish should take a placement examination before registering for a course in that language. Placement/proficiency exams in Arabic, French, German, and Spanish are scheduled through the Office of Admissions and Orientation; call 313-593-5100. A student wishing to take a proficiency exam in a language not mentioned above or not taught at UM-Dearborn should consult a CASL advisor; call 313-593-5293 for more information. Proficiency exams for a language other than those taught at UM-Dearborn must be administered at another four-year institution. A student wishing to waive the foreign language requirement must officially submit a request via petition. Please note that when the requirement is waived, or proficiency is demonstrated by exam, credit will not be awarded for courses not taken.