

# DATA SCIENCE FLOW CHART

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

1

**DS 110**  
Orientation  
R Cr

**Math 165**  
Calculus I  
(Pre-req ALEKS placement or C- in Math 143)  
4 Cr

**Com S 127**  
Intro to Computer Programming - Python  
4 Cr

**Engl 150**  
(if English ACT 24 or higher, placement into English 250)  
3 Cr

**Lib 160**  
(take with Engl 150/250)  
1 Cr

**Social Science**  
3 Cr

2

**Math 166**  
Calculus II  
(Pre-req C- in Math 165)  
4 Cr

**Com S 227**  
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 or DS 201)  
4 Cr

*Stat Option*  
**Stat 201, 101, 104, or 105**  
(check pre-reqs)  
4 Cr

**Engl 250**  
(Pre-req Engl 150 or exempt from Engl 150)  
3 Cr

3

**DS 201**  
Introduction to Data Science  
3 Cr

**Math 265**  
Calculus III  
(Pre req C- in Math 166 or Math 166H)  
4 Cr

**Com S 228**  
Introduction to Data Structures  
(Pre-req C- in Com S 227; Cr/E Math 165)  
3 Cr

**Stat 301**  
Intermediate Statistical Concepts & Methods  
(Pre-req Stat 101 or 104 or 105 or 201)  
4 Cr

**Arts & Humanities**  
3 Cr

4

**DS 202**  
Data Acquisition and Exploratory Data Analysis  
(Pre-req DS 201)  
3 Cr

**Math 207**  
Matrices and Linear Algebra  
(Pre-req 2 semesters calculus)  
3 Cr

*Choose Option*  
**Com S 230 or Cpr E 310**  
(check pre-reqs)  
4 Cr

**Social Science**  
3 Cr

**Arts & Humanities**  
3 Cr

5

**DS 303**  
Concepts & Applications of Machine Learning  
(Pre req DS 202; Math 207; Math 265; Stat 301)  
3 Cr

**Stat 347**  
Probability & Statistical Theory for data Science  
(Pre req Math 207 or 317; Math 265; Stat 301 or 326)  
4 Cr

**Com S 311**  
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

**Elective or World Language**  
3-4 Cr

**Arts & Humanities**  
3 Cr

6

**Com S 363**  
Introduction to Database Management Systems  
(Pre req C- in Com S 228; Math 165; Engl 250)  
3 Cr

**Stat 477**  
Introduction to Categorical Data Analysis  
(Pre req Stat 301 or 326 or 401 or 587)  
3 Cr

**Elective or World Language**  
3-4 Cr

**Arts & Humanities**  
3 Cr

**Natural Science**  
4 Cr

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*Choose Option*  
**Engl 302, 314 or 332**  
(Pre-req Engl 250 and junior classification)  
3 Cr

**Application Emphasis Area**  
3 Cr

**Application Emphasis Area**  
3 Cr

**Natural Science**  
4 Cr

**Social Science**  
3 Cr

8

**DS 401**  
Data Science Capstone  
(Pre-req DS 301 or DS 303)  
3 Cr

**Cpr E 419**  
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

**Application Emphasis Area**  
3 Cr

**Electives 300+**  
3-6 Cr

## 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

**A student must take at least 9 credits from any single application emphasis area and may choose from:** Big Data; Engineering Applications; Optimization; Security; Software Analytics; Statistics; Computational Biology; and Numerical Analysis.

## 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 AREAS

\*PAY ATTENTION TO SEMESTER OFFERINGS FOR COURSES\*

1

**BIG DATA**

**Com S 424**  
Introduction to High Performance Computing  
(Pre-req Math 265; Math 207 or 317)  
3 Cr

**Com S 426**  
Introduction to Parallel Algorithms and Programming  
(Pre-req Cpr E 308 or Com S 321; Cpr E 315 or Com S 311)  
4 Cr

**Com S 435**  
Algorithms for Large Data Sets: Theory and Practice  
(Pre-req Com S 311)  
3 Cr

**Com S 454**  
Distributed Systems  
(Pre-req Com S 311; Com S 352 or Cpr E 308)  
3 Cr

**Com S 561**  
Database Design, Management, and Research  
(Pre-req Com S 311 or permission of instructor)  
3 Cr

**Com S 474**  
Intro to Machine Learning  
(Pre-req Com S 311, Stat 330 or Stat 305 or Stat 341 or Stat 347, Math 165, Engl 250)  
3 Cr

2

**ENGINEERING APPLICATIONS**

**Cpr E 388**  
Embedded Systems II: Mobile Platforms  
(Pre-req Cpr E 288)  
4 Cr

**Cpr E 425**  
High Performance Computing for Scientific and Engineering Applications  
(Pre-req Com S 311; Engl 250; SpCm 212)  
3 Cr

**E E 425**  
Machine learning: A Signal Processing Perspective  
(Pre-req E E 322/Stat 322 (preferred) or Stat 330; and Math 207 or 407 (preferred))  
3 Cr

3

**OPTIMIZATION**

**I E 312**  
Optimization  
(Pre-req C/E Math 267)  
3 Cr

**I E 483**  
Data Mining  
(Pre-req I E 148; I E 312; Stat 231)  
3 Cr

**I E 487**  
Big Data Analytics and Optimization  
(Pre-req I E 312; Stat 231)  
3 Cr

4

**SECURITY**

**Com S 421**  
Logic for Mathematics and Computer Science  
(Pre-req Math 301 or 207 or 317 or Com S 230 or Cpr E 310)  
3 Cr

**Com S 453**  
Privacy Preserving Algorithms and Data Security  
(Pre-req Com S 311)  
3 Cr

**Cpr E 431**  
Basics of Information System Security  
(Pre-req Com S 309)  
3 Cr

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**SOFTWARE ANALYTICS**

**Com S 342**  
Principles of Programming Languages  
(Pre-req C- in Com S 228 and Math 165; Com S 230 or Cpr E 310)  
3 Cr

**Com S 413**  
Foundations and Applications of Program Analysis  
(Pre-req Com S 342)  
3 Cr

**Com S 440**  
Principles and Practice of Compiling  
(Pre-req Com S 311 or 342; Engl 250; SpCm 212)  
3 Cr

**Com S 474**  
Intro to Machine Learning  
(Pre-req Com S 311, Stat 330 or Stat 305 or Stat 341 or Stat 474, Math 165, Engl 250)  
3 Cr

**Cpr E 416**  
Software Evolution and Maintenance  
(Pre-req Com S 309)  
3 Cr

6

**STATISTICS**

**Stat 471**  
Introduction to Experimental Design  
(Pre-req Stat 301 or 326 or 401 or 587)  
3 Cr

**Stat 473**  
Introduction to Survey Sampling  
(Pre-req Stat 301 or 326 or 401 or 587; Stat 341 or 347 or 447 or 588)  
3 Cr

**Stat 475**  
Introduction to Multivariate Data Analysis  
(Pre-req Stat 301 or 326 or 401 or 587; knowledge of matrix algebra)  
3 Cr

**Com S 474**  
Intro to Machine Learning  
(Pre-req Com S 311, Stat 330 or Stat 305 or Stat 341 or Stat 474, Math 165, Engl 250)  
3 Cr

7

**COMPUTATIONAL BIOLOGY**

**BcBio 322**  
Intro to Bioinformatics and Computational Biology  
(Pre-req Biol 212)  
3 Cr

**BcBio 401**  
Fundamentals of Bioinformatics and Computational Biology  
(Pre-req BcBio 322, basic programming experience, Math 160 or Math 165; Stat 101 or Stat 104; Math 166 or Stat 301)  
4 Cr

**BcBio 402**  
Fundamentals of Systems Biology and Network Science  
(Pre-req Biol 212)  
3 Cr

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**NUMERICAL ANALYSIS**

**Com S 474**  
Intro to Machine Learning  
(Pre-req Com S 311, Stat 330 or Stat 305 or Stat 341 or Stat 474, Math 165, Engl 250)  
3 Cr

**Math 373**  
Intro to Scientific Computing  
(Pre-req Math 265)  
3 Cr

**Math 407**  
Applied Linear Algebra  
(Pre-req Math 317; or Math 207 and experience w/ proofs)  
3 Cr

**Math 424**  
Introduction to High Performance Computing  
(Pre-req Math 265; Math 207 or Math 317)  
3 Cr

**Math 481**  
Numerical Methods for Differential Equations  
(Pre-req Math 265 and either Math 266 or Math 267)  
3 Cr