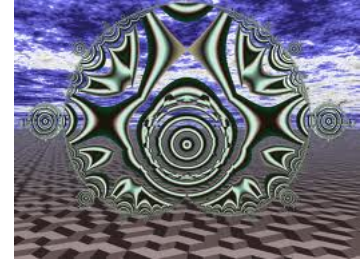# Computers and Networks

Agenda

- **Purpose**
- **Objectives**
- **Contents**
- **Prerequisites**
- **Exam**

Purpose

The purpose of this course is to provide you with a basic understanding of how computers do what they do.

By studying the fundamental organizing principles of computer systems, you are better able to understand, design, and implement complex systems.

Upon successful completion of this course, the computer will no longer seem a "black box" to you.
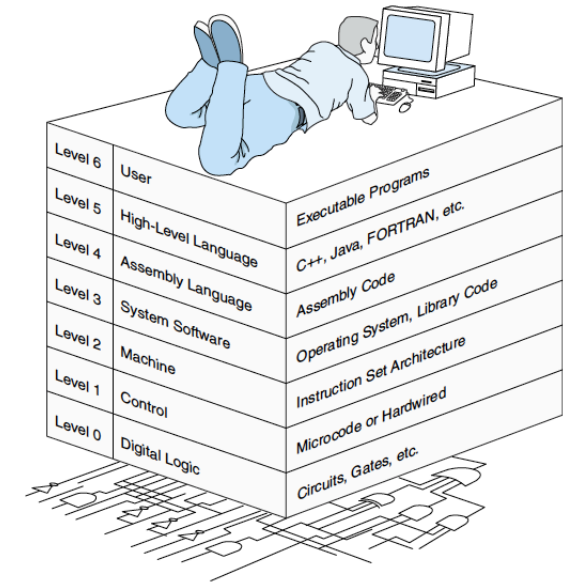
Non-goal

It is **not** the goal of the course to make you a hardware engineer!

The goal is to teach you what a computer scientist *should* know about computers and networks.

Objectives

Level 6	User	Executable Programs
Level 5	High-Level Language	C++, Java, FORTRAN, etc.
Level 4	Assembly Language	Assembly Code
Level 3	System Software	Operating System, Library Code
Level 2	Machine	Instruction Set Architecture
Level 1	Control	Microcode or Hardwired
Level 0	Digital Logic	Circuits, Gates, etc.

At the completion of the course, you will be able to:

- Understand basic computer architecture and demonstrate use of the associated vocabulary.
- Explain the organization of a computer as levels of virtual machines.
- Describe the operation of the CPU and explain how it is used to execute instructions.
- Write simple assembly language programs.
- Demonstrate knowledge of memory and I/O.
- Demonstrate an understanding of the basics of operating systems software.
- Discuss network architecture standards.
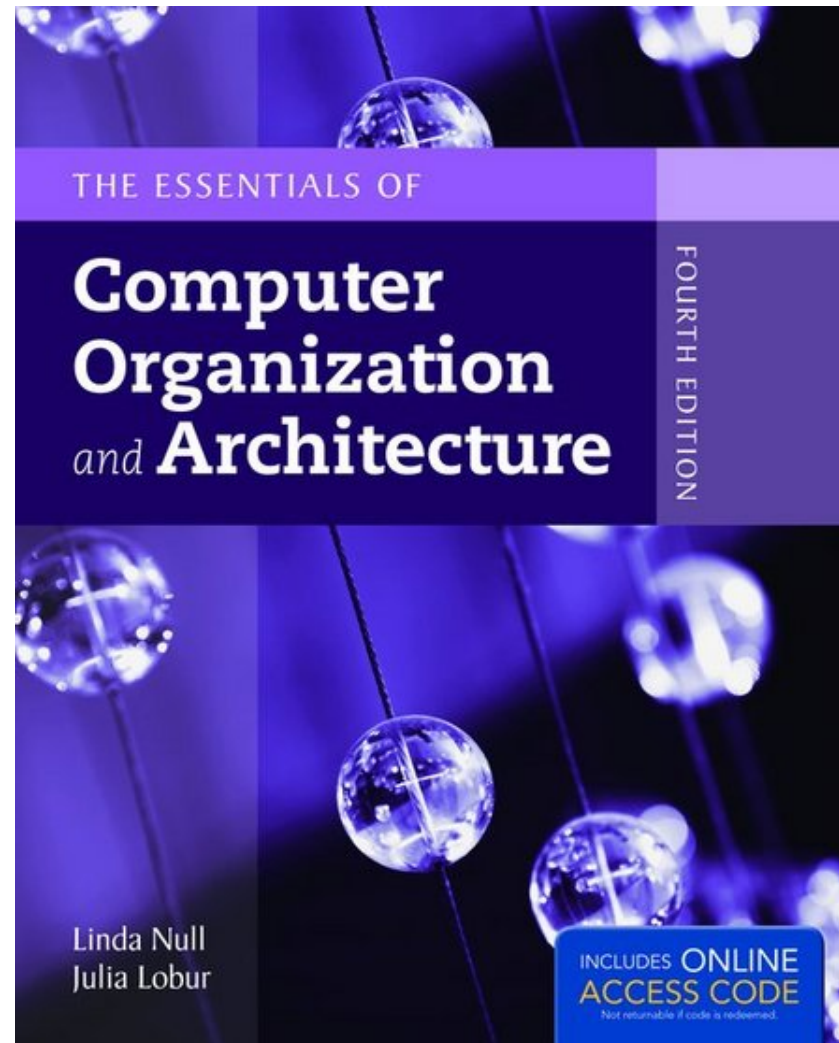- Describe ISO reference and Internet models.

Contents
Headlines

- Computer architecture

- Assembly programming

- Memory and I/O

- System software

- Networks

Textbook

Fourth Edition, 2015

Lectures
(Bottom-up approach)

1. Introduction (History of computers)
2. Data Representation in Computer Systems
3. Boolean Algebra and Digital Logic
4. MARIE: An Introduction to a Simple Computer
5. MARIE (continued)
6. A Closer Look at Instruction Set Architectures
7. Memory and Input/Output
8. System Software
9. Alternative Architectures
10. Network Organization and Architecture
11. Networks (continued)

Prerequisites

This course requires some programming skills, such as having passed courses in introductory programming, data structures and algorithms, and one programming project.

Tools

- Computer: Your own

- High-level language: C

- Low-level language: x86 assembly language

- Operating system: Linux (Ubuntu)

Exam

30 minutes oral examination with three days of preparation time after receiving an assignment.

The exam will focus on the solution of the assignment, and randomly drawn exam questions.

Lectures and exercises

Thursdays $13^{00} - 17^{15}$. Room 43-2.43

First course day: Thursday, September 11

dat.ruc/~keld

Computers and Networks

Fall 2014

by

Keld Helsgaun

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Plan 0
September 1 – September 11

- Read Chapter 1 in the textbook