

ACMS/Math 20210: Scientific Computing

Meeting: MWF 9:25-10:15 a.m. @ DeBartolo Hall 131

Instructor: Dr. Daniel Brake **Office:** Hurley Hall 152 B
email: dbrake@nd.edu
Office Hours: Mondays 10:30-11:30,
Wednesdays 8:00-9:00, and by appointment.

Teaching Assistant: Liang Wu **Office:** 215 Hayes-Healy
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Office Hours: Thursdays 3-4pm

Course Description: An introduction to solving mathematical problems using computer programming in high-level languages such as C.

Prerequisites: MATH 10560 or MATH 10860 or MATH 10360 (or concurrently)

Textbook: "Engineering problem solving with C++, 3rd Edition" by Delores M. Etter and Jeanine A. Ingber, Prentice Hall 2012.

Grades: Letter grade based on percentage of total points available:

Homework	150
Quizzes	100
Project	150
Final Exam	100

Homework and Project: Homework assignments will be assigned on Sakai and collected electronically. Over the course of the semester, a project will be assigned and developed. Assignments must be submitted before the due date and time. Late homework will be accepted, with 33.3% deduction for each day after the due date. Homework more than 2 days late will be accepted and graded, but no points given.

Quizzes: There will be in-class quizzes, on average weekly. No advance notice will typically be given. *Without a properly documented university excused absence, there will be no make-ups.*

Final Exam: There will be a final exam, worth 20% of your grade, at the location and time assigned by the registrar: **Tuesday May 5, 8:00am – 10:00am**. See also <http://registrar.nd.edu/pdf/FESpring.pdf>

*If the number of points in the homework category is not 150 at the end of the semester, it will be scaled to 150 points. E.g., if 136 points are assigned and available, you will earn $x \cdot 150 / 136$ end-points in the homework category, where x is the raw pre-scaled number you have earned.

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Honor Code: Each of quizzes, homework, project, and final are conducted under the honor code. While cooperation in small groups in doing homework and projects is permitted (encouraged!), but copying is not. Quizzes and final are to be done completely by you with no help from others.

Attendance: Your attendance is expected. While no points will be given for attendance, I will collect data.

Tentative Syllabus

Weeks 1 - 4

- How to get from {science, math, statistics} to computer programming –
Planning
 (1) Flow charts (2) data identification (3) process description
Control structures
 (1) Conditional Expressions: if/else, switch
 (2) Iterations: while, do/while, for, break, continue
Unified Modeling Language (UML)

Weeks 5 - 8

- Simple C++ programs –
 (1) Program structure (2) Data types (3) C++ operators, input and output
 (4) Basic mathematical functions (5) Working with data files
 (6) Programmer-defined functions (7) Parameter passing (8) Documentation

Weeks 9 - 13

- Bigger C++ programs –
 (1) Linking against other libraries (2) Data container choices
 (3) One- and two- dimensional arrays (4) matrices
 (5) Object Oriented Programming (OOP), custom classes.

Weeks 14 - 15

- Conclusions, project presentations

Week 16

- Final exam, **Tuesday May 5, 8:00am - 10:00am**. Location TBD