Course Number:	EGR 215-2
Course Title:	Fundamentals of Computational Science
Term and Year:	Spring 2026
Instructor:	Dr. Chris Wentworth (call me Chris)
Email:	chris.wentworth@doane.edu
Phone:	402-450-2080
Office:	
Office Hours:	T/Th 2:30 PM – 3:30 PM using Zoom
Course Dates/Times:	1/12/2026 - 5/14/2026 M/W 1:00 PM - 2:15 PM Lied 238
Prerequisites:	High School precalculus or equivalent.
Course Description:	Computational science lies at the intersection of the natural/social sciences, mathematics, and computer science. It involves using computational tools such as numerical computing/analysis, computer simulations, scientific visualization, symbolic computing, statistical analysis, and mathematical modeling to solve problems in the sciences. This course introduces students to the modeling process, methods of solving or simulating models using a computer, methods of statistical analysis for validating models, visualization techniques, basic programming, and elements of good programming practice. Open source computational tools will be used. Students who complete the course will be able to work through the process of designing, coding, and debugging a computer program; use a general approach to creating mathematical models in a variety of disciplines; map scientific or mathematical modeling problems to a computational framework; implement solutions or simulations of models using appropriate Python code; use basic statistical tools to assess reliability of models; use computer graphics tools to visualize model solutions or simulations; and collaborate successfully in a team working on a project.
Credits:	3
Textbook:	*Computational Science: An Introduction for Scientists and Engineers*. C.D. Wentworth. (2025). ISBN: 9798992800210. Web Version , Purchase Print Copy
Learning Outcomes:	**Course-level Objectives**: Upon successful completion of the course, students will: 1. Apply computational thinking to solve scientific and engineering problems. 2. Create mathematical models to describe selected natural and engineered systems.

3. Map scientific or mathematical models to an established scientific computing framework to create a computational solution.
4. Develop Python code that implements a computational solution.
5. Use data to validate a model.
6. Develop computer-generated visualizations to aid in understanding natural and engineered systems.
7. Develop communication strategies for working on team-based projects.

ABET Student Outcomes
This course addresses the following ABET Student Outcomes.

Upon graduation from the Doane University Bachelor of Science in Engineering Program a student will demonstrate:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Instructional Methods:

You will participate in lectures, small group problem-solving activities, readings, computer programming activities, drafting project reports with feedback, and homework assignments to accomplish the learning outcomes for the course.

Course Requirements:

Activities: Selected assignments that help develop an understanding of concepts. Most of these will be done in class. Each of these assignments will have a due date. Generally, no late assignments will be accepted without penalty.

Assessment Quizzes: Activities that test understanding of concepts. Each of these assignments will have a due date. Generally, no late assignments will be accepted without penalty.

Program Development Problems: Programming assignments that require developing and coding a solution to a computational problem. Each of these assignments will have a due date. Generally, no late assignments will be accepted without penalty.

Final Project: A project that involves application of the complete problem-solving strategy developed in the course. The project will be team-based, requiring collaboration among the team members.

Course Evaluation:

Course work will be weighted according to the following percentages:

Activities	30
Assessment Quizzes & Activities	20
Program Development Problems	35
Final Project	15

Using the percentage weights shown in the above table, a weighted average is calculated according to the equation shown below. Your grade is then assigned according to the above table using the weighted average.

$$W = W_{TW}\frac{n_{TW}}{N_{TW}} + W_A\frac{n_A}{N_A} + W_L\frac{n_L}{N_L} + W_P\frac{n_P}{N_P}$$

symbol	definition
W_i	percentage weight of category *i*
n_i	earned points in category *i*
N_i	possible points for category *i*

Your grade is then assigned according to the following table using the weighted average.

A+	97-
A	92-96+
A-	90-91+
B+	87-89+
B	81-86+
B-	80-81+
C+	77-79+
C	72-76+
C-	70-71+
D+	67-69+
D	62-66+
D-	60-61+

Preliminary Class Plan and Topics:

Week	**Topics**
1	Defining Computational Thinking
2	Logic, Algorithms, Basic Python Concepts
3	Selection Control and Iterative Control
4	Developing Algorithms, Scientific Models

5	Python Functions, Intro to Scientific Visualization
6	Solving Dynamical Systems Models
7	Fitting a Model to Data
8	Introduction to Stochastic Simulations
9	More Scientific Visualization
10	Software Project Infrastructure
11	Team Software Development Practice
12	Monte Carlo Simulations
13	Monte Carlo Simulations continued
14	Advanced Scientific Visualizations
15	Project Work
16	Project Work

Technical Support Contact Information:

If you are in need of technical assistance please access the Self Service Portal. You may reach the help desk at 402-826-8411 or by email at helpdesk@doane.edu.

Academic Integrity:

Fundamental to our mission, our core values, and our reputation, Doane University adheres to high academic standards. Students of Doane University are expected to conduct themselves in a manner reflecting personal and professional integrity. Disciplinary actions may be taken against students whose academic behavior is not congruent with the expectations of the University. Students are responsible for adhering to the standards detailed in this policy. Not being familiar with these standards does not mean that the students will not be accountable for adherence to them. Additional details on the Academic Integrity policy for violating academic integrity are published in the undergraduate and graduate catalogs.

Course-Specific Academic Integrity Items:

For this particular course acts of dishonesty include representing someone else's work as your own on quizzes and project reports.

AI Statement:

At Doane University, the responsible use of generative AI is permitted for academic purposes with the explicit guidance of course instructors. Generative AI must be used ethically and in accordance with Doane University's Academic Dishonesty policy and procedures found in Doane University Undergraduate and Graduate Catalogs.

When submitting an assignment for evaluation you: (1) make sure the facts are verified and accurately expressed, especially if they originate from generative AI resources; (2) make sure that all sources that go beyond common knowledge are suitably attributed; (3) make sure all specific requirements of the assigned work are respected, such as with transparency and documentation of process, or have been explained where this is not possible.

If any statement above is not true, whether by intent or negligence, you have violated your commitment to truth, and possibly other aspects of academic integrity, which will be subject to disciplinary action under university policies and procedures. Course instructors will provide specific guidance on what tools are permitted or not permitted,

when they are allowed or not allowed, and why the tools are allowed or not allowed for particular coursework.

Accommodations: Any student who feels that they may need an accommodation based upon the impact of a disability should contact me (Dr. Wentworth) privately to discuss their specific needs. If you think you need such an accommodation and have a documented disability, please contact the office of Disability Services for students with disabilities at accessibility@doane.edu or by calling 402-466-4774. Additional information is available at https://www.doane.edu/disability-services

Course Participation: Doane University expects active participation from students in a course, whether the course is on-ground or online. A student is expected to be prompt and regularly attend on-ground classes in their entirety. If you miss class due to an excused absence and have informed the instructor beforehand, then you will be permitted to make up any missed work, but it will be your responsibility to schedule the make-up work with me (Dr. Wentworth).

Syllabus Changes: The instructor and Doane University reserve the right to make changes as necessary to this course syllabus. All students will be notified of any changes.

Doane Syllabus Addendum: Each student is responsible for being aware of the policies, resources, and expectations as specified in the Doane Syllabus Addendum found at: https://www.doane.edu/Syllabus.