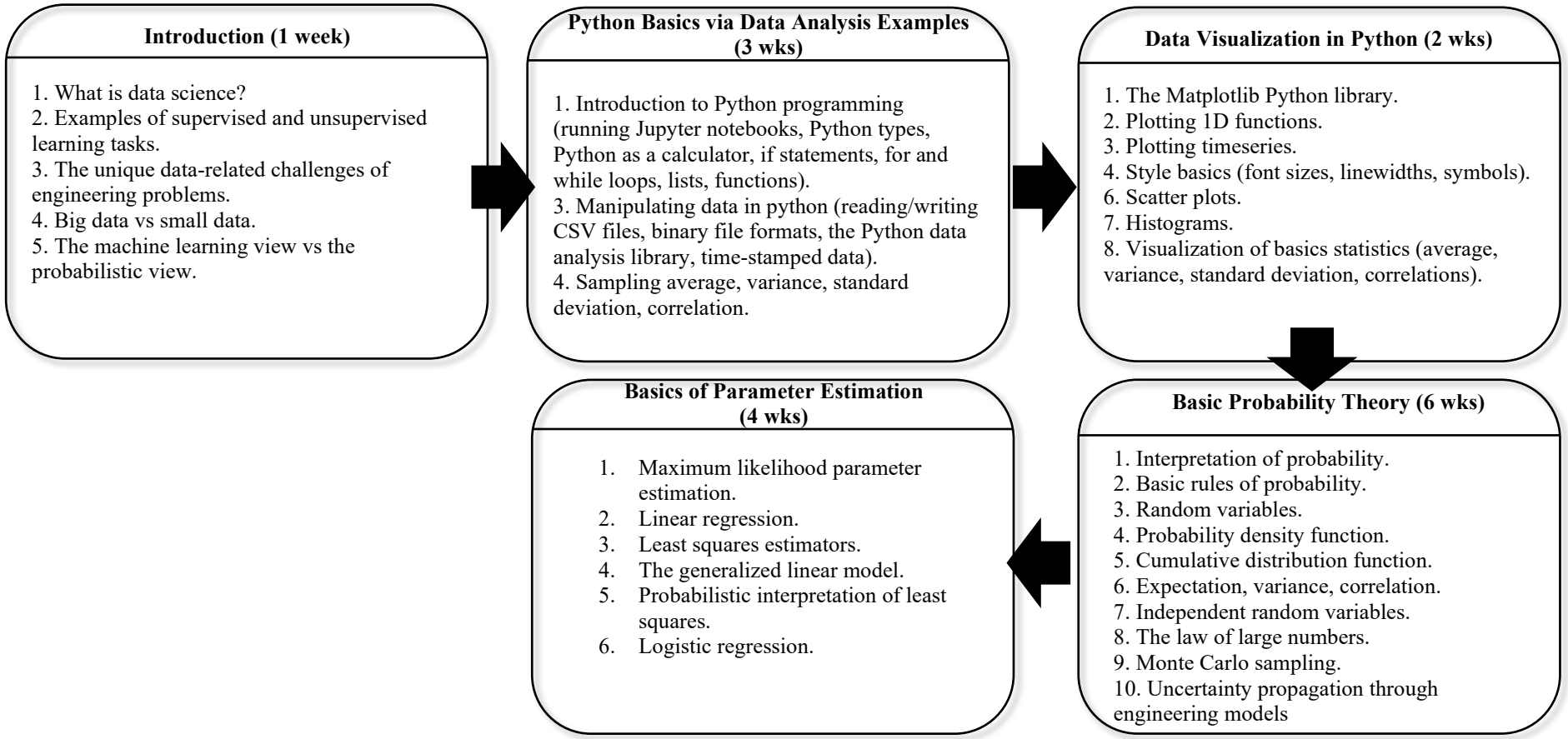
ME 23900
INTRODUCTION TO DATA SCIENCE FOR MECHANICAL ENGINEERS

Course Outcomes

1. Represent mathematically uncertainty in engineering models and assess quantitatively its effect on quantities of interest. [1]
2. Demonstrate the data-driven calibration of engineering models. [1]
3. Introduce the basics of constructing, calibrating, and evaluating data-driven models for common supervised learning tasks. [1]
4. Demonstrate how engineering knowledge and data to make decisions under uncertainty. [1, 2]
5. Improve Python programming and data visualization skills. [3]



COURSE NUMBER: ME 23900

COURSE TITLE: Introduction to Data Science for Mechanical Engineers

REQUIRED COURSE OR ELECTIVE COURSE: ELECTIVE COURSE

TERMS OFFERED: Spring, Fall

TEXTBOOK/REQUIRED MATERIAL: None

PRE-REQUISITES: CS 159, MA 261, MA 262 (or permission by the instructor)

COORDINATING FACULTY: I. Bilionis

COURSE DESCRIPTION:
Introduction to the fundamentals of data science for mechanical engineers. The fundamentals taught in this course are relevant to many modern Mechanical Engineering applications including:

- Autonomous systems (e.g., vehicles, robots, buildings)
- Fault detection, diagnosis, and prognosis (e.g., gears, motors, HVAC systems, human biological organs such as the heart or lungs)
- Human machine interaction (e.g., VR, haptics, robot-human collaboration)

COURSE OUTCOMES:

1. Represent mathematically uncertainty in engineering models and assess quantitatively its effect on quantities of interest. [1]
2. Demonstrate the data-driven calibration of engineering models. [1]
3. Introduce the basics of constructing, calibrating, and evaluating data-driven models for common supervised and unsupervised learning tasks. [1]
4. Demonstrate how engineering knowledge and data can be combined to make decisions under uncertainty. [1, 2]
5. Improve Python programming and data visualization skills. [3]

ASSESSMENTS TOOLS:

1. Class participation.
2. Weekly homework.
3. Project reports (initial, midterm, and final).

RELATED ME PROGRAM OUTCOMES:

1. Engineering fundamentals
2. Engineering design
3. Communication skills

PROFESSIONAL COMPONENT:
None

NATURE OF DESIGN CONTENT:

The students will be able to use data analysis to (i) estimate the parameters of engineering models which can be used to predict the performance of new designs with quantified uncertainties; (ii) build data analysis techniques in engineered artifacts to give them more capabilities.

COMPUTER USAGE: All class activities, homework, and the project require students to write Python code in the form of Jupyter notebooks

COURSE STRUCTURE/SCHEDULE:
Lecture – 1 day per week at 50 minutes

PREPARED BY: I. Bilionis

REVISION DATE: 5 / 19 / 2025