



Nanchang University CS 23: Computer Problem Solving

Credit: 4

Contact Hours

This course is composed of 24 lecture sessions, 3 tutorial sessions and 9 office contact hours. Each lecture session takes 2 contact hours in length; each tutorial session takes 3 contact hours in length; There will be a Q-A review session(3 contact hours) and Final Exam (3 contact hours) at the end of this term. This course has 72 contact hours in total.

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 of topics covering the essentials of mathematics, arrays, procedural programming, sorting and searching, etc. All the applications focus on engineering sphere with emphasis on scientific and engineering examples and problems.

Required Textbook

Engineering Problem Solving with C++, Delores M. Etter, Jeanine A. Ingber, Person, 2016

Grading

- Participation 10%
- Papers 20%
- Quizzes 20%
- Midterm Exams 20%
- 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 contact hours in length. At the end



of this term, there will be a Q-A review session(3 contact hours) and Final Exam (3 contact hours).

Note: the course outline and required readings are subject to change.

Class 1:

Historical Perspective

Recent Engineering Achievements; Computing Systems

Reading: Chapter 1: Problem Solving

Class 2:

Data Representation and Storage

An Engineering Problem-Solving Methodology

Reading: Chapter 1: Problem Solving

Class 3:

Program Structure; Constants and Variables

C++ Classes; Building C++ Solutions with IDEs: Xcode; C++ Operators

Reading: Chapter 2: Simple C++ Programs

Quiz 1

Class 4:

Standard Input and Output; Building C++ Solutions with IDEs: NetBeans

Basic Functions Included in the C++ Standard Library

Problem Solving Applied: Velocity Computation; System Limitations

Reading: Chapter 2: Simple C++ Programs

Paper 1

Class 5:

Algorithm Development; Structured Programming; Conditional Expressions

Selection Statements: if Statement; Numerical Technique: Linear Interpolation

Reading: Chapter 3: Control Structures: Selection

Class 6:

Problem Solving Applied: Freezing Temperature of Seawater

Selection Statements: switch Statement; Building C++ Solutions with IDEs: NetBeans

Defining Operators for Programmer-Defined Data Types

Reading: Chapter 3: Control Structures: Selection

Class 7:

Algorithm Development; Repetition Structures 156

Problem Solving Applied: GPS; Break and Continue Statements

Reading: Chapter 4: Control Structures: Repetition

Quiz 2



Class 8:

Structuring Input Loops; Problem Solving Applied: Weather Balloons

Building C++ Solutions with IDEs: Microsoft Visual C++

Reading: Chapter 4: Control Structures: Repetition

Class 9:

Defining File Streams; Reading Data Files

Generating a Data File

Reading: Chapter 5: Working with Data Files

Quiz 3

Class 10:

Problem Solving Applied: Data Filters – Modifying an HTML File

Error Checking; Numerical Technique: Linear Modeling

Problem Solving Applied: Ozone Measurements

Building C++ Solutions with IDEs: Xcode-Weather Patterns

Reading: Chapter 5: Working with Data Files

Class 11:

Review of Chapters 1 - 5

Mid-Exam 1

Class 12:

Modularity

Programmer-Defined Functions; Parameter Passing

Problem Solving Applied: Calculating a Center of Gravity; Random Numbers

Reading: Chapter 6: Modular Programming with Functions

Class 13:

Problem Solving Applied: Instrumentation Reliability; Defining Class Methods

Problem Solving Applied: Design of Composite Materials

Numerical Technique: Roots of Polynomials

Problem Solving Applied: System Stability; Numerical Technique: Integration

Reading: Chapter 6: Modular Programming with Functions

Paper 2

Class 14:

Arrays; Problem Solving Applied: Hurricane Categories 357

Statistical Measurements; Problem Solving Applied: Speech Signal Analysis

Reading: Chapter 7: One-Dimensional Arrays

Class 15:

Sorting and Searching Algorithms; Problem Solving Applied: Tsunami Warning Systems

Character Strings; The String Class; Building C++ Solutions with IDEs: Xcode Vegetation Maps

The Vector Class; Problem Solving Applied: Calculating Probabilities



Reading: Chapter 7: One-Dimensional Arrays

Class 16:

Two-Dimensional Arrays

Problem Solving Applied: Terrain Navigation

Two-Dimensional Arrays and the Vector Class

Reading: Chapter 8: Two-Dimensional Arrays

Class 17:

Matrices; Numerical Technique: Solution to Simultaneous Equations

Problem Solving Applied: Electrical Circuit Analysis

Higher-Dimensional Arrays

Reading: Chapter 8: Two-Dimensional Arrays

Quiz 4

Class 18:

Review of Chapters 6 - 8

Mid-Exam 2

Class 19:

Addresses and Pointers; Pointers to Array Elements

Problem Solving Applied: El Niño-Southern Oscillation Data

Dynamic Memory Allocation

Reading: Chapter 9: An Introduction to Pointers

Class 20:

Problem Solving Applied: Seismic Event Detection

Common Errors Using New and Delete; Linked Data Structures

The C++ Standard Template Library; Problem Solving Applied: Concordance of a Text File 525

Reading: Chapter 9: An Introduction to Pointers

Quiz 2

Class 21:

Data Abstraction

Building C++ Solutions with IDEs: Xcode Image Files; Binary File Input and Output

Reading: Chapter 10: Advanced Topics

Class 22:

Problem Solving Applied: Color Image Processing; Recursion

Generic Programming; Inheritance

Reading: Chapter 10: Advanced Topics

Class 23:

Virtual Methods; Problem Solving Applied: Iterated Prisoner's Dilemma



Class 24:

Review of Chapters 8 - 10

Preparation for the 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

Nanchang 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.