

# Course Syllabus for The C Programming Language

## I. Basic Information

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                   |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------|
| Course Code                                        | 109652                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | School Offering this Module | School of Electronics and Information Engineering |
| Course Name (Chinese)                              | C 语言课程设计                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |                                                   |
| Course Name (English)                              | The C Programming Language                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                   |
| Applicable Major                                   | Electronic Information Engineering, Communication Engineering, Electronic Science and Technology, Microelectronic Science and Engineering, Integrated Circuit Design and Integrated Systems                                                                                                                                                                                                                                                                                                                          |                             |                                                   |
| Course Category                                    | <input type="checkbox"/> General Education Category <input type="checkbox"/> Mathematics and Natural Sciences Category <input type="checkbox"/> Engineering Fundamentals Category <input type="checkbox"/> Professional Fundamentals Category <input type="checkbox"/> Professional Category<br><input type="checkbox"/> Professional Expansion Category <input checked="" type="checkbox"/> Engineering Practice and Graduation Design (Thesis) Category <input type="checkbox"/> Occupational (Direction) Category |                             |                                                   |
| Course Nature                                      | <input checked="" type="checkbox"/> Compulsory <input type="checkbox"/> Limited Elective <input type="checkbox"/> Elective                                                                                                                                                                                                                                                                                                                                                                                           |                             |                                                   |
| Credits                                            | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Credit Hours                | 60                                                |
| Smart Teaching Platform<br>Course Name and Website | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                   |

## II. Course Introduction

This course is a compulsory course of the Engineering Practice and Graduation Design (Thesis) category for majors of Electronic Information Engineering, Communication Engineering, Electronic Science and Technology, Microelectronic Science and Engineering, and Integrated Circuit Design and Integrated Systems. Prerequisite courses include Fundamentals of Computer Science and C Language Programming. In turn, this course serves as a prerequisite for Data Structures, Principles of Microcomputers, Principle and Application of Single Chip Computer, and other related courses. Within the curriculum system of the above majors, it plays a bridging role and is a highly important practice-oriented course. It cultivates students' ability to analyze and solve problems using software engineering approaches.

## III. Course Ideological and Political Education Requirements

1. Professional Ethics: Cultivate students' strong professional ethics, raising their legal and moral consciousness.
2. Spirit of Craftsmanship: Promote students' spirit of craftsmanship, nurturing their dedication to work and innovative mindset.
3. Team Spirit: Promote mutual support and assistance, and cultivate students' humility, friendliness, and team spirit.

#### IV. Course Objectives and Their Supporting Relationship with Learning Outcomes

This course needs to support 2 observation points in accordance with the learning outcomes of the applicable major. Under the guidance of observation points of learning outcomes, this course has developed 2 course objectives and corresponding assessment methods, as shown in Table 1.

Table 1: Relationship between Course Objectives and Learning Outcomes Support

| No. | Learning Outcomes            | Observation Point                                                                                                                                                                                                                                                                                                                                    | Course Objective                                                                                                                                                                                                                                                        | Assessment Method for Course Objectives                                       |
|-----|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| 1   | Design/Development Solutions | (Observation Point 3.1): Be able to design and develop functional components, testing schemes, or processes in the discipline to meet specified needs for particular complex engineering problems.                                                                                                                                                   | Course Objective 1: Be able to complete practical project requirement analysis, overall design, detailed design, coding verification, debugging, and testing based on software engineering principles, and pass acceptance according to the project task specification. | Achievement Degree = Course Objective 1 Score / Course Objective 1 Full Marks |
| 2   | Communication                | (Observation Point 10.2): Possess certain written and oral communication skills; be able to effectively communicate and exchange ideas with industry peers and the general public on complex engineering problems in the discipline; and be capable of writing reports and design documents, delivering presentations, and expressing ideas clearly. | Course Objective 2: Be able to complete daily assignments on time in accordance with software engineering principles, and prepare a comprehensive report on the course design, followed by an on-site defense, explanation, and demonstration.                          | Achievement Degree = Course Objective 2 Score / Course Objective 2 Full Marks |

#### V. Content and Requirements

This course requires students to work in groups of four. Based on software engineering principles, each group is to complete a project in C language, including requirement analysis, overall design, detailed design, coding verification, debugging, and testing. A comprehensive report must be written and successfully defended. The specific content is as follows:

##### 1. [Requirement Analysis] Problem Analysis and Task Definition (4 Class Hours) (Supporting Course Objective 1)

(1) Content: Analyze and fully understand the problem according to the requirements of the design task, clearly define what needs to be done, and identify the constraints.

(2) Requirements: Master methods of problem analysis; specify the tasks of program design using unambiguous statements; understand how to use use-case diagrams to clarify system functions.

(3) Key and Difficult Points: State the tasks of program design unambiguously; conduct thorough problem analysis to avoid errors in requirement analysis.

(4) Explanation: This stage addresses the question of "what to do." The aim is to fully understand the user's

requirements and accurately express the accepted user needs.

## **2. [Overall Design] Logical Design and Selection of Data Structures (4 Class Hours) (Supporting Course Objective 1)**

(1) Content: Define appropriate data structures for the objects of operation; divide the system into modules following the principles and methods of structured programming; define abstract data types for data.

(2) Requirements: Master the methods of logical design and selection of data structures.

(3) Key and Difficult Points: Logical design and selection of data structures.

(4) Explanation: The main task of this stage is to transform the data flow diagram obtained from requirement analysis into software and data structures. The specific tasks of software structure design include: dividing the overall system into modules according to functionality, establishing the hierarchy and calling relationships of modules, determining interfaces between modules, and designing the human-computer interface. Data structure design involves describing data characteristics, defining structural properties of data, and designing the database. Overall design establishes the logical model of the target system, independent of the computer platform.

## **3. [Detailed Design and Coding Verification] (4 Class Hours) (Supporting Course Objective 1)**

(1) Content: Detailed description of algorithms and program coding.

(2) Requirements: Master the methods of detailed design based on logical design, refining the results into programs written in programming languages. Add appropriate comments and assertions to make the logical concepts in the program clear.

(3) Key and Difficult Points: Carrying out detailed design based on logical design and implementing it through coding.

(4) Explanation: The main task of this stage is to design the implementation algorithm and required local data structures for each module. The objectives of detailed design are twofold: ensure the algorithm for realizing module functions is logically correct, and make the algorithm description concise and easy to understand.

## **4. [Debugging and Testing] (4 Class Hours) (Supporting Course Objective 1)**

(1) Content: Input of source programs and program debugging.

(2) Requirements: Proficiently master the various functions of debugging tools; design test data to locate suspected errors; verify or bypass them through program modifications. After successful debugging, carefully organize the source program and its annotations to produce a well-formatted and stylistically consistent source code listing and results. Understand methods for analyzing the time and space complexity of algorithms. Be aware of general approaches to code refactoring.

(3) Key and Difficult Points: Mastering the various functions of debugging tools.

## **5. [Writing the Comprehensive Report] Generating the Comprehensive Course Design Report and Defense (4 Class Hours) (Supporting Course Objective 2)**

(1) Content: Write the course design report according to the given template.

(2) Requirements: The cover page and main text of the design report must conform to the standard format requirements of Sanjiang University for course design and internship reports.

## VI. Schedule

| No.   | Content                                                                                                                                                                          | Course Objective   | Period (days) |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|
| 1     | [Requirement Analysis] Problem Analysis and Task Definition (Software Product Definition) + Submit Assignment 1                                                                  | Course Objective 1 | 0.5           |
| 2     | [Overall Design] Preliminary Design and Selection of Data Structures + Submit Assignment 2                                                                                       | Course Objective 1 | 0.5           |
| 3     | [Detailed Design and Coding Verification] + Submit Assignment 3                                                                                                                  | Course Objective 1 | 0.5           |
| 4     | [Debugging and Testing] + Submit Assignment 4                                                                                                                                    | Course Objective 1 | 0.5           |
| 5     | [Writing the Comprehensive Report] Combine the four assignments into a comprehensive course design report + Defense (explanation and demonstration, with at least two functions) | Course Objective 2 | 0.5           |
| Total |                                                                                                                                                                                  |                    | 2.5           |

## VII. Requirements for the Comprehensive Course Design Report

### 1. Report Content:

The outline of the comprehensive course design report (Word version) is as follows:

- (1) Project introduction;
- (2) Requirement analysis: Data Flow Diagrams (levels 0, 1, and 2); E-R diagram; state transition diagram;
- (3) Overall design: hierarchical structure diagram, interface design, data structure and database design;
- (4) Detailed design and coding verification: flowcharts, source code;
- (5) Debugging and testing: test cases for the part undertaken by the student;
- (6) System testing results with screenshots: overall test cases and screenshots.

### 2. Report Requirements:

The comprehensive course design report should provide a complete summary of the design process, organize and analyze data, distinguish the essential from the non-essential, and arrive at correct interpretations and understandings of phenomena and results.

The report must be written independently, with clear and fluent language, comprehensive yet concise content, clear focus, and creativity. Handwriting should be neat, charts and figures should be clear, analyses should be reasonable, and conclusions should be correct. The report must follow a standardized format, with a unified report template and cover page, and charts drawn on standardized coordinate paper. The report should be no less than 5,000 Chinese characters.

## VIII. Course Assessment and Grade Evaluation

### 1. Assessment Method

This course is assessed through examination and scored on a percentage scale.

### 2. Scoring Criteria and Methods

| No.         | Supporting Course Objectives | Scoring Points                                                                         | Grade Composition Ratio | Assessment/Evaluation Details                                                                                                                                                                                                                                                                                                                                  |
|-------------|------------------------------|----------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1           | Course Objective 1           | Complete requirement analysis and submit Assignment 1                                  | 10%                     | 1. Complete requirement analysis, overall design, detailed design and coding verification, debugging and testing of the training project, with outputs successfully validated.<br>2. Through the comprehensive training report and defense, demonstrate proficiency in report writing, communication and presentation skills, and successful project outcomes. |
| 2           |                              | Complete overall design and submit Assignment 2                                        | 10%                     |                                                                                                                                                                                                                                                                                                                                                                |
| 3           |                              | Complete detailed design and coding verification and submit Assignment 3               | 10%                     |                                                                                                                                                                                                                                                                                                                                                                |
| 4           |                              | Complete debugging and testing and submit Assignment 4                                 | 10%                     |                                                                                                                                                                                                                                                                                                                                                                |
| 5           | Course Objective 2           | Complete the comprehensive course design report and pass the defense and demonstration | 60%                     |                                                                                                                                                                                                                                                                                                                                                                |
| Total Score |                              |                                                                                        | 100%                    |                                                                                                                                                                                                                                                                                                                                                                |

## IX. Teaching Resources

### 1. Textbooks and Lecture Notes

(1) C Language Course Design, self-compiled lecture notes, author: Chen Yizhou, June 2022

### 2. Main Reference Books

(1) C Language Programming Tutorial (4th Edition), Zhu Minghua, Luo Xiaofang, Dong Ming, Meng Jun, Wang Degang (Eds.), China Machine Press, 2019.

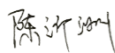
(2) C Primer Plus (5th Edition), written by Stephen Prata (USA), Yundian Studio, Posts & Telecom Press, 2013.

### 3. Main instruments and devices

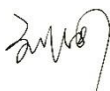
(1) PC or laptop computer;

(2) Dev C++ software.

Prepared by:



Reviewed by:



Approved by:



Preparation Date: July 2023