# COMP 5100/6100: COMPUTATION FOR AI

**Course Description:** This course introduces programming and computational problem solving through hands-on applications in Artificial Intelligence and Machine Learning. The course emphasizes Python programming, data manipulation, visualization, and foundational AI workflows using practical, application-driven examples. Students will develop the programming skills and computational fluency necessary for introductory coursework in AI, machine learning, and data-centric computing.

**Prerequisites:** None

**Credit Hours:** 3

**Objectives:** By the completion of this course, students will be able to:

- Demonstrate proficiency in Python programming for AI and data-driven applications.
- Apply computational thinking and problem-solving techniques to implement simple AI workflows.
- Use foundational programming constructs including functions, control flow, modular programming, and debugging techniques.
- Manipulate, process, and visualize structured data using commonly used AI and machine learning libraries.
- Develop simple AI and machine learning pipelines using existing software frameworks.
- Work with text, image, and tabular data in introductory AI applications.
- Utilize APIs, notebooks, and AI development tools commonly used in modern AI workflows.
- Utilize generative AI assistants responsibly for programming, experimentation, and software development.

**Tentative Course Outline:**

Week 1: Introduction to Programming for AI, Python Environment, Computational Thinking

Week 2: Variables, Data Types, Expressions, Input/Output, and Basic Operators, Assignment 1

Week 3: Conditional Statements, Loops, Functions, and Modular Programming

Week 4: Lists, Tuples, Dictionaries, and Basic Data Manipulation, Assignment 2

Week 5: File Handling, CSV Processing, and Working with Real-World Data

Week 6: NumPy Arrays and Numerical Computing for AI, Assignment 3

Week 7: Data Visualization and Exploratory Data Analysis with Pandas and Matplotlib

Week 8: Midterm Review and Midterm Examination

Week 9: Introduction to Machine Learning Workflows and Scikit-learn, Assignment 4

Week 10: Regression, Classification, and Model Evaluation Basics

Week 11: Working with Images and Introductory Computer Vision Pipelines, Assignment 5

Week 12: Working with Text Data and Introductory NLP Pipelines

Week 13: APIs, Foundation Models, and Generative AI Programming Interfaces

Week 14: Mini AI Application Development and Project Workshops

Week 15: Responsible AI, Ethics, Privacy, and Safe AI-Assisted Programming

Week 16: Course Review and Final Exam