

PHD (DATA SCIENCE) [Option 1]
College of Science, College of Engineering, School of Statistics
Proposed date of effectivity: 1st Semester AY 2022-2023

Proposed: 58-60 units

FIRST YEAR

1st Semester	9-11 units
DS 301	3
Mathematical Methods*	3-5
Statistical Methods**	3

2nd Semester	9 units
Computational Methods***	3
Elective 1****	3
Elective 2 ****	3

SECOND YEAR

1st Semester	9 units
Elective 3 ****	3
Elective 4 ****	3
Elective 5 ****	3

2nd Semester	9 units
Elective 6 ****	3
Elective 7 ****	3
Special Topic 1 (DS 397)	3

THIRD YEAR

1st Semester	6 units
Special Topic 2 (DS 397)	3
Special Topic 3 (DS 397)	3

2nd Semester	4 units
DS 396	1
DS 399	3

FOURTH YEAR

1st Semester	12 units
DS 400 ^a	12

2nd Semester	0 units

NOTES:

* Any of the following courses may be taken and credited under Mathematical Methods:

1. Math 271.1 (Numerical Analysis I) [prerequisite: Math 171/COI]
2. AI 211 Computational Linear Algebra [prerequisite: COI]

3. Stat 207 (Statistical Inference for Data Science) [prereq: Stat 195/equiv., Stat 100/equiv.]
4. Stat 280 (Special Fields of Statistics) [prereq: COI; must be about topics in mathematical statistics]

Additional courses in this area may be added as approved by the Data Science Graduate Committee.

** Any of the following courses may be taken and credited under Statistical Methods:

1. IE 211 Quantitative Methods in Eng'g [prereq: none]
2. IE 230 Statistical Design and Analysis for Eng'g [prereq: IE 29 28/equiv.]
3. Any graduate statistics course prescribed by the Program Adviser

Additional courses in this area may be added as approved by the Data Science Graduate Committee.

*** Any of the following courses may be taken and credited under Computational Methods:

1. Physics 215 (Advanced Computational Methods of Physics) [prerequisite: App Phys 155/equiv.]
2. Stat 217 (Computational Statistics) [prereq: Stat 207/equiv.; coreq: Stat 208/equiv.]
3. Stat 280 (Special Fields of Statistics) [prereq: COI, must be about topics in Computational Methods]
4. CS 236 Scientific Computing [prereq: COI]
5. IE 271 Information Systems Engineering [prereq: COI]

Additional courses in this area may be added as approved by the Data Science Graduate Committee.

**** List of possible Electives:

1. CS 242 (Data Visualization) [prereq: COI]
2. CS 270 (Advanced Database Systems) [prereq: CS 165/equiv]
3. CS 282 (Computer Vision) [prereq: COI]
4. CS 289 (Digital Image Processing) [prereq: COI]
5. CS 294 (Advanced Topics in Computational Science) [prereq: COI]
6. CS 297 (Special Topics) [prereq: COI]
7. CS 298 (Special Problem) [prereq: completion 12 units]
8. CS 315 (Algorithms in Bioinformatics) [prereq: CS 135/COI]
9. CS 334 (Computational Systems Biology) [prereq: COI]
10. CS 380 (Computational Intelligence 1 - Evolutionary Computation) [CS 253/COI]
11. CS 381 (Computational Intelligence 2) [CS 280/COI]
12. EE 236 (Principles of Robotics) [prereq: COI]
13. EE 237 (Advanced Robotics) [prereq: ECE 131]
14. EE 238 Mobile Robotics (to be renamed "Autonomous Learning Machines") [prereq: COI]
15. EE 330 (Optimal Control) [prereq: EE 212]
16. EE 274 (Digital Signal Processing) [prereq: EEE 35/equiv]
17. IE 231 (Analysis of Production Systems) [Coreq IE 241]
18. IE 241 (Operations Research 1) [prereq: IE 214 or COI]
19. IE 242 (Operations Research 2) [prereq: IE 230 or COI]
20. IE 271 (Information Systems Engineering) [prereq: COI]
21. IE 272 (Data Engineering) [prereq: COI]
22. IE 273 (Analytics Systems Engineering) [prereq: COI]
23. IE 281 (Systems Simulation) [prereq: IE 230 and ES 26 or equiv]
24. Math 222 (Approximation Theory) [prereq: Math 220.1/COI]
25. Math 227 (Calculus of Variations) [prereq: COI]
26. Math 235 (Mathematics in Population Biology) [prereq: Math 122/COI]
27. Math 236 (Mathematics in Biological Processes) [prereq: COI]
28. Math 250 (Probability Theory) [prereq: Math 220.1/COI]
29. Math 265 (Stochastic Calculus) [prereq: Math 150.1/COI]
30. Math 266 (Mathematical Finance) [prereq: Math 265/COI]
31. Math 271.2 (Numerical Analysis II) [prereq: Math 271.1/COI]
32. Math 280 (Linear Programming) [prereq: COI]
33. Math 281 (Nonlinear Programming) [prereq: COI]
34. Math 285 (Introduction to Stochastic Optimization) [prereq: Math 40, Math 150.1]
35. Math 286 (Finite Graphs and Networks) [prereq: Math 285/COI]
36. Math 288 (Numerical Optimization) [prereq: Math 171.1/COI]
37. Physics 305 (Special topics in Theoretical Physics) [prereq: COI]
38. Physics 251 (Statistical Physics I) [prereq: Physics 151]
39. Physics 252 (Statistical Physics II) [prereq: Physics 251]
40. Stat 218 (Statistical Machine Learning) [prereq: Stat 217/equiv]
41. Stat 219 (Advanced Topics in Machine Learning) [prereq: Stat 218/COI]
42. Stat 227 (Knowledge Discovery in Data) [coreq: Stat 218/equiv]
43. Stat 240 (High Dimensional Data) [prereq: Stat 218/223/233/equiv/COI, Stat 217/226/equiv/COI]
44. Stat 241 (Nonlinear Regression) [prereq: Stat 218/223/233/equiv/COI]
45. Stat 245 (Survival Analysis) [Stat 207/222/232/equiv/COI]
46. Stat 247 (Data Mining and Business Intelligence) [prereq: COI]
47. Stat 249 (Nonparametric Modeling) [prereq: Stat 207/222/232/equiv/ COI, Stat 218/223/233/equiv/COI]
48. Stat 260 (Quantitative Risk Management) [Stat 218/223/233/equiv/COI, Stat 225/equiv/COI]
49. Stat 263 (Bayesian Analysis) [prereq: Stat 207/222/232/equiv/COI]

50. Stat 268 (Advanced Time Series Analysis) [Stat 218/223/233/equiv/ COI, Stat 225/equiv/COI]

51. Stat 269 (Advanced Categorical Data Analysis) [prereq: Stat 207/243/ equiv/COI]

52. Stat 280 (Special Fields of Statistics) [prereq: COI]

Any creditable graduate-level course from any or outside of the implementing units endorsed by the Program Adviser and the Graduate Committee of the implementing unit and approved by the Data Science Graduate Committee may be considered as Elective and added to the list of options under Electives.

A complete listing of Electives approved by the Data Science Graduate Committee shall be made available at the Graduate Office of each implementing unit.

^a For DS 400: Must have an approved dissertation topic before taking this course; Maybe taken in parts, provided a total of 12 units of DS 400 have been taken before being allowed to graduate. Each part may only be broken into 3-unit, 4-unit and 6-unit courses, or their multiples (i.e., 3, 4, 6, 8, 9, or 12 units respectively corresponding to 3, 4, 6, 8, 9, or 12 hours of independent study).

PHD (DATA SCIENCE) [Option 2]*
 College of Science, College of Engineering, School of Statistics

Proposed date of effectivity: 1st Semester AY 2022-2023

Proposed: 37 units

FIRST YEAR

1st Semester	9 units
DS 301	3
Elective 1 **	3
Elective 2 **	3

2nd Semester	6 units
Elective 3 **	3
Special Topic 1 (DS 397)	3

SECOND YEAR

1st Semester	6 units
Special Topic 2 (DS 397)	3
Special Topic 3 (DS 397)	3

2nd Semester	4 units
DS 396	1
DS 399	3

THIRD YEAR

1st Semester	12 units
DS 400 ***	12

2nd Semester	0 units
--------------	---------

NOTES:

* Minimum admission requirement: Master's degree in science or engineering with at least 24 units of graduate courses from a recognized institution of higher learning. Additional requirements will be imposed for those with a professional master's degree. Specifically, they may be required to take relevant graduate courses. And for those coming from a non-thesis or non-research track master's degree, they must show proof of competence to do graduate-level research.

** List of possible Electives:

1. CS 242 (Data Visualization) [prereq: COI]
2. CS 270 (Advanced Database Systems) [prereq: CS 165/equiv]
3. CS 282 (Computer Vision) [prereq: COI]
4. CS 289 (Digital Image Processing) [prereq: COI]
5. CS 294 (Advanced Topics in Computational Science) [prereq: COI]
6. CS 297 (Special Topics) [prereq: COI]
7. CS 298 (Special Problem) [prereq: completion 12 units]
8. CS 315 (Algorithms in Bioinformatics) [prereq: CS 135/COI]
9. CS 334 (Computational Systems Biology) [prereq: COI]
10. CS 380 (Computational Intelligence 1 - Evolutionary Computation) [CS 253/COI]
11. CS 381 (Computational Intelligence 2) [CS 280/COI]
12. EE 236 (Principles of Robotics) [prereq: COI]
13. EE 237 (Advanced Robotics) [prereq: ECE 131]
14. EE 238 Mobile Robotics (to be renamed "Autonomous Learning Machines") [prereq: COI]
15. EE 330 (Optimal Control) [prereq: EE 212]

16. EE 274 (Digital Signal Processing) [prereq: EEE 35/equiv]
17. IE 231 (Analysis of Production Systems) [Coreq IE 241]
18. IE 241 (Operations Research 1) [prereq: IE 214 or COI]
19. IE 242 (Operations Research 2) [prereq: IE 230 or COI]
20. IE 271 (Information Systems Engineering) [prereq: COI]
21. IE 272 (Data Engineering) [prereq: COI]
22. IE 273 (Analytics Systems Engineering) [prereq: COI]
23. IE 281 (Systems Simulation) [prereq: IE 230 and ES 26 or equiv]
24. Math 222 (Approximation Theory) [prereq: Math 220.1/COI]
25. Math 227 (Calculus of Variations) [prereq: COI]
26. Math 235 (Mathematics in Population Biology) [prereq: Math 122/COI]
27. Math 236 (Mathematics in Biological Processes) [prereq: COI]
28. Math 250 (Probability Theory) [prereq: Math 220.1/COI]
29. Math 265 (Stochastic Calculus) [prereq: Math 150.1/COI]
30. Math 266 (Mathematical Finance) [prereq: Math 265/COI]
31. Math 271.2 (Numerical Analysis II) [prereq: Math 271.1/COI]
32. Math 280 (Linear Programming) [prereq: COI]
33. Math 281 (Nonlinear Programming) [prereq: COI]
34. Math 285 (Introduction to Stochastic Optimization) [prereq: Math 40, Math 150.1]
35. Math 286 (Finite Graphs and Networks) [prereq: Math 285/COI]
36. Math 288 (Numerical Optimization) [prereq: Math 171.1/COI]
37. Physics 305 (Special topics in Theoretical Physics) [prereq: COI]
38. Physics 251 (Statistical Physics I) [prereq: Physics 151]
39. Physics 252 (Statistical Physics II) [prereq: Physics 251]
40. Stat 218 (Statistical Machine Learning) [prereq: Stat 217/equiv]
41. Stat 219 (Advanced Topics in Machine Learning) [prereq: Stat 218/COI]
42. Stat 227 (Knowledge Discovery in Data) [coreq: Stat 218/equiv]
43. Stat 240 (High Dimensional Data) [prereq: Stat 218/223/233/equiv/COI, Stat 217/226/equiv/COI]
44. Stat 241 (Nonlinear Regression) [prereq: Stat 218/223/233/equiv/COI]
45. Stat 245 (Survival Analysis) [Stat 207/222/232/equiv/COI]
46. Stat 247 (Data Mining and Business Intelligence) [prereq: COI]
47. Stat 249 (Nonparametric Modeling) [prereq: Stat 207/222/232/equiv/ COI, Stat 218/223/233/ equiv/COI]
48. Stat 260 (Quantitative Risk Management) [Stat 218/223/233/equiv/COI, Stat 225/equiv/COI]
49. Stat 263 (Bayesian Analysis) [prereq: Stat 207/222/232/equiv/COI]
50. Stat 268 (Advanced Time Series Analysis) [Stat 218/223/233/equiv/ COI, Stat 225/equiv/COI]
51. Stat 269 (Advanced Categorical Data Analysis) [prereq: Stat 207/243/ equiv/COI]
52. Stat 280 (Special Fields of Statistics) [prereq: COI]

Any creditable graduate-level course from any or outside of the implementing units endorsed by the Program Adviser and the Graduate Committee of the implementing unit and approved by the Data Science Graduate Committee may be considered as Elective and added to the list of options under Electives.

A complete listing of Electives approved by the Data Science Graduate Committee shall be made available at the Graduate Office of each implementing unit.

*** For DS 400: Must have an approved dissertation topic before taking this course; Maybe taken in parts, provided a total of 12 units of DS 400 have been taken before being allowed to graduate. Each part may only be broken into 3-unit, 4-unit and 6-unit courses, or their multiples (i.e., 3, 4, 6, 8, 9, or 12 units respectively corresponding to 3, 4, 6, 8, 9, or 12 hours of independent study).

PHD (DATA SCIENCE) [Option 3]*
College of Science, College of Engineering, School of Statistics

Proposed date of effectivity: 1st Semester AY 2022-2023

Proposed: 26 units

FIRST YEAR

1st Semester	5 units
DS 301	3
DS 398	2

2nd Semester	3 units
DS 398	2
DS 396 **	1

SECOND YEAR

1st Semester	3 units
DS 398	2
DS 396 **	1

2nd Semester	3 units
DS 398	2
DS 396 **	1

THIRD YEAR

1st Semester	12 units
DS 400 ***	12

2nd Semester	0 units

NOTES:

* Minimum admission requirement: (a) Master's degree in science or engineering with at least 24 units of graduate courses from a recognized institution of higher learning. Additional requirements will be imposed for those with professional master's degree and/or may be required to take relevant credit courses; (b) At least three (3) publications in a highly-reputable publishing medium included in a list approved by the Data Science Graduate Committee, at least one (1) of which the applicant must be the lead/primary author and published in the last five years; and (c) Presentation of capsule proposal for dissertation research and endorsement by at least two (2) faculty members from the members of Data Science Graduate Committee.

** Each DS 396 requires a colloquium presentation.

*** For DS 400: Must have an approved dissertation topic before taking this course; Maybe taken in parts, provided a total of 12 units of DS 400 has been taken before being allowed to graduate. Each part may only be broken into 3-unit, 4-unit and 6-unit courses, or their multiples (i.e., 3, 4, 6, 8, 9, or 12 units respectively corresponding to 3, 4, 6, 8, 9, or 12 hours of independent study).