Computer Architecture

COMP SCI 2GA3

Dr. Bojan Nokovic, P.Eng.
McMaster University, Fall Term 2021/22

Course Format

Lecturing (and slides) will only cover the highlights of each topic, not the topic in its entirety.

Some classes may be mixture of lecturing and videos. The slides of the lectures will be posted at Avenue.

The tutorials help you to prepare for assignments, midterm and final: the TAs will answer questions you may have. There are no stupid questions.

Grading Scheme

Assignments: 20%
Four assignments, each worth 5%, will mainly be questions from textbook with some programming questions in assembly or C. All questions require individual work, collaboration is not allowed. If you miss a due date for medical or University-related reasons, you get an extension; in this case, you have to use an MSAF or supply documentation, normally to the Associate Dean's Office.

Midterms Exams: 30%
Two midterms, each worth 15%. 45min online examination at Avenue. It may have 2% bonus question. If you miss one midterm exam and have MSAF your final will worth 65%.

Final Exam: 50%
Two hour written examination, most likely online at Avenue

About This Course

The course is on the relationship between software and hardware

Even if your interest is in software, you increasingly need an understanding of hardware as it influences software design, e.g. parallel programming, energy efficiency.

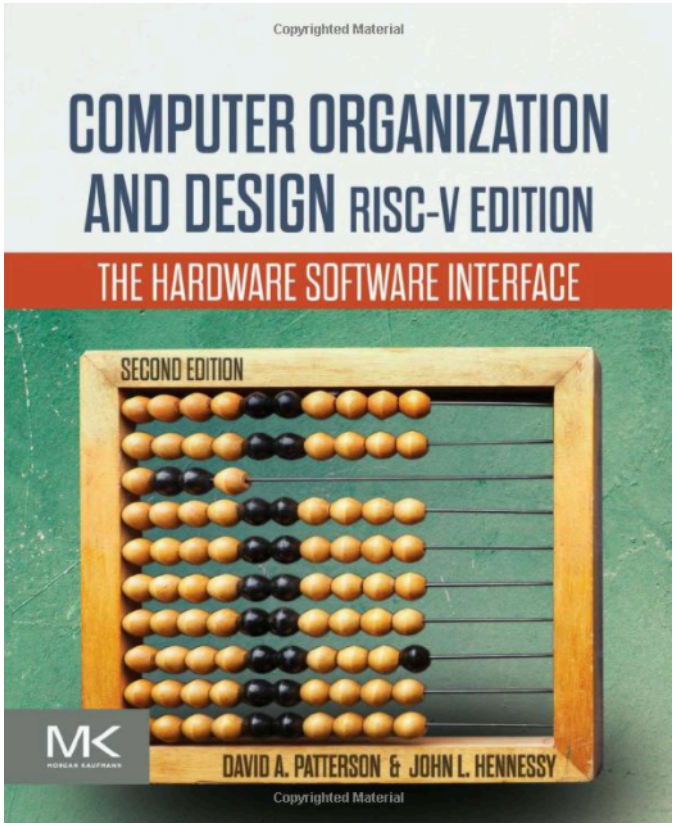
The topics are a mixture of “timeless” material and “real stuff”.

Course Textbook

Computer Organization and Design The Hardware/Software Interface: RISC-V Edition, 2nd Edition - David A. Patterson, John L. Hennessy

The book is comprehensive and easy to read

All other references will be posted at Avenue



Why RISC-V?

Open instruction set

Developed originally at UC Berkeley offers "*a simple, elegant, modern take on what instruction set should look like in 2020*".

Open source RISC-V simulators, compilers, debuggers

As on 2020, 300 companies have joined the RISC-V foundation

Course Outline

Avenue - Course outline
http://avenue.mcmaster.ca/

What is a Computer?

A programmable usually electronic device that can store, retrieve, and process data!

Antikythera mechanism - an analogue computer used to predict astronomical positions and eclipses decades in advance, dated to about 100BC

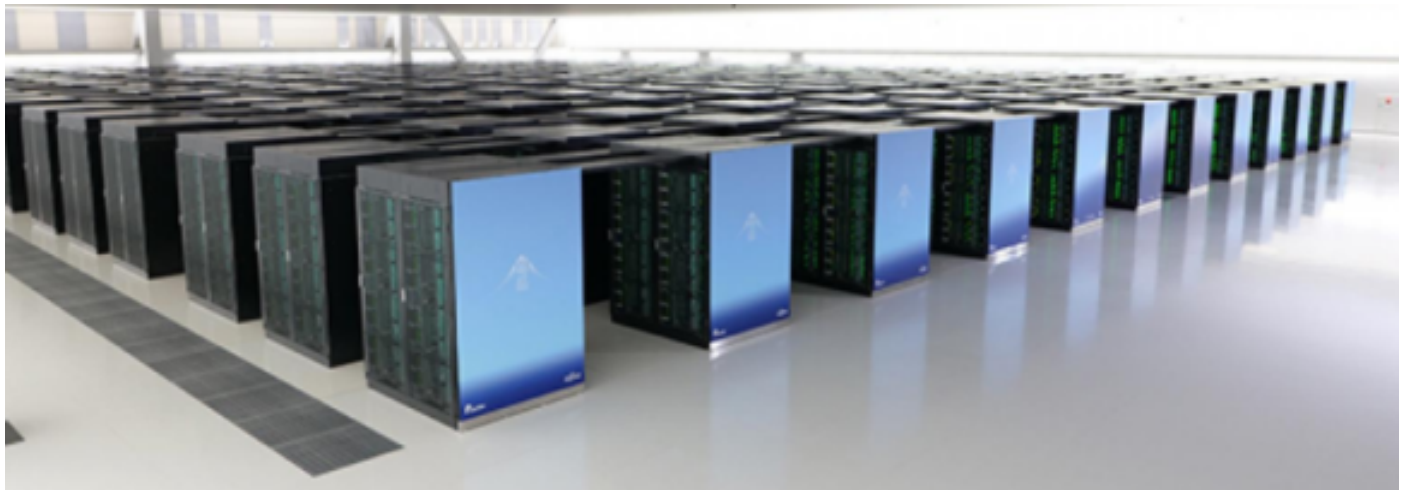
Early vacuum tube computer (ENIAC)
Mainframe computer (IBM System 360)

Smartphone (LYF Water 2)
Desktop computer (IBM ThinkCentre S50 with monitor)

Supercomputer (IBM Summit)
Video game console (Nintendo GameCube)

https://en.wikipedia.org/wiki/Computer

Supercomputer



Fugaku - As of June 29, 2021, the
fastest supercomputer!

Fugaku held the top spot on the TOP500 list by achieving a score of 442 petaFLOPS

FLOPS - floating operations per second
petaFLOPS = 10^{15} = 1 000 000 000 000 000 FLOPS

Architecture?

The art or practice of designing and building structures and especially habitable ones.

Merriam-Webster SINCE 1828

WIKIPEDIA
The Free Encyclopedia

Architecture (Latin *architectura*, from the Greek ἀρχιτέκτων *arkhitekton* "architect", from ἀρχι- "chief" and τέκτων "creator") is both the process and the product of planning, designing, and constructing buildings or other structures.[3]

The art and science of designing and making buildings, or the style of a building.

Cambridge Dictionary

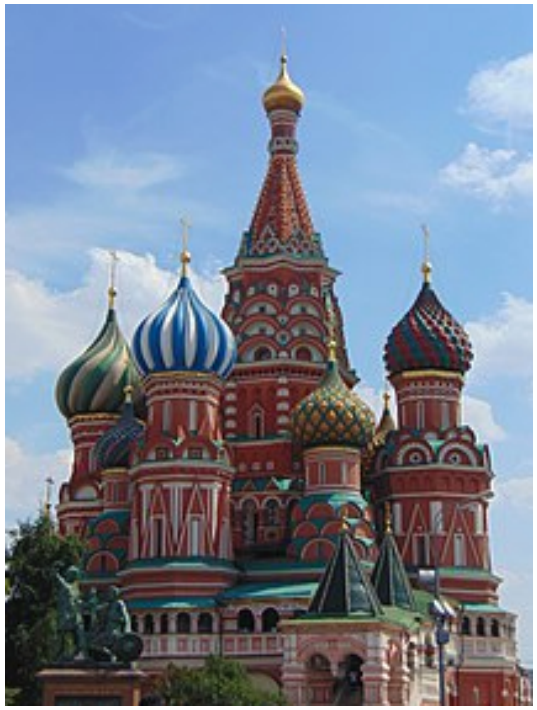
Computer Architecture

The manner in which the components of a computer or computer system are organized and integrated. *Merriam-Webster*

A set of rules and methods that describe the functionality, organization, and implementation of computer systems - *Wikipedia*

The design and structure of a computer system, which controls what equipment can be connected to it and what software can operate on it - *Cambridge Dictionary*

Catalyst for Creativity



Thank You

Questions?