

# Computer Science Fundamentals

## Lecture 1

# Welcome to BIS!

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Join Telegram group, please!

<https://t.me/joinchat/BroIMhiOgEWVP8kZQagYZA>

Please, join the **telegram group as soon as possible** in order to deal with any arising problems

# Join video conferencing in intranet

1. Make sure you use latest version of Chrome/Firefox

In Chrome go **Settings -> About Chrome**

Or copy <chrome://settings/help> to the address line and update to the latest version

In Firefox go **Help -> About Firefox**

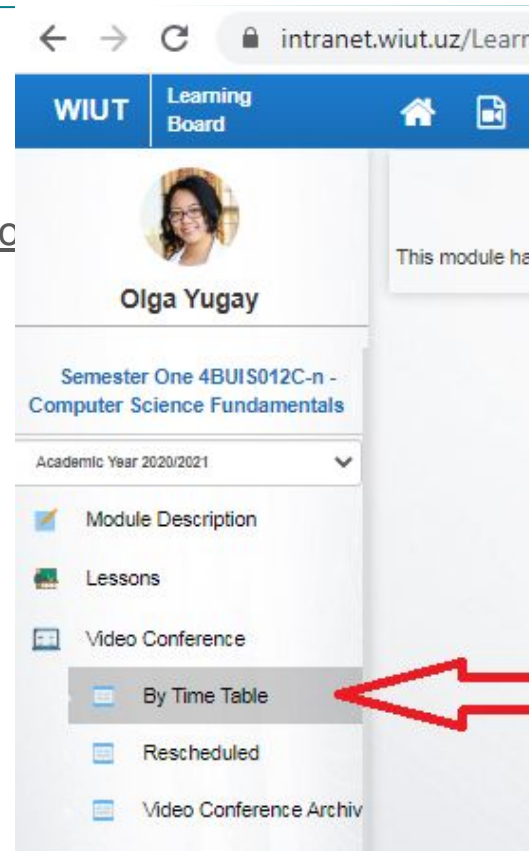
Update to the latest version

2. Go to Intranet -> WLB -> Computer Science Fundamentals  
-> Video Conference by Timetable

<https://intranet.wiut.uz/UserModuleMaterials/SingleModuleView?moduleId=559>

In case of problems let's communicate over the Telegram

<https://t.me/joinchat/BroIMhiOgEWVP8kZQagYZA>



# Trouble with previous slide link (9:00 slot)

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If majority has trouble with joining video conferencing on previous slide by 9:20 then we all move to Zoom

Join Zoom Meeting <https://us04web.zoom.us/j/73013418591?pwd=RFFPc2dIMUQybFVBeHBrNVBteVFkQT09>

Meeting ID: 730 1341 8591

Passcode: csf

If you do not have Zoom installed click to install it in the popup

# Trouble with previous slide link (11:00 slot)

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If majority has trouble with joining video conferencing on previous slide by 11:20 then we all move to Zoom

Join Zoom Meeting: <https://us04web.zoom.us/j/75256607810?pwd=V0c2NDBWQ1Y2bDZFNIhINVN4UHdkZz09>

Meeting ID: 752 5660 7810

Passcode: csf

If you do not have Zoom installed click to install it in the popup

# Agenda

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1. Module overview
  - 1.1. Team and Assessment
  - 1.2. Learning outcomes
  - 1.3. Roadmap for the semester
2. History of the computers
3. Brief history of computing software

# 1. Module overview

# 1.1 Module overview

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Module team:

- Olga Yugay, module leader
- Subair Ali, tutor

Q&A:

- <http://intranet.wiut.uz/LearningMaterial/Discussion/Details/649?moduleId=559>

## Assessment

Coursework 40%, Final exam 60%



# 1.2 Learning outcomes

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1. Identify and interpret the numerical processes running within computer system.
2. Describe the tasks and features of each of the **main components of a computer system** and how these components work together.
3. Show understanding of the **von Neumann architecture** and **stored program paradigm**.
4. Explore and experiment with **algorithms** and other relevant computer science topics.
5. Explore **current trends in technology** and learn to use relevant resources and tools
6. Demonstrate a thorough knowledge of basic **command line commands and git**



# Abstraction is

...way to think about the something which removes or hides complex details

...a technique for managing complexity of computer systems.

Abstraction

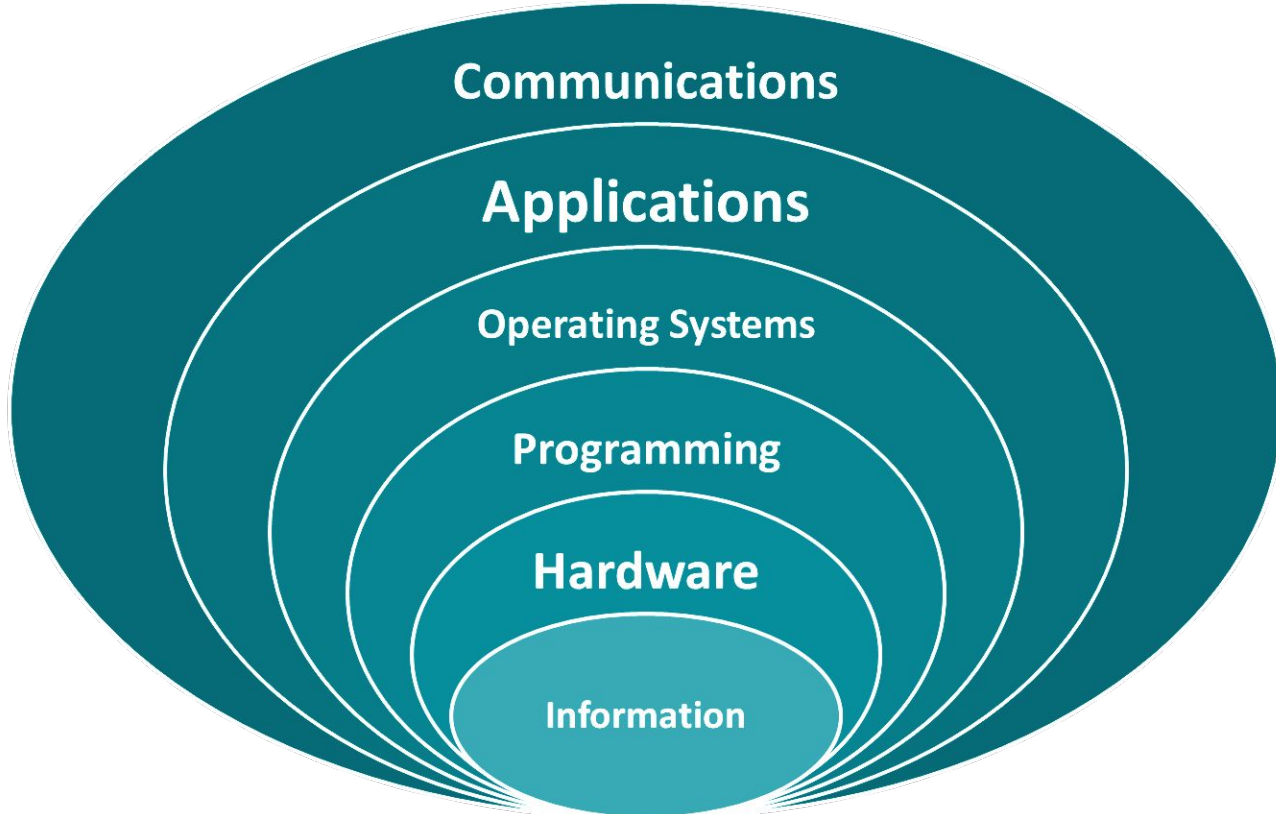


Reality



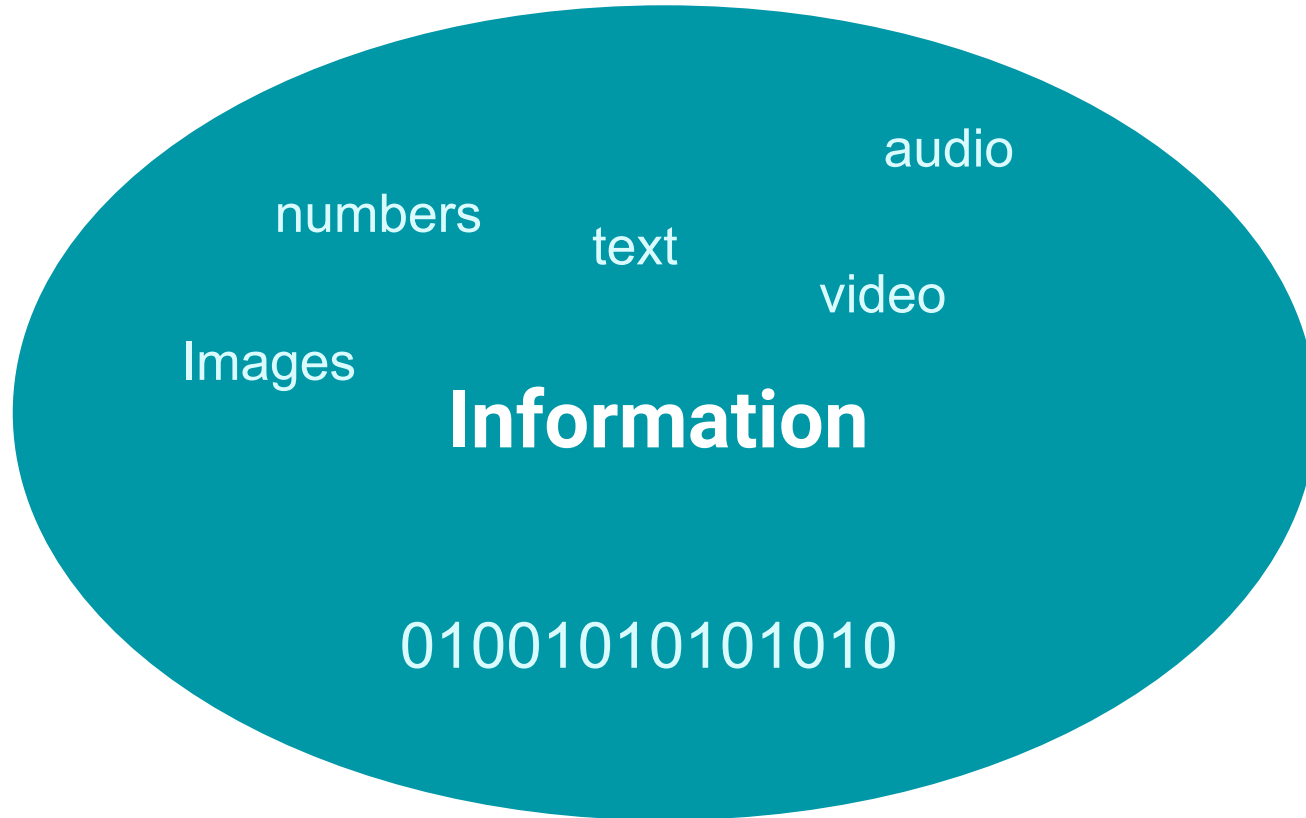
## 1.3 Roadmap for the semester: layers of computing systems

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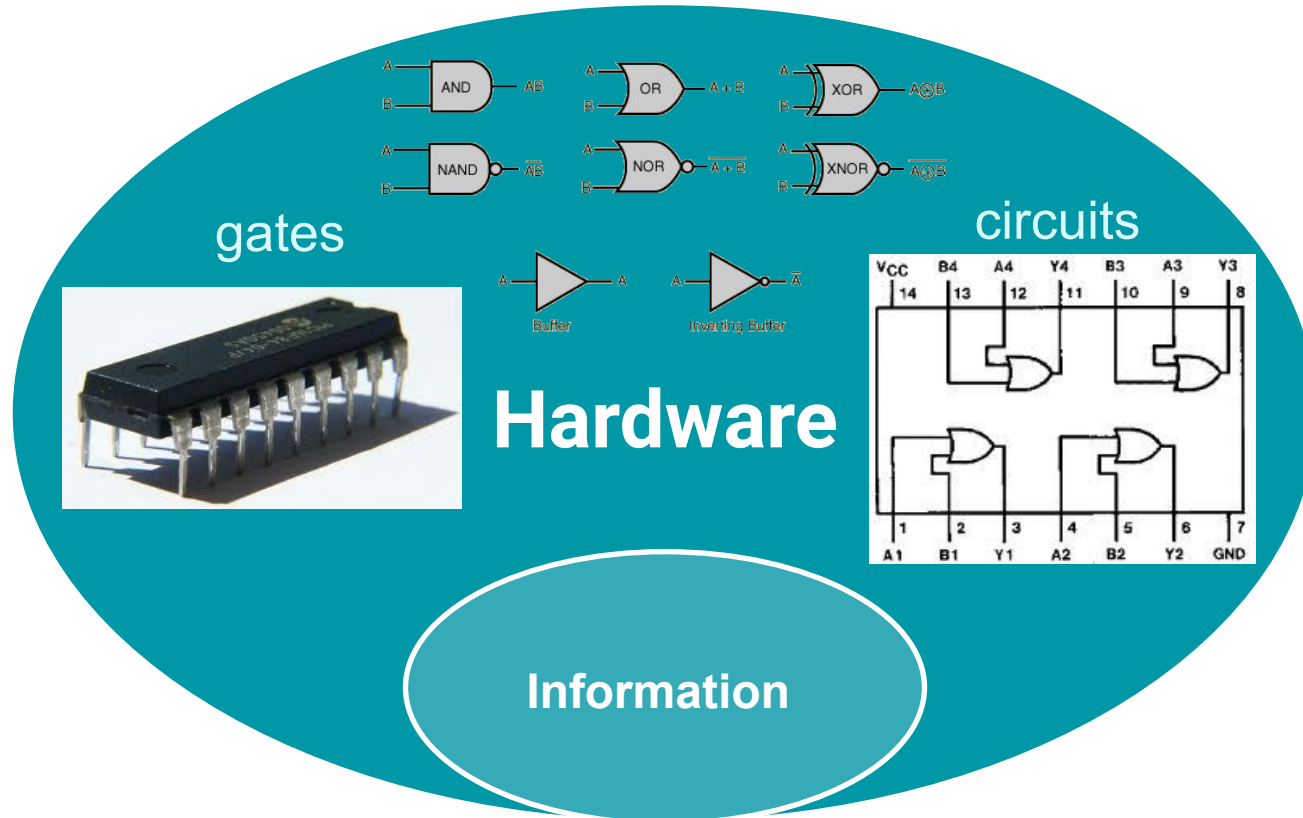
## 1.3 Layers of the computing systems

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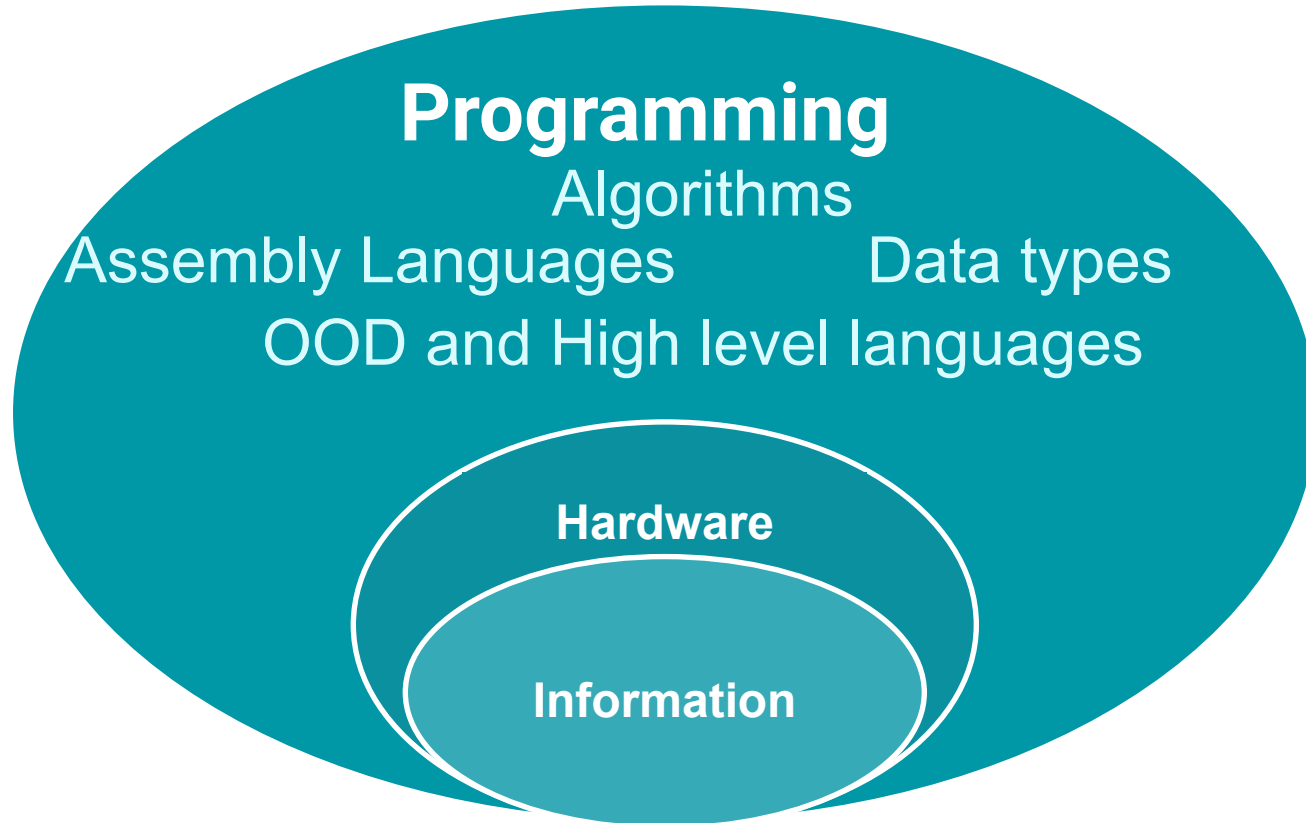


# 1.3 Layers of the computing systems



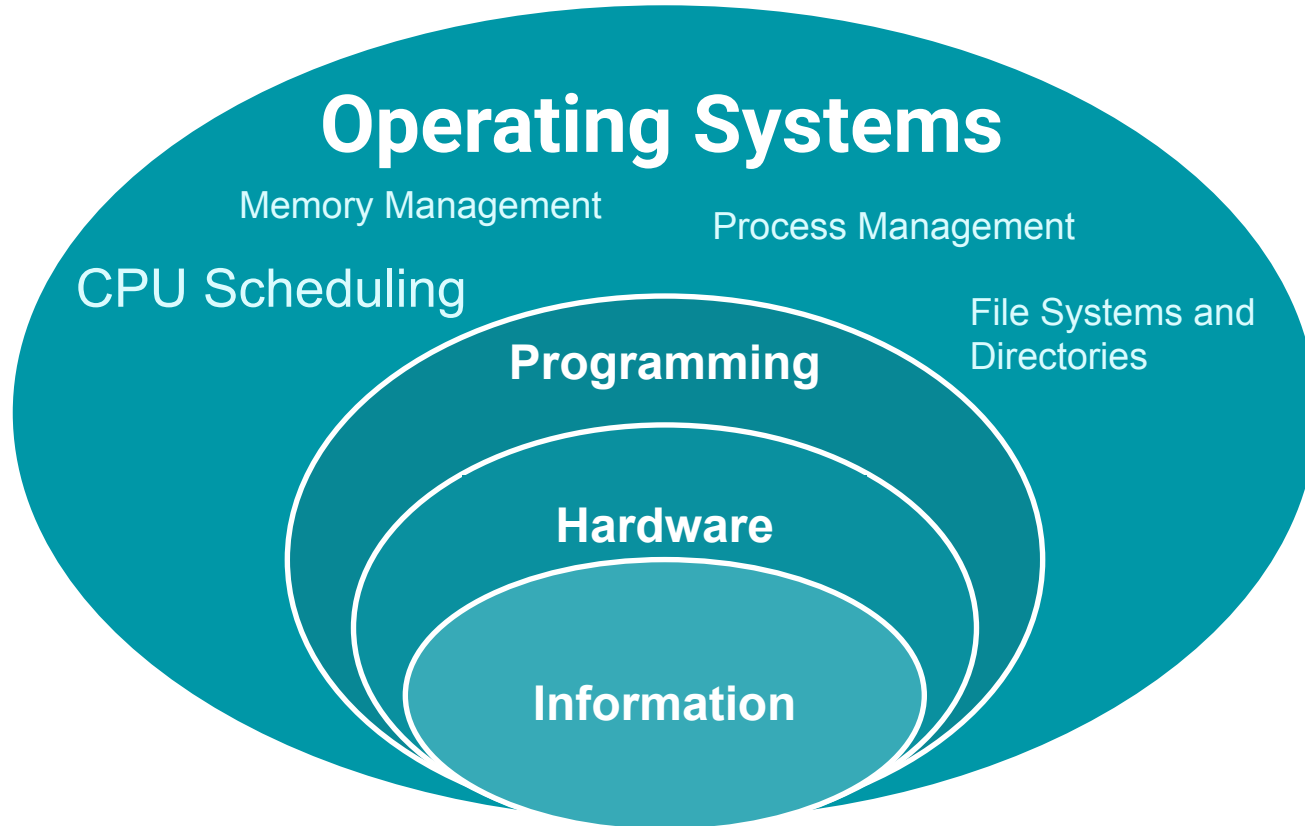
## 1.3 Layers of the computing systems

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# 1.3 Layers of the computing systems

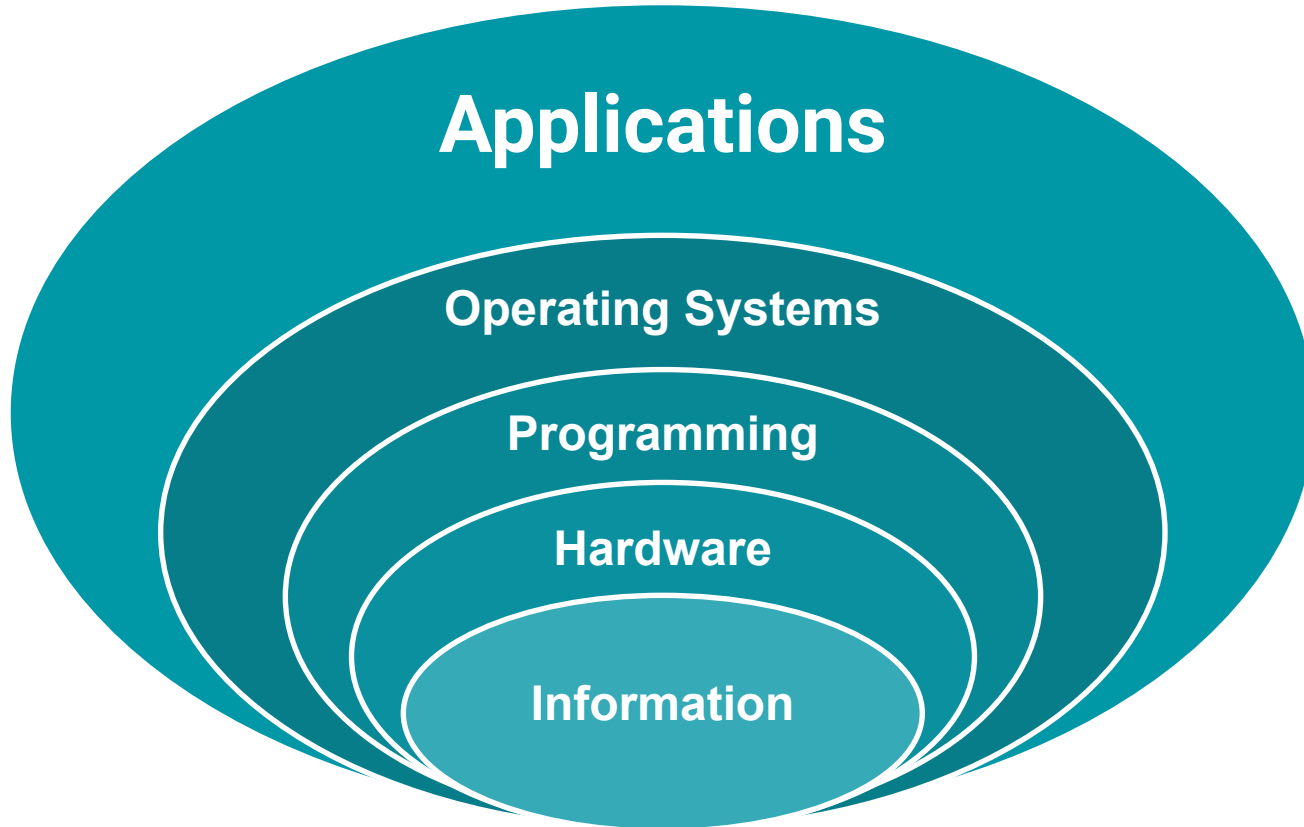
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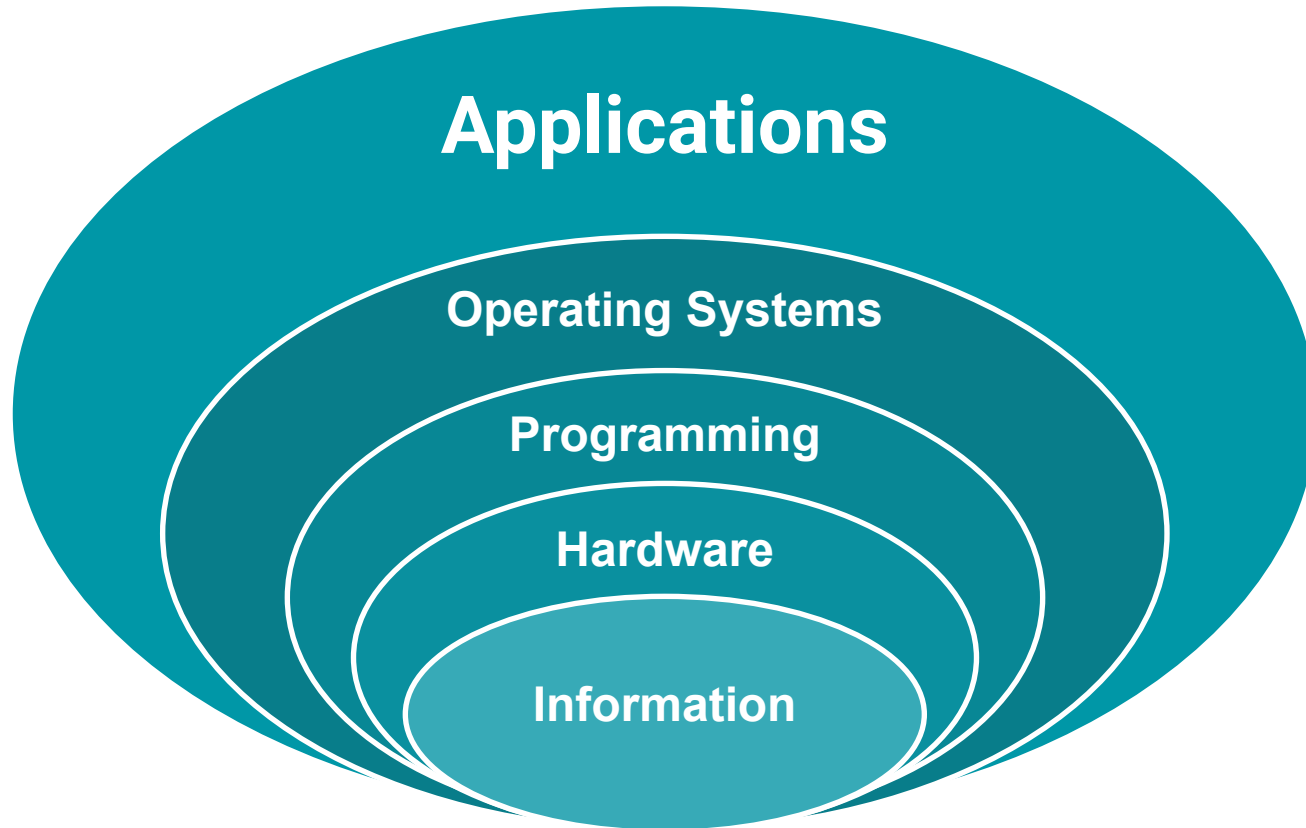
## 1.3 Layers of the computing systems

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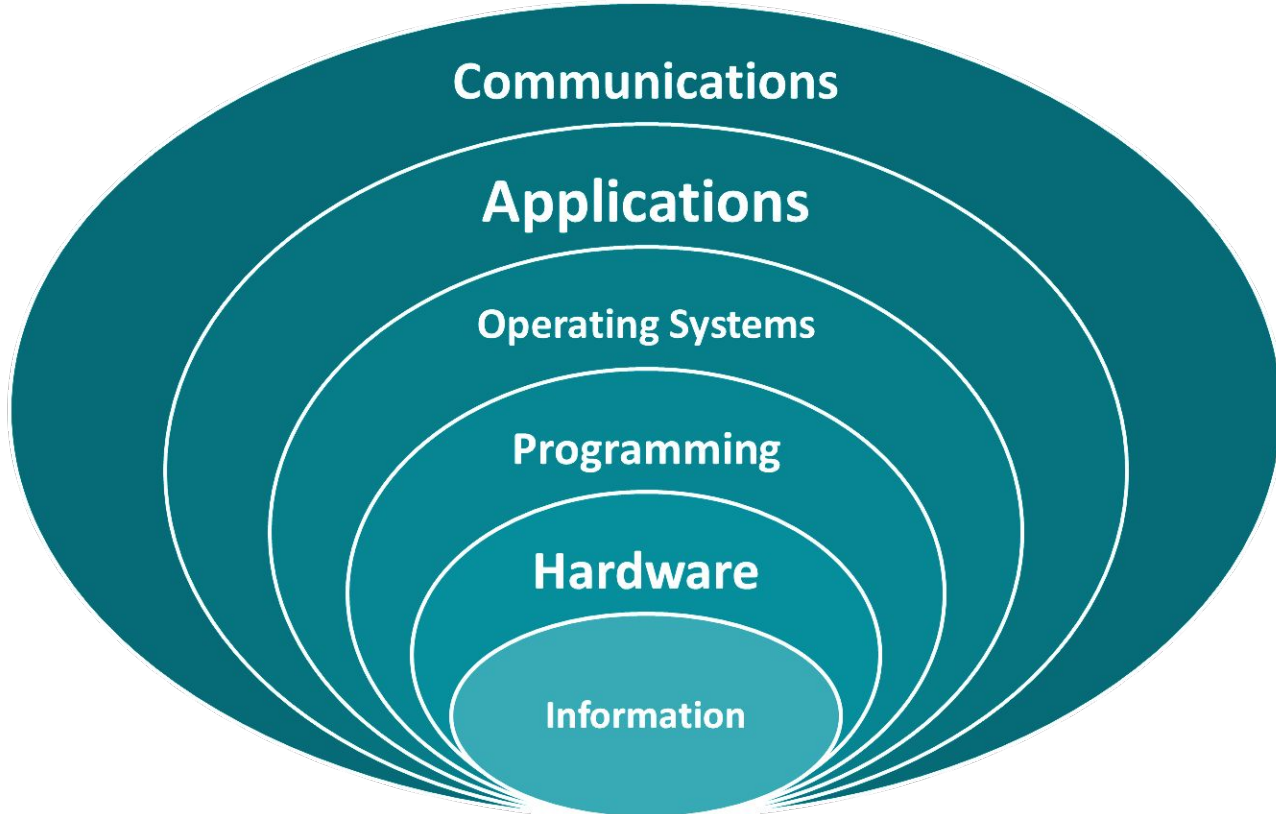
## 1.3 Layers of the computing systems

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## 1.3 Roadmap for the semester: layers of computing systems

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## 2. History of computers

Your ideas first

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When do you think history of computing began?

What was the first computing device?

# Early history of computing

Abacus(around 2500 BC)

- An early device to record numeric values



# Early history of computing

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- [Blaise Pascal](#)(In the middle of 17th century)

Mechanical device to add, subtract, divide & multiply

- [Joseph Jacquard](#)(late 18th century)

Jacquard's Loom, the punched card

- [Charles Babbage](#)(19th century)

Analytical Engine

There are video links about it on the last slide

# More recent history: 4 generations of computers

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First generation computers (1951 – 1959)

Second generation computers (1959-1965)

Third Generation computers(1965-1971)

Fourth Generation computers(1965-1971)

Fifth Generation: Artificial Intelligence (Present and Beyond)



# First generation computers (1951 – 1959)

- Vacuum tubes stored information
- Generated a lot of heat
- Primary memory device – magnetic drum that rotated under read/write head
- Slow Input/Output
  - Input device – card reader that read the holes punched in an IBM card
  - Output – punched card or a line printer
- Use: UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951.



# Second generation computers (1959-1965)

- **Transistor** replaced vacuum tubes
- Smaller, more reliable
- **Memory** made from magnetic cores, tiny doughnut-shaped devices, each capable of storing one bit of information -> Immediate access memory
- Transistors and other components - were assembled by hand on printed circuit board
- **Use:** atomic energy industry



# Third Generation computers(1965-1971)

- **Integrated Circuits (IC)** - solid pieces of silicon with transistors, other components, and their connections.
- Smaller, cheaper, faster, and more reliable
- 1970s – several thousand transistors on a silicon chip
- **Memory** – use of transistor, each transistor one bit of information, volatile memory – the information went away when the power was turned off
- **Input, output device** – the terminal with keyboard and screen first appeared
- **Use:** Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors



# Fourth Generation computers(1965-1971..present?)

- Large scale integration
- Micro-computer on a chip
- Development of GUIs, the mouse and handheld devices.
- The workstations were networked
- PC (Personal Computer) entered the vocabulary
  - Apple
  - Tandy/Radio Shack
  - Atari
  - Commodore
  - Sun
  - IBM
  - Hewlett-Packard and many others
- Use: desktop computers in many areas of life as more and more everyday products began to use microprocessors



# Fifth Generation: Artificial Intelligence (Present and Beyond)

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Fifth generation computing devices, based on **artificial intelligence**, are still in development, though there are some applications, such as **voice recognition**, that are being used today.

The use of **parallel processing** and **superconductors** is helping to make artificial intelligence a reality.

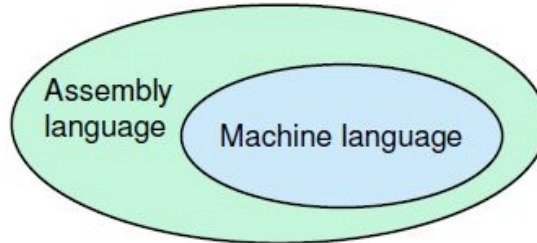
**Quantum computation** and **molecular and nanotechnology** will radically change the face of computers in years to come.

**Use:** The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of **learning and self-organization**.

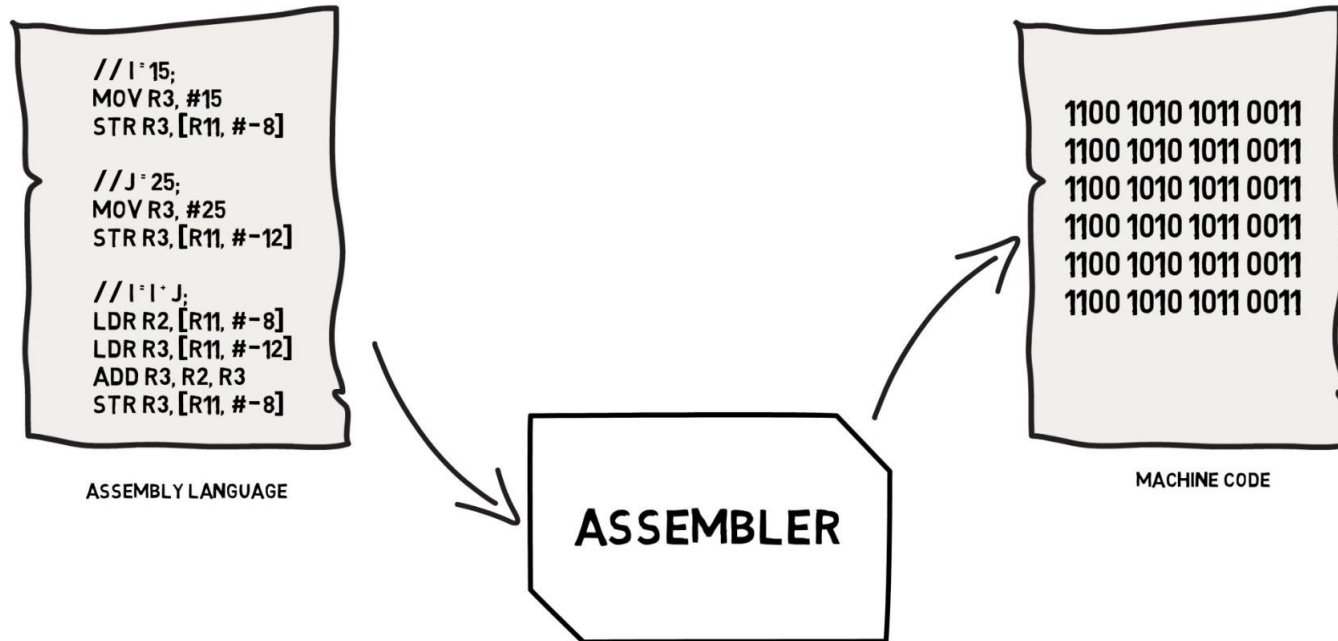
### 3. Brief history of computing software

# First generation software

- First programs were written on machine language
- Instructions were built into the electrical circuitry of a particular computer
- E.g.: small task of adding two numbers together used three instructions written in binary (1s and 0s), and the programmer had to remember which combination of binary digits means what
- Programming in machine language is both time-consuming and prone to errors -> first artificial programming languages were developed - assembly languages, used mnemonic codes to represent each machine-language instruction.



# First generation software

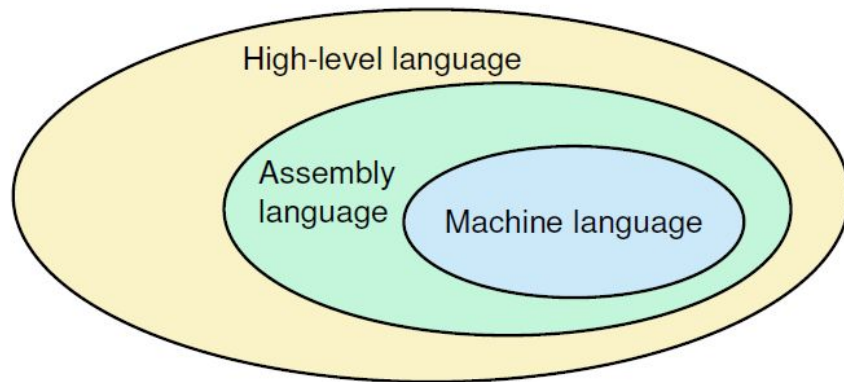




# Second generation software

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- More powerful hardware → more powerful tools to use it effectively
- Assembly language limitation (thinking in terms of machine instructions) → more powerful languages (high level) developed
  - Fortran, Cobol, Lisp
- Same program could now run on more than 1 computer
  - Compiler – translating program



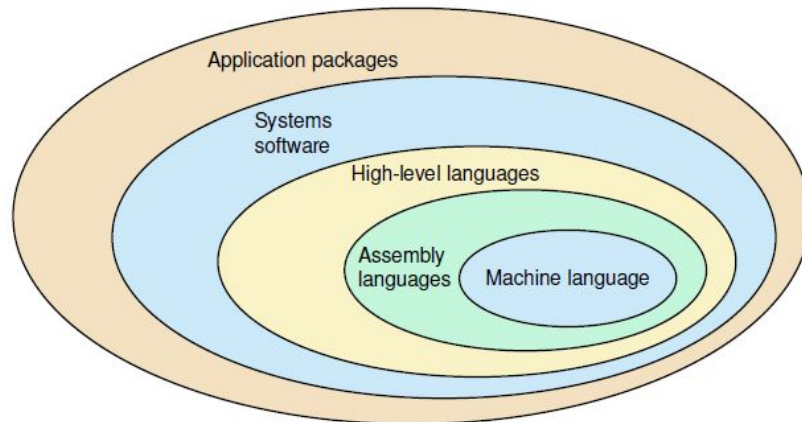
# Second generation software

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- Systems programmers wrote **tools** like **assemblers and compilers**
- Application programmers used these tools to write programs
- The application programmer was becoming even more insulated from the computer hardware

# Third generation software (1965 - 1971)

- With 3rd generation of computers, it became clear that the human was slowing down the computing process.
- Computers were **sitting idle while waiting** for the computer operator to prepare the next job.
- **Solution:** put the computer resources under the control of the computer => to write a program that would determine which programs were run when => an **operating system**



# Fourth generation software (1971 - 1989)

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- Structured programming, a logical, disciplined approach to programming
  - Pascal
  - Modula-2
  - BASIC
  - C
  - C++
- More powerful operating systems
  - UNIX under AT&T
  - PC-DOS for IBM PC
  - MS-DOS
  - OS for Macintosh with mouse and point-and-click graphical interface
- Application software packages appeared
  - Spreadsheets
  - Word processors
  - Database management systems

# Fifth generation (1990 - present)

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- Microsoft
- Apple
- Open source software (Linux and alike)
- Object-oriented design and programming
- World Wide Web
- Embedded systems

# Recommended actions!

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1. [https://www.youtube.com/watch?v=O5nskjZ\\_Gol&t=32s](https://www.youtube.com/watch?v=O5nskjZ_Gol&t=32s)
2. <https://www.youtube.com/watch?v=LN0ucKNX0hc>
3. <https://www.youtube.com/watch?v=6dME3wgaQpM&list=PL1331A4548513EA81>
4. Module page (e-version) or Library (hard copy) :
  - a. **Dale, Computer Science Illuminated, Ch 1**

