Graduate Certificate in Agricultural Data Science

List of suggested courses (updated May 2025)

A Graduate Certificate is similar to a minor and is designed to complement a student's major program of study. This program is open only to enrolled, degree-seeking graduate students at the University of Georgia. The curriculum is highly interdisciplinary and **requires a total of 16 credit hours across four areas**. Two required core courses integrate analytical approaches and case studies from a range of disciplines. A capstone seminar features intramural and invited speakers across disciplines and industries. Elective courses are drawn from different colleges and Institutes across the university. The curriculum has been designed such that prerequisites for core and elective courses will not be prohibitive for students coming from a range of different disciplines and graduate majors.

Certificate Areas:

- Area 1: Agricultural Data Science Core (6 credits): Two required courses covering the foundations in descriptive and predictive analytics in the agri-food sciences and providing context for and integration among more specialized data science elective courses.
- Area 2: Analytical Foundations (3 credits): More specialized elective courses in the foundations of data science: programming, data management, statistics, econometrics, and/or data mining.
- Area 3: Analytical Applications (at least 6 credits): Elective courses from a range of applications including precision agriculture, geographic information science, imaging and sensing, agricultural statistics, bioinformatics, and consumer analytics, among others.
- Area 4: Seminar in Agricultural Data Science (1 credit): Interdisciplinary seminar course featuring UGA and external (industry and academia) speakers highlighting diverse applications in agricultural analytics.

AREA 1: AGRICULTURAL DATA SCIENCE CORE

Take AESC 6100 and (INFO 8000 or CRSS 8030):

AESC 6100 - Applied Agricultural Data Science (3 credits)

This course will cover a variety of modern approaches for analyzing and interpreting data types commonly encountered in the agri-food sciences (including but not limited to variable selection and transformation, decision trees, neural networks, regression models, combination of models, and text mining).

INFO 8000 – Foundations of Informatics for Research and Practice (3 credits)

This interdisciplinary course provides instruction and exposure to the theory, tools, and techniques that connect data to information, knowledge, and decisions. Students will gain the knowledge and skills necessary to deeply engage in the increasingly interdisciplinary, data-

driven, security-focused industrial and research enterprises as they complete practical analytical tasks and projects.

CRSS 8030 – Data Science and Statistical Programming Applied to Agriculture (3 credits)
Students will be exposed to data analytical workflows in agriculture utilizing data science principles. Workflows include analysis of designed and observational data (analysis of variance, regression, machine learning). Tasks will be performed using data science tools for reproducibility like version control, R, open data, code automation, and interactive dashboards.

AREA 2: ANALYTICAL FOUNDATIONS (Programming, Statistics, Data Mining, Data Management)
Take 3 credits:

AAEC 6610 – Quantitative Techniques in Agricultural Economics (3 hours)
Basic quantitative techniques in agricultural economic theory, emphasizing basic models used in the study of prices, marketing, and production.

AAEC 6630 or 6630E - Quantitative Tools for Agribusiness Management (3 credits)
Quantitative methods for agribusiness management focused on seven topics, including statistical tests, regression, forecasting, linear programming, non-linear optimization, multi-criteria decision making, and simulation models. These tools are introduced in lecture and then put to practical use in the computer lab using SAS and Excel.

AESC 6200 – Artificial Intelligence (AI) in Agriculture: Principles and Applications (3 credits)
Explore applications of AI in modern agriculture. Students will learn how to apply AI in the agricultural domain that include analysis of numerical data, computer vision applications, and natural language processing. Class periods will consist of lectures, coding demos, hands-on exercises, and discussions of example applications.

BINF 8006 - Programming and Data Structures for Informatics (4 credits)
An intensive introduction to fundamental concepts in programming and data structures and their application to everyday use in informatics analyses. Hands-on exercises will emphasize problem-solving and writing code to collect, analyze, and present results.

CSCI 6370 – Database Management (4 Credits)
The theory and practice of database management. Topics to be covered include efficient file access techniques, the relational data model as well as other data models, query languages, database design using entity-relationship diagrams and normalization theory, query optimization, and transaction processing.

STAT 6360 or 6360E – Statistical Software Programming (3 credits)
Programming techniques in modern statistical software, including SAS and R for students with some experience with computer programming. Topics include data input/output; data formats and types; data management; flow control, conditional execution, and program design; statistical graphics and exploratory data analysis; basic procedures, and functions for statistical modeling and inference.

STAT 6365 or 6365E - Modern Statistical Programming (3 credits)
Statistical analysis and data manipulation in R and Python. Implementation of SQL. Topics include data input/output; data formats and types; data management; functions for statistical modeling; introduction to algorithms; flow control and program design; and programs for complex data manipulation and analysis. Additional topics may include MATLAB and parallel computing.

AREA 3: ANALYTICAL APPLICATIONS

In consultation with the Certificate Coordinator, choose at least 6 credits from graduate-level courses with an analytical or quantitative focus and having prefixes from graduate programs in the College of Agricultural and Environmental Sciences, College of Engineering, College of Family and Consumer Science, or School of Forestry and Natural Resources. Suitable course topics may include precision agriculture, geographic information science, imaging and sensing, agricultural statistics, bioinformatics, and consumer analytics, among others.

AREA 4: SEMINAR IN AGRICULTURAL DATA SCIENCE

This course is required:

AESC 8150 – Seminar in Agricultural Data Science (1 credit)

Capstone seminar course featuring UGA and external speakers (industry and academia) highlighting diverse applications in agricultural analytics.

More detailed information about all courses, including the semesters when they are offered, is available in the UGA Bulletin (http://bulletin.uga.edu/). For more information about the Certificate, please visit https://site.caes.uga.edu/agdatascience/