

# DATA SCIENCE FLOW CHART, 2023-2024

THIS FLOW CHART IS ONLY A GUIDE. PLEASE REFER TO YOUR ADVISOR FOR QUESTIONS

1

<b>DS 110</b> Orientation R Cr	<b>Math 165</b> Calculus I (Pre-req ALEKS placement or C- in Math 143) 4 Cr	<b>Com S 127</b> Intro to Computer Programming - Python 4 Cr	<b>Engl 150</b> (if English ACT 24 or higher, placement into English 250) 3 Cr	<b>Lib 160</b> (take with Engl 150/250) 1 Cr	<b>Social Science</b> 3 Cr
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2

<b>Math 166</b> Calculus II (Pre-req C- in Math 165) 4 Cr	<b>Com S 227</b> Object-oriented Programming - Java (Pre-req Cr/E in Math 143 or higher; Com S 127 or Cpr E 185 or S E 185 or E E 285) 4 Cr	<i>Stat Option</i> <b>Stat 201, 101, 104, or 105</b> (check pre-reqs) 4 Cr	<b>Engl 250</b> (Pre-req Engl 150 or exempt from Engl 150) 3 Cr
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3

<b>DS 201</b> Introduction to Data Science 3 Cr	<b>Math 265</b> Calculus III (Pre req C- in Math 166 or Math 166H) 4 Cr	<b>Com S 228</b> Introduction to Data Structures (Pre-req C- in Com S 227; Cr/E Math 165) 3 Cr	<b>Stat 301</b> Intermediate Statistical Concepts & Methods (Pre-req Stat 101 or 104 or 105 or 201) 4 Cr	<b>Arts &amp; Humanities/ USD</b> 3 Cr
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4

<b>DS 202</b> Data Acquisition and Exploratory Data Analysis (Pre-req DS 201) 3 Cr	<b>Math 207</b> Matrices and Linear Algebra (Pre-req 2 semesters calculus) 3 Cr	<i>Choose Option</i> <b>Com S 230 or Cpr E 310</b> (check pre-reqs) 4 Cr	<b>Social Science/ IP</b> 3 Cr	<b>Arts &amp; Humanities</b> 3 Cr	<b>LAS 203</b> 1 Cr
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5

<b>DS 303</b> Concepts & Applications of Machine Learning (Pre req DS 202; Math 207; Math 265; Stat 301) 3 Cr	<b>Stat 347</b> Probability & Statistical Theory for data Science (Pre req Math 207 or 317; Math 265; Stat 301 or 326) 4 Cr	<b>Com S 311</b> Introduction to the Design & Analysis of Algorithms (Pre req C- in Com S 228; Math 166; Engl 150; Com S 230 or Cpr E 310) 3 Cr	<b>Elective or World Language</b> 3-4 Cr	<b>Arts &amp; Humanities (300+)</b> 3 Cr
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6

<b>Com S 363</b> Introduction to Database Management Systems (Pre req C- in Com S 228; Math 165; Engl 250) 3 Cr	<b>Stat 477</b> Introduction to Categorical Data Analysis (Pre req Stat 301 or 326 or 401 or 587) 3 Cr	<b>Elective or World Language</b> 3-4 Cr	<b>Arts &amp; Humanities</b> 3 Cr	<b>Natural Science</b> 4 Cr
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7

<b>Application Emphasis Area</b> 3 Cr	<b>Application Emphasis Area</b> 3 Cr	<i>Choose Option</i> <b>Engl 302, 314 or 332</b> (Pre-req Engl 250 and junior classification) 3 Cr	<b>Natural Science</b> 4 Cr
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8

<b>DS 401</b> Data Science Capstone (Pre-req DS 301 or DS 303) 3 Cr	<b>Cpr E 419</b> Software Tools for Large Scale Data Analysis (Pre req Com S 363 or Com S 352 or Cpr E 308; Com S 228) 4 Cr	<b>Application Emphasis Area</b> 3 Cr	<b>Social Science (300+)</b> 3 Cr
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## ALEKS Math Placement

- 39** - Math 140 (3 cr) College Algebra
- 51** - Math 143 (4 cr) Calculus Prep
- 76** - Math 165 (4 cr) Calculus I

## Curriculum Requirements

### World Language

- 1 year at college level or
- 3 years at high school

### Arts and Humanities - 12 cr

- Select credits from the LAS approved list on degree audit

### Social Sciences - 9 cr

- Select credits from the LAS approved list on degree audit

### International Perspectives AND U.S. Diversity - 6 cr

- Select credits from the LAS approved list on degree audit

### Natural Sciences - 8 cr

- Select credits from the LAS approved list on degree audit

## Application Emphasis Area:

- 3 credits from approved quantitative course listings
- 6 credits of 300+ level from any following departments: A B E, ADVRT, AGRON, AN S, ARCH, BC BIO, COM S, C R P, CPR E, CYBSC, CYB E, E E, FIN, GIS, I E, J L MC, LING, L A, MATH, MIS, MKT, POL S, SOC, STAT, S E, TSM

## Graduation Requirements

- Minimum of 120 Cr.
- All students are required to take at least 45 hours of courses at the 300+ level or above.
- This may require taking additional electives.
- Last 32 credits must be taken at Iowa State.
- Advisor can waive 6 of the last 32 credits taken at Iowa State.

# APPLICATION EMPHASIS AREA

## At least 3 credits from one of the following courses:

- COM S 424, 426, 435, 454, 461, 474, 421, 342, 413, 440
- CPR E 388, 425, 431, 416
- DS 490
- E E 425
- I E 312, 483, 487
- STAT 471, 473, 475
- BCBIO 401, 406
- MATH 373, 407, 424, 481

## At least 6 credits from courses at the 300, 400, or 500 level from the following designations:

A B E, ADVRT, AGRON, AN S, ARCH, BCBIO, COM S, C R P, CPR E, CYB E, CYBSC, DS, E E, ECON, FIN, GIS, I E, JL MC, LA, LING, MATH, MIS, MKT, POL S, S E, SOC, STAT, TSM

## EXAMPLE APPLICATION EMPHASIS AREA OPTIONS

<b>Agriculture</b>	<b>A B E 340</b> Functional Analysis of Soil, Crop, and Machine Systems	<b>AGRON 425</b> Crop and Soil Modeling	<b>AGRON 452</b> GIS for Geoscientists	<b>AGRON 488</b> GIS for Geoscientists II	<b>TSM 433</b> Precision Agriculture	<b>AN S 500</b> Applied Data Science and Statistics using Statistical Software
<b>Geographic Information Systems</b>	<b>C R P 351</b> Intermediate GIS	<b>C R P 454</b> Fundamentals of Remote Sensing and Spatial Analysis	<b>C R P 456</b> GIS Programming and Automation	<b>NREM 345</b> Natural Resource Photogrammetry and GIS	<b>NREM 446</b> Integrating GPS and GIS for Natural Resource Management	<b>L A 558</b> Web Mapping and Spatial Data Visualization
<b>Linguistics</b>	<b>LING 331</b> Theory of Computing	<b>LING 511</b> Introduction to Linguistic Analysis	<b>LING 516</b> Methods of Formal Linguistic Analysis	<b>LING 527</b> Discourse Analysis	<b>LING 537</b> Corpus Approaches to Grammatical Analysis	<b>COM S 579X</b> Natural Language Processing
<b>Software Engineering &amp; Analytics</b>	<b>COM S 309</b> Software Development Practices	<b>COM S 319</b> Construction of User Interfaces	<b>COM S 362</b> Object-Oriented Analysis and Design	<b>COM S 413</b> Foundations and Applications of Program Analysis	<b>COM S 561</b> Database Design, Management, and Research	<b>COM S 571X</b> Introduction to Trustworthy Data Science
<b>Statistics</b>	<b>STAT 471</b> Introduction to Experimental Design	<b>STAT 473</b> Introduction to Survey Sampling	<b>STAT 474</b> Introduction to Bayesian Data Analysis	<b>STAT 475</b> Introduction to Multivariate Data Analysis	<b>STAT 483</b> Empirical Methods for the Computational Sciences	<b>STAT 588</b> Statistical Theory for Research Workers
<b>Numerical Analysis</b>	<b>MATH 373</b> Introduction to Scientific Computing	<b>MATH 407</b> Applied Linear Algebra	<b>MATH 423</b> Mathematical Modeling in Biology	<b>MATH 424</b> Introduction to High Performance Computing	<b>MATH 481</b> Numerical Methods for Differential Equations	<b>COM S 474</b> Introduction to Machine Learning
<b>Computational Biology</b>	<b>BCBIO 322</b> Introduction to Bioinformatics and Computational Biology	<b>BCBIO 401</b> Fundamentals of Bioinformatics & Computational Biology	<b>BCBIO 402</b> Fundamentals of Systems Biology and Network Science	<b>BCBIO 423</b> Mathematical Modeling in Biology	<b>COM S 401</b> Bioinformatics of Sequences	<b>COM S 406</b> Bioinformatics of OMICS