



Hunan University CS 23: Computer Problem Solving

Professor: To be announced
Total contact hours: 54 hours
Credit: 4

Course Description

This course provides a concise and clear outlook of engineering problem solving. Solving methodology is presented and incorporated during the whole course. Students will learn the flexibility in the ordering pg topics covering the essentials of mathematics, arrays, procedural programming, sorting and searching, ect. All the applications focus on engineering sphere with emphasis on scientific and engineering examples and problems.

Required Material

Textbook: Engineering Problem Solving with C++
Author: Delores M. Etter, Jeanine A. Ingber
Publisher: Person
Publication Year: 2016

Grading

2 Papers 20%

2 Quizzes

20% 2 Midterm Exams

30%		
Final Exam		
30%		

A+ 96-100	A 90-95	A- 85-89
B+ 82-84	B 78-81	B- 75-77
C+ 71-74	C 66-70	C- 62-65
D 60-61	F < 60	

Course Schedule

The course has 24 class sessions in total. All sessions are 2 hours and 15 minutes in length.
Note: the course outline and required readings are subject to change.



Class 1:

Chapter 1: Problem Solving

- 1.1 Historical Perspective
- 1.2 Recent Engineering Achievements
- 1.3 Computing Systems

Class 2:

Chapter 1: Problem Solving (Cont.)

- 1.4 Data Representation and Storage
- 1.5 An Engineering Problem-Solving Methodology

Class 3:

Chapter 2: Simple C++ Programs

- 2.1 Program Structure
- 2.2 Constants and Variables
- 2.3 C++ Classes
- 2.4 Building C++ Solutions with IDEs: Xcode
- 2.5 C++ Operators

Class 4:

Chapter 2: Simple C++ Programs (Cont.)

- 2.6 Standard Input and Output
- 2.7 Building C++ Solutions with IDEs: NetBeans
- 2.8 Basic Functions Included in the C++ Standard Library
- 2.9 Problem Solving Applied: Velocity Computation
- 2.10 System Limitations

Paper 1

Class 5:

Chapter 3: Control Structures: Selection

- 3.1 Algorithm Development
- 3.2 Structured Programming
- 3.3 Conditional Expressions

Class 6:

Chapter 3: Control Structures: Selection (Cont.)

- 3.4 Selection Statements: if Statement
- 3.5 Numerical Technique: Linear Interpolation
- 3.6 Problem Solving Applied: Freezing Temperature of Seawater
- 3.7 Selection Statements: switch Statement
- 3.8 Building C++ Solutions with IDEs: NetBeans
- 3.9 Defining Operators for Programmer-Defined Data Types

Quiz 1



Class 7:

Chapter 4: Control Structures: Repetition

- 4.1 Algorithm Development
- 4.2 Repetition Structures 156
- 4.3 Problem Solving Applied: GPS
- 4.4 Break and Continue Statements

Class 8:

Chapter 4: Control Structures: Repetition (Cont.)

- 4.5 Structuring Input Loops
- 4.6 Problem Solving Applied: Weather Balloons
- 4.7 Building C++ Solutions with IDEs: Microsoft Visual C++

Class 9:

Chapter 5: Working with Data Files

- 5.1 Defining File Streams
- 5.2 Reading Data Files
- 5.3 Generating a Data File

Class 10:

Chapter 5: Working with Data Files (Cont.)

- 5.4 Problem Solving Applied: Data Filters-Modifying an HTML File
- 5.5 Error Checking
- 5.6 Numerical Technique: Linear Modeling
- 5.7 Problem Solving Applied: Ozone Measurements
- 5.8 Building C++ Solutions with IDEs: Xcode-Weather Patterns

Class 11:

Review of Chapters 1 - 5

Mid-Exam 1

Class 12:

Chapter 6: Modular Programming with Functions

- 6.1 Modularity
- 6.2 Programmer-Defined Functions
- 6.3 Parameter Passing
- 6.4 Problem Solving Applied: Calculating a Center of Gravity
- 6.5 Random Numbers

Class 13:

Chapter 6: Modular Programming with Functions (Cont.)

- 6.6 Problem Solving Applied: Instrumentation Reliability
- 6.7 Defining Class Methods
- 6.8 Problem Solving Applied: Design of Composite Materials



6.9 Numerical Technique: Roots of Polynomials

6.10 Problem Solving Applied: System Stability

6.11 Numerical Technique: Integration

Paper 2

Class 14:

Chapter 7: One-Dimensional Arrays

7.1 Arrays

7.2 Problem Solving Applied: Hurricane Categories 357

7.3 Statistical Measurements

7.4 Problem Solving Applied: Speech Signal Analysis

Class 15:

Chapter 7: One-Dimensional Arrays (Cont.)

7.5 Sorting and Searching Algorithms

7.6 Problem Solving Applied: Tsunami Warning Systems

7.7 Character Strings

7.8 The String Class

7.9 Building C++ Solutions with IDEs: Xcode Vegetation Maps

7.10 The Vector Class

7.11 Problem Solving Applied: Calculating Probabilities

Class 16:

Chapter 8: Two-Dimensional Arrays

8.1 Two-Dimensional Arrays

8.2 Problem Solving Applied: Terrain Navigation

8.3 Two-Dimensional Arrays and the Vector Class

Class 17:

Chapter 8: Two-Dimensional Arrays (Cont.)

8.4 Matrices

8.5 Numerical Technique: Solution to Simultaneous Equations

8.6 Problem Solving Applied: Electrical Circuit Analysis

8.7 Higher-Dimensional Arrays

Class 18:

Review of Chapters 6 - 8

Mid-Exam 2

Class 19:

Chapter 9: An Introduction to Pointers (Cont.)

9.1 Addresses and Pointers

9.2 Pointers to Array Elements

9.3 Problem Solving Applied: El Niño-Southern Oscillation Data



9.4 Dynamic Memory Allocation

Class 20:

Chapter 9: An Introduction to Pointers (Cont.)

9.5 Problem Solving Applied: Seismic Event Detection

9.6 Common Errors Using New and Delete

9.7 Linked Data Structures

9.8 The C++ Standard Template Library

9.9 Problem Solving Applied: Concordance of a Text File 525

Quiz 2

Class 21:

Chapter 10: Advanced Topics

10.1 Data Abstraction

10.2 Building C++ Solutions with IDEs: Xcode Image Files

10.3 Binary File Input and Output

Class 22:

Chapter 10: Advanced Topics (Cont.)

10.4 Problem Solving Applied: Color Image Processing

10.5 Recursion

10.6 Generic Programming

10.7 Inheritance

10.8 Virtual Methods

10.9 Problem Solving Applied: Iterated Prisoner's Dilemma

Class 23:

Review of Chapters 8 - 10

Preparation for the Final Exam

Class 24:

Final Exam

Attending Policy

Regular and prompt attendance is required. Under ordinary circumstances, you may miss two times without penalty. Each absence over this number will lower your course grade by a third of a letter and missing more than five classes may lead to a failing grade in the course. Arriving late and/or leaving before the end of the class period are equivalent to absences.

Policy on "Late Withdrawals"

In accordance with university policy, appeals for late withdrawal will be approved ONLY in case of medical emergency and similar crises.



Academic Honesty

Hunan University expects all students to do their own work. Instructors will fail assignments that show evidence of plagiarism or other forms of cheating, and will also report the student's name to the University administration. A student reported to the University for cheating is placed on disciplinary probation; a student reported twice is suspended or expelled.

General Expectations:

Students are expected to:

- Attend all classes and be responsible for all materials covered in class and otherwise assigned;
- Complete the day's required reading and assignments before class;
- Review the previous day's notes before class and make notes about questions you have about the previous class or the day's reading;
- Participate in class discussions and complete required written work on time;
- Refrain from texting, phoning or engaging in computer activities unrelated to class during the class period;
- While class participation is welcome, even required, you are expected to refrain from private conversations during the class period.

Special Needs or Assistance

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.