INFSCI 0310: Computation in Information Science

Fall, 2023-2024

Instructor: Kunpeng Wang

E-mail: **kunpeng.wang@scupi.cn**

Office Hours: Tue./Wed. 8-11 am, Tue. 12:30-5 pm, Fri. 12:30-2 pm

Office: Room **3-317A** SCUPI Building

Course Description

The objective of this course is to introduce the mathematical and computational techniques used in information science with an emphasis on modeling and analysis of information technology (i.e., computers, data centers, communication networks). Topics course covers fundamental concepts, such as probability, statistical analysis of measurement data, matrix methods, graph theory, and simulation and modeling techniques. Also Covers Basic mathematical concepts that are relevant to information science, including matrix operators, probability, graph theory, binary codes, and entropy.

Section: 01

Class Room: Room **4-212** SCUPI Building

Class Hours: Thursday 8:15-9:00 am, 9:10-9:55 am, 10:15-11:00 am

Teaching Assistant: Ke Xu

QQ/Wechat Group: 796407311

Email: **kexu567@gmail.com**

Section: 02

Class Room: Room **4-212** SCUPI Building

Class Hours: Friday 8:15-9:00 am, 9:10-9:55 am, 10:15-11:00 am

Teaching Assistant: Yifan Chen

QQ/Wechat Group: 891741116

Email: **chenyifan2526@stu.scu.edu.cn**

Tutorials: Tuesday 11:10 am, 3-101 SCUPI Building, or,

Wednesday 11 am, 3-102 SCUPI Building

Prerequisites

MATH 0220 Analytic Geometry and Calculus 1

Course Objectives

This course develops the problem solving, modeling, mathematical and algorithmic techniques. In this course, students will be able to:

1. Understand the commonly used mathematics such as matrix operations, probability in modeling.
2. Become familiar with the basic concepts of logic, set theory, graph theory.

3. Use several tools and techniques to solve specific problems with computers.
4. Employ the R software to conduct calculation and data analysis.
5. Know the basics of optimization and simulation.

Course Content

We will cover several somewhat independent/disjoint topics related to computation in information science.

Class Structure

Lectures.

Tutorials

No regular tutorials. Notices for occasional tutorials will be given when necessary.

Course Materials

Textbook: Computational Thinking for the Modern Problem Solver, 7th Edition, by Kenneth H. Rosen, McGraw-Hill, 2012.

Suggested Reading: R programming Manuals can be found at https://cran.r-project.org/doc/manuals/. You may find *R-intro.pdf* and *R-data.pdf* useful.

Software Requirements

We will use **R programming** for this course. R is an open-source software and its most up-to-date version can be downloaded from https://cran.r-project.org/bin/windows/base/ for Windows, and https://cran.r-project.org/bin/macosx/ for Mac OS. Afterwards, please also download and install **RStudio Desktop**, which is a powerful and free interface of R, from https://rstudio.com/products/rstudio/download/.

Blackboard

Please regularly log on and check https://learn.scupi.cn/. We will upload there lecture notes, assignments, projects, announcements and your grades.

Course Assessment

Biweekly assignments, occasional quizzes, class activities, projects, midterm and final exams.

Schedule of Exams, Assignments and Quizzes

Exams

Date	Time	Component
Week 10	2 hours	Midterm exam
Final exam week (Dec 23 to Dec 29)	2 hours	Final exam

Assignments

Homework assignments will be given out biweekly. They will be due by the following two weeks at the beginning of each corresponding section, 8:15 am. Plagiarism will not be tolerated. However, discussions of the assignment problems will be permited. Please also note each student must submit his/her individual assignment.

Quizzes

Students will be asked to complete a quiz in occasional tutorials. Normally, a quiz will consist of a short question.

Projects

Students will work in groups of $4-5$ students on the final project. It is the responsibility of the groups to manage their own interactions and individual participation. The groups will make a professional-level presentation for the project during Weeks 16 and 17. Each student in a group will receive the same grade based on the assessment of the project written report and presentation.

Start	Due	Component
Nov 20, 2023	Dec29, 2023	Final Project

Grading Policy

The final grade will be computed according to the following scheme:

Scheme: Total grade = 20 % Assignments + 25 % Midterm Exam + 30 % Final Exam + 15 % Project + 10 % Quizzes and Attendance.

Conversion of Numerical Grades to Final Letter Grades Follows the SCUPI Common Grade

A $[90,100]$ A- $[85,90)$ B+ $[80,85)$ B $[76,80)$ B- $[73,76)$ C+ $[70,73)$ C $[66,70)$
C- $[63,66)$ D+ $[61,63)$ D $[60,61)$ F $(60,0)$

Schedule and weekly learning goals

The schedule is tentative and subject to change. The listed objects below should be viewed as the key concepts you should grasp after each week, and also as a study guide before each exam, and at the end of the semester. Each exam will base on material that was taught up until the second last week prior to the test, namely, the midterm exam covers Weeks 01-08. The final exam will cover all topics taught in this semester.

Week 01, 09/04-09/08

- Course introduction.
- Computational thinking and modeling.
- R programming.

Week 02, 09/11-09/15

- Representing information.

Week 03, 09/18-09/22

- Coding and boolean logic.

Week 04, 09/25-09/29

- Set theory and counting.

Week 05, 10/02-10/08

- National Day Holiday.
- Basic probability concepts.
- Bayes rules.

Week 06, 10/09-10/13

- Discrete and continuous random variables.

Week 07, 10/16-10/20

- Generating random numbers and variates.

Week 08, 10/23-10/27

- Descriptive statistics.

Week 09, 10/30-11/03

- **Midterm Exam**.
- Confidence intervals.

Week 10, 11/06-11/10

- Hypothesis test.

Week 11, 11/13-11/17

- Simple and multiple linear regression.

Week 12, 11/20-11/24

- Vector and matrix algebra.
- Linear system of equations.

Week 13, 11/27-12/01

- Basics of graph theory.

Week 14, 12/04-12/08

- Linear and integer optimization.
- Continuous methods.

Week 15, 12/11-12/15

- System dynamics models with interaction.
- Euler's method.

Week 16, 12/18-12/22

- Discrete event models.

Weeks 17 & 18, 12/25-01/05 Final Exam Week

Course Policies

There will be no special treatments for any students in this course! For example, if you have a heavy course load, you should expect a steep learning curve and be prepared for it. You will not be exempted from any assignments.

During Class

Computers may be allowed in class for the electronic recording of notes. But please refrain from using computers for any activities that are unrelated to the course. Phones are prohibited as they are rarely useful for anything in the course. Eating and drinking are allowed in class but please keep from it affecting the course.

Attendance Policy

Attendance is expected in all lectures. Valid excuses for absence will be accepted before class. In extenuating circumstances, valid excuses with proof will be accepted after class.

Policies on Late Assignments and Exams

Students should start their homework assignments immediately after the assignments are given, and DO NOT wait until the last minute to meet the deadlines. **Late assignments will be NOT accepted except for emergencies and health issues. Any other late assignments handed in will be marked but will be given 0**. At most **Two** extensions for assignments will be given in this course. All assignments will be counted in your total grade. **Late submission for previous assignments during the final exam period will NOT be accepted in any form for any excuses**.

All tests and the final exam are mandatory. There will be absolutely no makeup exam for each test. If you miss the final, a makeup exam may be given for the final exam if the student has the approval from the instructor or emergencies and health issues **with a valid proof**. I will not accept the student deceleration for absence form for the final exam.

Academic Integrity

At Sichuan University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do.

Everyone at SCUPI is expected to treat others with dignity and respect. The Code of

Student Conduct allows Sichuan University to take disciplinary action if students don't follow this community expectation.