

# Undergraduate Certificate in **Data Fluency**

## OVERVIEW

This certificate is designed to provide non-STEM and STEM undergraduate students with exposure to basic data manipulation and analysis. It will provide basic fluency in the basic principles, issues, and tools within the field of data science. Those seeking an ability to develop and deploy data science tools should seek the undergraduate certificate in data science.

**Mathematical Prerequisite:** MATH 1010 (College Algebra)

**Expected Learning Outcomes:** Statistical familiarity, programming familiarity, data wrangling, ethics of data, and familiarity with some area applications.

<b>Statistical Familiarity - 3 hours, at least one of the following courses</b>	
MATH 1070	Introduction to Statistical Inference (3)
MATH 3070	Applied Statistics I (4)
CS 3130/ECE 3530	Engineering Probability and Statistics (3)
FCS 3210	Statistics in Family and Consumer Studies (4)
SOC 3122	Social Statistics (3)
PSY 3100	Statistical Methodology in Psychology (3)
ECON 3640	Probability and Statistical Inference for Economists
ME EN 2550	Probability and Statistics (3)

These courses should have the following expected learning outcomes:

- Elements of exploratory data analysis (data summaries; descriptive statistics; etc.)
- A working knowledge of the normal distribution and its role in sampling
- A working knowledge of linear regression and correlation, uses and limitations of the central limit theorem and the normality assumption, and basics of testing and confidence intervals

<b>Programming Familiarity - 3 hours, at least one of the following courses</b>	
COMP 1010	Programming for All I (3)
CS 1400	Introduction to Computer Programming (3)
CS 1420	Accelerated Introduction to Object Oriented Programming (3)

These courses should have the expected learning outcomes:

- Write small functions and scripts to accomplish desired tasks
- Use external code and packages in their own programs to add functionality
- Debug and modify small programs
- Should have enough programming (preferably in python) to prepare students for Data Wrangling courses

<b>Data Wrangling - 3 hours, at least one of the following courses</b>	
DS 2500	Data Wrangling (3)
MATH 4100/COMP 5360	Introduction to Data Science (3)

These courses should have the expected learning outcomes:

- Learn how to acquire, obtaining data from existing sources (basic web-scraping, working with APIs, databases)

<b>Ethics of Data</b> <b>3 hours, at least one of the following courses (Additional courses taken may fulfill Application Elective hours)</b>	
DS 3390	Ethics of Data Science (3)
HONOR 3112	How Not to Lie with Statistics (3)
MKTG 4650	Fair Machine Learning Algorithms for Business Decisions (3)
PHIL 3390	Technology and Design Ethics (3)

These courses should have the expected learning outcomes:

- Learn about foundational theories of ethics and their application
- Understand the data science pipeline and how harms might be introduced even far downstream

**Applications Electives (minimum of 11 hours required)**

Application electives should expose students to scientific, engineering, or societal topics which are dependent on “data”(broadly defined) and its interpretation. They will provide students exposure to subject specific data and how it is analyzed or otherwise used within the discipline.

Full list of pre-approved courses is here:

<https://www.cs.utah.edu/wp-content/uploads/2024/02/Data-Fluency-Electives.pdf>

To propose using a course not pre-approved, please email: [DS-Ugshelp@cs.utah.edu](mailto:DS-Ugshelp@cs.utah.edu)