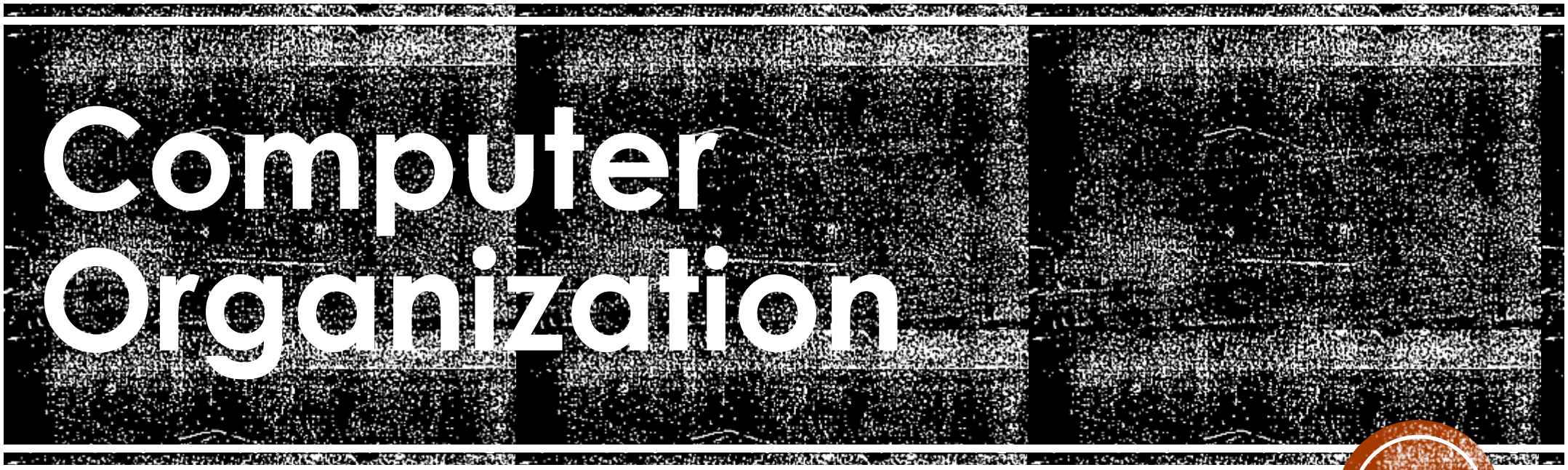


Fall 2022 – CSCI 2500 – Syllabus

Konstantin Kuzmin – kmkuzmin@gmail.com

Course instructors

- Konstantin Kuzmin
  - Office: Amos Eaton 112
  - Office hours: Monday 8:00 am – 9:45 am and
    Thursday 8:00 am – 9:45 am
    or by appointment
  - Email: comporginstructors@cs.lists.rpi.edu
    kmkuzmin@gmail.com

Teaching Assistants (TAs)

Please attend only your assigned labs!

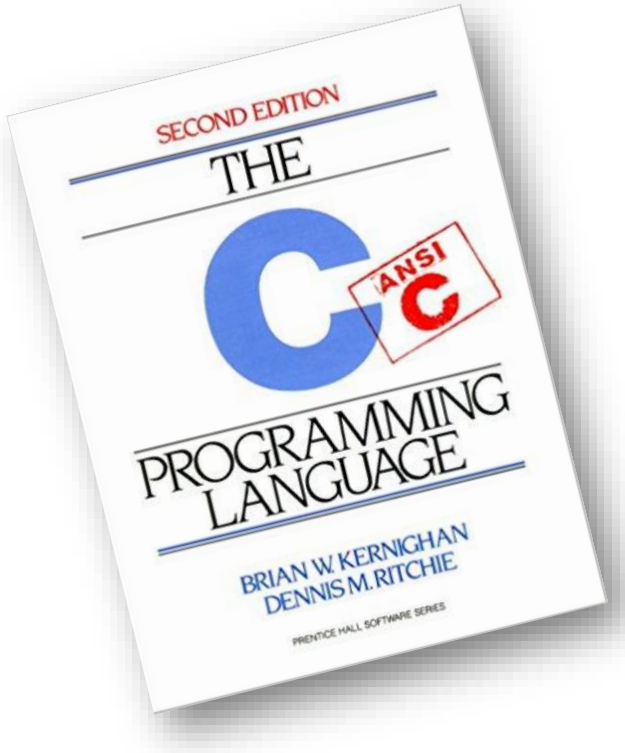
- Xiao Zou (comporg-staff@cs.lists.rpi.edu or zoux2@rpi.edu)
  - Lab: Section 01 10:00 am – 11:50 am in in LOW 4050
  - Office hours: Thursday 2:00 pm – 4:00 pm in TBA
- Neha Keshan (comporg-staff@cs.lists.rpi.edu or keshan@rpi.edu)
  - Lab: Section 02 12:00 pm – 1:50 pm in LOW 3051
  - Office hours: Monday 12:00 pm – 2:00 pm in TBA
    Tuesday 10:00 am – 12:00 pm in TBA
- Shrey Jain (comporg-staff@cs.lists.rpi.edu or jains6@rpi.edu)
  - Lab: Section 03 2:00 pm – 3:00 pm in LOW 4050
  - Office hours: Friday 4:00 pm – 8:00 pm in TBA
- Nathaniel Adair (comporg-staff@cs.lists.rpi.edu or adairn@rpi.edu)
  - Lab: Section 04 4:00 pm – 5:50 pm in LOW 4050
  - Office hours: Tuesday 4:00 pm – 6:00 pm in TBA
    Thursday 12:00 pm – 2:00 pm in TBA

Undergraduate mentors

Undergraduate mentors are here to assist you in the labs and office hours

- Toba Akinyemi
- Griffin Bates
- Mingyi Chen
- Yuetian Chen
- Christos Kreatsoulas
- Patiphon Loetsuthakun
- Jack Mansfield
- Javier A. Marin
- Zetong Pan
- Noah Pedroso
- Cole Speare
- Kewen Xia
- Xiaoyu Yang

Purpose of this course



- Course description (from the Rensselaer Catalog):
  - Introduction to computer organization, assembler language, and operating systems.
  - Computer systems organization: processors, memory, I/O.
  - Digital logic: gates, Boolean algebra, digital logic circuits, memory, buses.
  - Microprogramming.
  - Machine level: instruction formats, addressing modes, instruction types, flow of control.
  - Operating systems: virtual memory, virtual I/O instructions, processes, interprocess communication.
  - Numeric representation.
  - Assembler language: the assembly process, macros, linking, loading.
  - Advanced architectures: RISC architectures, parallel architectures.
- Prerequisite: CSCI 1200 Data Structures

Course topics

- List of major topics covered in this course:
  - Linux and C programming
  - History, computing performance, parallelism
  - Assembly language programming (MIPS)
  - Digital logic
  - Computer arithmetic
  - Building a processor and pipelining
  - Memory hierarchy
  - Parallel computing

The underlying and motivating theme of this course is *performance*, meaning techniques for writing code to improve runtime performance based on our knowledge of the underlying computer architecture (i.e., memory, processor(s), disk I/O, etc.)

Learning objectives (part 1)

- Apply the concepts of the C programming language to the construction of moderately complex software implementation problems
- Apply the concepts of assembly language to the correct and efficient translation of a given C programming language into an assembly language
- Apply the concepts of integer and floating-point formats to convert from base-10 integers or scientific format numbers into the correct machine-readable binary format
- Apply the concepts of Boolean algebra to simplify Boolean equations
- Apply the concepts of K-Maps to the problem of Boolean expression simplification
- Apply the concepts of performance to the analysis of computer performance problems

Learning objectives (part 2)

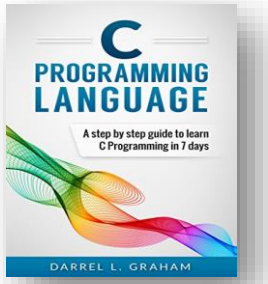
- Apply the concepts of a multi-cycle datapath and control by showing in written form the processing steps that different classes of instructions require as they move through the datapath and control hardware structures
- Apply the concepts of a pipelined datapath and control by showing in written form the processing steps that different classes of instructions require as they move through the datapath and control hardware structures
- Apply the concepts of caching and memory hierarchy to solving problems that require you to design the “best” cache system given particular design constraints
- Apply the concepts of parallel programming to the construction and implementation of correct and efficiently executing multi-threaded programs

Textbooks

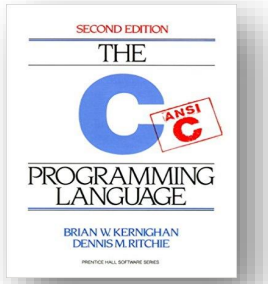
- One digital textbook is required:
  zyBooks interactive digital textbook **Computer Organization and Design MIPS Edition: The Hardware/Software Interface** by Patterson and Hennessy, 6th ed. along with additional exercises, practice labs, and Programming in C book.
  - Visit https://learn.zybooks.com
  - Enter this course code: RPICSCI2500KuzminFall2022
  - Click Subscribe

Active class zyBooks

Recommended Reading



- Other recommended books:
  - **C Programming Language: A Step by Step Beginner's Guide to Learn C Programming in 7 Days** by Graham, 2016 (**https://amzn.com/B01H0LBF9Q**) *free Kindle version!*



  - **The C Programming Language** by Kernighan and Ritchie, 2nd ed., 1988 (*just Google it and you'll find it!)*

Required software and OS

- We will use C, MIPS, and Submitty for numerous assignments
- The Submitty server uses gcc and Ubuntu 20.04 LTS
  - It's recommended you try and mirror this setup
  - Native install: https://releases.ubuntu.com/20.04/
    - You can also boot it “live” from a flash drive
  - Windows: https://docs.microsoft.com/en-us/windows/wsl/install
  - Mac: You should be able to install gcc at least
- MIPS – you need to install some SPIM simulator
  - Many different versions
  - Recommended
    - QtSpim
      - https://sourceforge.net/projects/spimsimulator/files/
      - Mac, Linux, and Windows compatibility
    - MARS
      - http://courses.missouristate.edu/kenvollmar/mars/
        Written in Java, so runs on any platform that supports Java

Attendance/classroom policies

- Lectures will be in person.
- Please attend lectures and come prepared to participate in class discussions, answer questions in class, etc.
- **IMPORTANT:** For prescheduled and unforeseen absences, see http://studentlife.rpi.edu/student-success/excused-absence

Required assignments

- There will be ten labs (10%)
  - Lab problems will be available on Tuesdays before the lab
  - Labs are held on Wednesdays and you must be present in person for the entire lab to get checked off and receive credit for the lab
  - There will be weekly sets of zyBooks problems and activities (15%)
- There will be seven individual homework assignments (28%)
  - Programming homework assignments will be auto-graded via Submitty
  - Non-programming homework assignments will be collected via Submitty
- There will be three tests throughout the semester (39%)
  - Tests are given on Wednesday during the course's scheduled testing block time, 6:00 - 7:50 pm
  - Tests will be given in-person only
  - Pen and paper format
  - Lab time before each test is designated Q/A
- There will be one team project (8%)
- There will also be no formal final exam (0%)

You will have at least 7 calendar days for each homework!

Grading criteria

- Grading breakdown is as follows:

Homework (7)	28%
Tests (3)	39%
Labs (10)	10%
zyBooks (15)	15%
Team Project (1)	8%

- Extensions or make-up opportunities will only be granted to students with a formal Excused Absence Request (http://studentlife.rpi.edu/student-success/excused-absence).
- Generally, programming assignments will be graded on correctness of output. Make sure your program compiles and runs, as you can only earn limited credit for a non-working program!

Late Days

- Every student will receive five late days for the entire semester
  - Late days can only be used on homework assignments but no other gradeable
  - There is a maximum of one late day that can be applied to any homework assignment

Grading policies

- You may appeal a grade assigned by a TA or instructor by filing a grade inquiry on Submitty within seven days of grades being announced. No grade inquiries will be accepted by email.
- Graded tests will be available on Submitty and reviewed in class
- Final course grades are determined by rounding to the nearest 0.01, then applying the following ranges:
- 93.00-100.00 A; 90.00-92.99 A-;
- 87.00-89.99 B+; 83.00-86.99 B; 80.00-82.9
- 77.00-79.99 C+; 73.00-76.99 C; 70.00-72.9
- 67.00-69.99 D+; 60.00-66.99 D;
- 0.00-59.99 F

Disability services for students

- From http://studenthealth.rpi.edu/disabilityservices:
  - "The Office of Disability Services for Students (DSS) assists Rensselaer students with disabilities in gaining equal access to academic programs, extracurricular activities, and physical facilities on campus. DSS is the designated office at Rensselaer that obtains and files disability-related documentation, assesses for eligibility of services, and determines reasonable accommodations in consultation with students."
- Contact: dss@rpi.edu or 518-276-8197 or Academy Hall 4226
- For accommodations, please contact DSS this week!
  - You must renew your accommodations each academic year
  - **Please contact me ASAP about any needed accommodations!**

Academic integrity

- Rensselaer Handbook of Student Rights and Responsibilities:
  - “Intellectual integrity and credibility are the foundation of all academic work. A violation of the Academic Integrity policy is, by definition, considered a flagrant offense to the educational process. It is taken seriously by students, faculty, and Rensselaer and will be addressed in an effective manner.”
  - “If found responsible for committing academic dishonesty, a student may be subject to one or both types of penalties: an academic (grade) penalty administered by the professor and/or disciplinary action through the Rensselaer judicial process described in this handbook.”

http://www.rpi.edu/dept/doso/resources/main/2014-2016StudentHandbookrevOctober2015.pdf

Academic integrity policy

- Each assignment must be the sole work of each individual student
- For team projects, team members may certainly work together
- Copying from others is not allowed
- Please do not discuss assignment solutions with one another
- Ask specific questions on our course Submitty Discussion Forum (https://submitty.cs.rpi.edu/courses/f21/csci2500/forum) but please do not post solutions
- Further, protect your work from being copied by others!

Academic integrity policy

- If found in violation of the academic dishonesty policy:
  - You will receive a grade of zero on the given assignment
    - **And** lose 5% from your overall grade
  - For a second offense, you will receive an automatic F in the course
  - Each incident will be reported to the Dean of Students and the Department Head
  - Cheating may cause you to be ineligible to mentor for the department, participate in departmental organizations, etc.

Questions?