

## Syllabus\_CS0449 Introduction to Systems Software (2025-2026\_Spring)

### 1 General Information

- Course Number: 312195030; Credit hours: 3
- Instructor: Dr. CHEN Yanru, [chenyanru@scu.edu.cn](mailto:chenyanru@scu.edu.cn)
- Office: Rm417, PI New Building(North), Jiangan 江安匹兹堡学院大楼(北楼)417
- Office hours: Thur. at late afternoon, or schedule any mutually convenient time
- Lecture: Section 01 - **Thur., 13:50-16:25, Rm211, PI New Building(North)** (北楼)211  
- Teaching Assistant - ZENG Di, 2327900323@qq.com  
Section 02 - **Thur., 18:50-21:25, Rm211, PI New Building(North)** (北楼)211  
- Teaching Assistant - LUO Zhiwei, 3516024892@qq.com

### 2 Course Information

#### 2.1 Description

Introduction to Systems Software (SS) course is designed to teach you the vital concepts underlying a computer system which is comprised of both hardware and software. It aims to enhance the understanding of how hardware, operating systems (OS) and compilers interact and influence the performance and correctness of application programs. It explores issues of programming computer systems by examining abstractions, interfaces, and design decisions that influence the way that software runs. This includes the role OS has in communication and resource management. This course focuses on high-level models of modern processors, offering comprehensive insights into SS. It lays the groundwork for advanced programming and system development, adaptable for a 17-week semester.

#### 2.2 Prerequisite

CS0445 Data Structures; CREQ: CS0447 Computer Organization and Assembly Language

#### 2.3 Course Objectives

This course begins with the creation of executable programs in the C programming language. We will then explore the resultant program as it is stored on disk and as it is loaded for execution. Next, we will examine the interactions between our code and the code provided via libraries or the OS to facilitate common, low-level tasks. Lastly, we will look at the abstractions and resource management undertaken by OS & its drivers to facilitate communication & hardware interaction.

#### 2.4 Learning Outcomes

- Learning C programming. C is the most common language used for SS.
- Exploring the layout of an executable programs code and data both as stored on disk and loaded into memory.
- Interacting with the abstractions that libraries and the OS provide.
- Implementing abstractions and managing hardware resources through device drivers.

### 3 Textbooks & Readings

- **CSAPP3e**: Randal E. Bryant and David R. O'Hallaron, Computer Systems: A Programmer's Perspective, Third Edition (CS:APP3e), Pearson, 2016, North American Edition (ISBN-10: 0-13-409266-X).
- **Misurda**: Jonathan Misurda. Introduction to Systems Software (online). [https://people.cs.pitt.edu/~jmisurda/teaching/cs449/cs449\\_latest.pdf](https://people.cs.pitt.edu/~jmisurda/teaching/cs449/cs449_latest.pdf)

- **Practical C:** Oualline, Steve. Practical C Programming. OReilly, Sebastopol, CA, 1997. ISBN: 1-56592-306-5.
- **K&R:** Kernighan, Brian W. and Ritchie, Dennis M. C Programming Language. 2nd Ed. Prentice Hall PTR, 1988.
- **ALP:** Mark Mitchell, Jeffrey Oldham, Alex Samuel, Advanced Linux Programming (online). <https://ia800700.us.archive.org/22/items/ost-computer-science-advanced-linux-programming/Advanced%20Linux%20Programming.pdf>
- **LDD3:** Jonathan Corbet, Alessandro Rubini, and Greg Kroah-Hartman, Linux Device Drivers, Third Edition (online). <https://lwn.net/Kernel/LDD3/>
- **C Notes for Professionals:** The C Notes for Professionals book is compiled from Stack Overflow Documentation by GoalKicker.com (online). <https://goalkicker.com/CBook/>

#### 4 Schedule

The weekly **topics may be adjusted based on class progress**. They serve as a guide for your primary, supplementary and extra readings, helping you to concentrate on specific concepts.

Week	Date	Topics	Readings	Timeline
1	03.12	<b>Intro to the Course</b>	CSAPP3e: Chap 1	
2	03.19	C Programming: Data Types and Representation; Operators & Bitwise Manipulation, Control Flow, Arrays; <b>Representing and Manipulating Information1</b>	Practical C: Chap 1-11 CSAPP3e: Chap 2.1-2.2	
3	03.26	C Programming: Strings, Functions, Scope vs. Lifetime, Pointers; I/O, Console, Files, Memory management, malloc/free; <b>Representing and Manipulating Information2</b>	Practical C: Chap 12-23 Misurda: Chap 1-2 CSAPP3e: Chap 2.3-2.5	Project1 due(03.30)
4	04.02	Multi-file Development, Providing an interface/API, Header files, Makefiles; <b>Machine-Level Representation of Programs1</b>	PracticalC: Chap7,10,18 CSAPP3e: Cha3.1-3.5	
5	04.09	<b>Machine-Level Representation of Programs2</b>	CSAPP3e: Chap 3.6-3.7	
6	04.16	Presentation		Project2 due(04.16)
7	04.23	<b>Machine-Level Representation of Programs3</b>	CSAPP3e: Chap 3.8-3.12	Assignment1 due(04.24)
8	04.30	<b>Optimizing Program Performance1</b>	CSAPP3e: Chap 5.1-5.2	Assignment2 due(05.01)
9	05.07	<b>Optimizing Program Performance2</b>	CSAPP3e: Chap 5.3-5.4	Assignment3 due(05.08)
10	05.14	<b>The Memory Hierarchy1</b>	CSAPP3e: Chap6.1-6.2	
11	05.21	<b>Midterm</b> (exact time yet to be determined)		Mid-Exam
12	05.28	<b>The Memory Hierarchy2</b>	CSAPP3e: Chap6.3-6.7	Assignment4 due(05.29)
13	06.04	Program Representation, Linking(Static&Dynamic),Libraries,archives,shared objects,Executable file formats; <b>Linking</b>	Misurda: Chap 3, 4 CSAPP3e: Chap 7	Assignment5 due(06.05)
14	06.11	Linux Device Drivers, Signal Handling; <b>Exceptional Control Flow</b>	LDD3: Chap1, 2 CSAPP3e: Chap 8	Assignment6 due(06.12)
15	06.18	Processes & Address Spaces, Data Representation, Globals, constants, Activation Records, Arrays&Structures; <b>Virtual Memory</b>	Misurda: Chap 5, 7 CSAPP3e: Chap9	Assignment7 due(06.19)
16	06.25	<b>Final review</b> Interaction with Operating System, interrupts, calling convention/ABI, Syscalls; Threading, User vs. Kernel Threading, Scheduling/yield/sleep, Pthreads; Synchronization, Deadlock; Communication and Networking; <b>Operating Systems</b>	Misurda: Chap 8-11 ALP: Chap 3, 4, 8	
17	07.02	<b>Final</b> (exact time yet to be determined)		Final Exam

## 5 Grading Policy

### 5.1 Grading Structure

Total	Attendance	Assignments	Projects	Midterm Exam	Final Exam
100%	5%	20%	25%	25%	25%

**5.1.1 Attendance:** Besides 5% of attendance, attending lectures can effectively boost your grade, as **bonus points** are selectively awarded (it's recorded) based on factors like class interaction, individual improvement, random quizzes, & special roles like course representatives.

**5.1.2 Assignments:** See the Schedule for due date.

**5.1.3 Projects:** Specific requirements for the projects are attached or will be announced. Kindly remind that it's **mandatory** to do all projects; otherwise, this portion of grade is gone (as it's crucial to make the effort).

#### 5.1.4 Exam INSTRUCTIONS:

1. Exam is closed-book with **one** double-sided A4 sheet with handwritten or printed notes (Excluding pre-worked or pre-solved problems; No pasted/stuck-on materials; More than one sheet will be confiscated; Each individual **must** prepare your own sheet independently).

2. All materials (exam papers and A4 sheets) must be submitted together. Early submission is only allowed after 60 minutes.

3. During exam: Pencils & red pens are not allowed for answering; they're considered as drafts. Calculators & correction tapes are allowed, but **no borrowing**. Tearing papers by pages, talking to others, electronic aids such as smart glasses, smartwatches, phones are not allowed.

4. Full mark is 100; write **clearly** to avoid grading errors. If make a mess, clearly indicate your final answers. Answer directly in the provided space; no extra answer paper is needed. For your convenience, the provided space can work as drafts too, just clearly separate drafts from answers. Do not bring your own draft paper.

### 5.2 Grade Rebuttal

To correct honest grading mistakes & prevent unnecessary requests, one-time grade rebuttal requests are allowed. It includes regrading entire work for fairness, possibly altering grade up or down. Submit official requests via email within **certain period** set by instructors, not via social media (after the period, the grade is final). Requests must attach the typewritten paragraph clearly explaining perceived grading errors, with reasonably references.

### 5.3 Grace-day Policy

*For your well-being, if you encounter an ongoing issue where grace-day policy cannot help you, such as long-term hospitalization, etc., promptly inform advisor & instructor **before due date**, as it can affect all courses.*

You have **3 grace days** at your disposal for this course to handle any emergencies like computer issues, high workloads, medical situation, personal matters, family things, school events, etc. It's **automatically** used for attendance, assignments & projects in chronological order.

Grace days cannot be exchanged, traded, bought, or sold. We advise conserving them later for challenging submissions or unexpected emergencies where you have to use it.

### 5.3.1 Grace-day Policy for Attendance:

1. If informing instructor in advance for lecture absence due to **any emergencies** with some grace days left, your attendance will be fine as 1 grace day is automatically used.
2. Students are **responsible** to obtain missed materials due to own absence & complete all submissions based on the timeline. Ideally, following the original schedule helps your learning in a more structured way.

### 5.3.2 Grace-day Policy for Late Submissions (Assignments & Projects):

1. All submissions are due by **11:59pm** on due date, only latest one is graded; if submitted at 00:01am (2mins past), it's 1 day late because it's the next calendar day. Late submissions beyond grace days incur **20% daily penalty**; submissions are **not accepted more than 4 days** overdue.
2. If submitted 1 day late with grace days left, no penalty incurs as 1 grace day is automatically used; if submitted 4 days late with 3 grace days left, 1-day penalty incurs as 3 grace days are automatically used; if submitted 4 days late with no grace days left, 4-day penalty incur; if submitted 5 days late, it's considered not done and grace days do not apply.
3. Submission time is based on system's submitted timestamp, not the file's completion time.

## 6 Academic Integrity

Students must maintain professionalism, honesty, integrity & ethical standards throughout the semester. **Cheating is strictly prohibited** including unauthorized materials, copying, or viewing others' solutions, etc. You may discuss & share insights (that's how you learned), but you must work independently & submit your own work.

Specifically, violations in submissions result in heavy score penalties for both parties (don't take away others' learning opportunities). Violations in exams directly lead to disciplinary actions under University's Academic Integrity Policy. **Thanks!**

**Pay attention to the timeline. The stage is all yours. Enjoy!**