Is the Data Science Pathway Right for You?

Through the Data Science (DS) elective pathway, you'll practice Python and R programming, learn about probability and statistics, and explore the fundamental principles, techniques, challenges, and applications of data science, machine learning, and more. Through the three elective courses in the DS elective pathway, you'll gain the knowledge and skills to lead data science projects, shape data strategy, and make informed decisions that impact organizations across various industries. The DS elective pathway is ideal for professionals who want to use data to guide business strategy, build predictive models, and develop advanced analytical capabilities that support IT leadership roles across industries.

In preparation for your program start in the DS pathway, all students are encouraged to review the following resources:

Installation/Getting Started Resources

➢ Self-Assessment Test (Answer Key)

Programming, Course, and Software Resources

➢ IBM: Python Basics for Data Science
➢ Coursera: Python 3 Programming and Statistics with Python
➢ R Programming for Data Science
➢ Book recommendations:
  ○ Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python
  ○ R for Everyone: Advanced Analytics and Graphics (Addison-Wesley Data & Analytics Series) 2nd Edition

➢ Slack Pro Channel ($20/semester); includes AI Teaching Assistant
➢ Git/ GitHub (free account available!)

Technical Resources and Requirements

➢ USD's Information Technology Services Hardware Recommendations
➢ Windows Operating System - 16 GB, 1.5 GHz Speed I7 + 500 GB external memory (preferably SSD hard disk drive). How-to-Check Guide Here!
➢ Microsoft Office is required (free with your USD account!)

➢ Speakers or headset – to listen and record multimedia.
➢ Webcam – for recording video.
➢ High-speed internet connection required (DSL or better).
➢ Browser Plug-ins – Windows Media Player, QuickTime, Adobe Reader, and Java.

Additional Academic Resources

➢ Khan Academy: Calculus
➢ Khan Academy: Statistics
➢ Khan Academy: Linear Algebra

➢ Math is Fun: Statistics
➢ Calculus eTextbook by Gilbert Strang
➢ Paid Tutoring: Wyzant.com – external tutoring resources available per hour

Course Descriptions

The curriculum of this specialized track blends IT leadership core courses with data science-focused electives, as shown below.

ADS 500A Probability and Statistics for Data Science	This course is an introduction to probability and statistical concepts and their applications in solving real-world problems. This prerequisite course provides a solid background in the application of probability and statistics that will form the basis for advanced data science methods. Statistical concepts, probability theory, random and multivariate variables, data and sampling distributions, descriptive statistics, and hypothesis testing will be covered. The use of computer-based applications for the performance of basic statistics will be utilized. Covered topics include the numerical and graphical description of data, elements of probability, sampling distributions, probability distribution functions, estimation of population parameters, and hypothesis tests. This course will combine the learnings from texts, case studies, and standard organizational processes with practical problem-solving skills to present, structure, and plan the problem as it would be presented in large enterprises and execute the steps in a structured analytics process.
ADS 500B Data Science Programming	This course is an introduction to fundamental concepts of programming and problem-solving techniques for data science. Python and R are the languages used to analyze and deliver insights from real-world datasets. Topics include the basics of Python and R, data acquisition, integration and transformation, problem understanding, data preparation, standardization, and exploratory data analysis. In addition, command line tools and editors are explored in UNIX, and methods to access and analyze RDBMS databases are examined. The course ends with introducing students to the basics of machine learning models.
ADS 501 Foundations of Data Science and Data Ethics	This course covers an introduction to the methods, concepts, and ethical considerations found and practiced in the field of professional data science. Topics include defining and structuring the problem, managing the business, the CRISP-DM and Agile processes, ensuring the science in data science using the scientific method, project management, managing ethical concerns and model bias, and the importance of performing exploratory data analysis. This course will combine the learnings from case studies, texts, and standard organizational processes with practical problem-solving skills to present, structure, plan, and present the problem as it would be done in large enterprises, including executing steps in the data science work-stream. Prerequisites: ADS 500A and ADS 500B. Both ADS 500A and ADS 500B can be waived by the Academic Director based on an evaluation of the student's professional background and academic history.