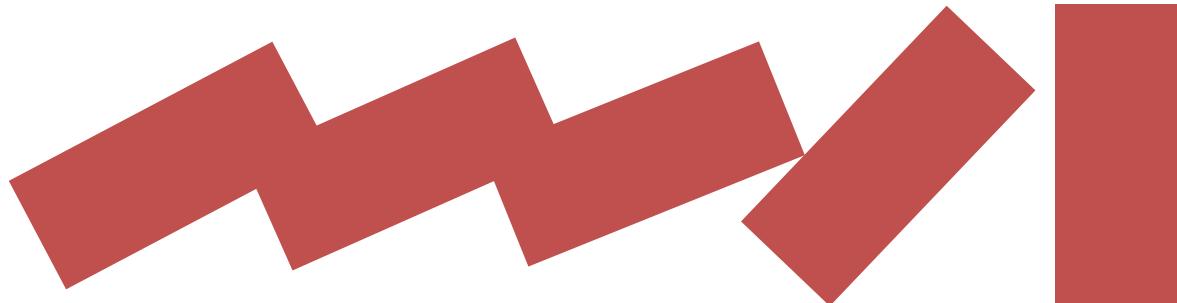




Introduction to Computer System

Asst.Prof.Dr.Supakit Nootyaskool



<http://supakit.net>

Learning VB WC ISD RMS **ICS** OS CSOS DL SDTE IS SL

ICS

[6016205--Introduction to Computer System \(ICS\)](#)

Course description: Number systems, binary system, Boolean algebras, logic design techniques, logic gate and minimization, basic combinational circuits, arithmetic logic units, computer evolution, computer function and interconnection, computer arithmetic. <[download](#)>

[Schedule](#)

Week	Date	Topic	Documents
9	Sep-30	1 Computer system Lab1	Slide1 Chap1 Lab1 HardwareList
10	Oct-7	2 Memory and I/O addressing Lab2--LED and Switch	Chap2 Lab2
11	Oct-14	3 Input and output signal to the computer system Lab3	Chap3 Lab3
12	Oct-21	4 Analog and digital signal in the computer system Lab4	Chap4 Lab4 Lab-Video

The image shows a YouTube channel page for "Supakit Nootyaskool". The channel has 585 subscribers and 167 videos. The profile picture is a portrait of a man. The channel description states: "Supakit channel is variety of contents related to digital, electronics, computer programming, and so on...". Below the description are "Customize channel" and "Manage videos" buttons. The main content area displays three video thumbnails: "BADD Chapter10 Naive Bayes" (65 views, 5 months ago), "CSOS LAB 5-LED RUNNING" (68 views, 6 months ago), and "NNL05 1-3 N:N 1:N neural model" (35 views, 6 months ago). The channel also features a sidebar with links to "Home", "Shorts", "Subscriptions", and "YouTube Music".

Course description

- Number systems, binary systems, Boolean algebra, digital design techniques, logic gate and minimization, **basic combinational circuits, arithmetic logic units, computer evolution, computer function and interconnection, computer arithmetic**

กันยายน

SEPTEMBER

2567

อาท.	จ.	อ.	พ.	พฤ.	ศ.	ส.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

ตุลาคม

OCTOBER

2567

อาท.	จ.	อ.	พ.	พฤ.	ศ.	ส.
	1	2	3	4	5	
6	7	8	9	10	11	12
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27	28	29	30	31		

ขออ้อนรายวิชาเรียน [*7]

จ. 1 ก.ค. - ศ. 11 ต.ค. 67

การสอบกลางภาค

(ไม่เว้นวันเสาร์และวันอาทิตย์ แต่เว้นวันหยุดนักขัตฤกษ์และวันหยุดชดเชย)

จ. 26 ส.ค. - อ. 1 ก.ย. 67

ช่วงเวลาการประเมินการสอนของอาจารย์

จ. 23 ก.ย. - ศ. 18 ต.ค. 67

วันสุดท้ายของการลาพักรการศึกษา หรือการขอรักษาสภาพนักศึกษา และ
วันสุดท้ายของการชำระเงินค่าธรรมเนียมลาพักรการศึกษาหรือค่าธรรมเนียม
รักษาสถานภาพนักศึกษา

ศ. 18 ต.ค. 67

วันสุดท้ายของการเรียนการสอน

อ. 20 ต.ค. 67

การสอบปลายภาค

(เว้นวันเสาร์ วันอาทิตย์ วันหยุดนักขัตฤกษ์ และวันหยุดชดเชย)

จ. 21 ต.ค. - จ. 4 พ.ย. 67

วันสุดท้ายการสอบเพื่อสำเร็จการศึกษา (ระดับบัณฑิตศึกษา) [*8]
(ไม่เว้นวันเสาร์และวันอาทิตย์ แต่เว้นวันหยุดนักขัตฤกษ์และวันหยุดชดเชย)

ศ. 22 พ.ย. 67

วันปิดภาคการศึกษา

อ. 5 พ.ย. 67

วันส่งคะแนนและเกรด

ศ. 15 พ.ย. 67

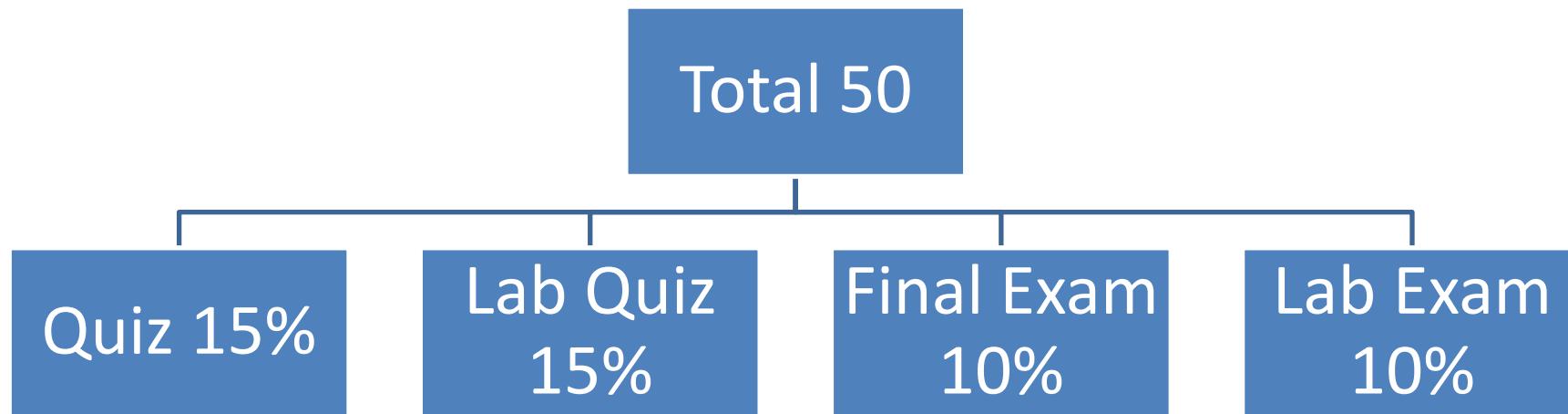
Date	Topics	Note
Sep-2	1. Computer system overview	Quiz1
Sep-6	Lab1: Measurement tools & Devices in online	LabQuiz1
Sep-9	2. Memory, I/O addressing	Quiz2
Sep-13	Lab2: Frequency generator, oscilloscope, and frequency response	LabQuiz2
Sep-16	3. Input output signal in computer system	Quiz3
Sep-20	Lab3: Push switch LED on/off delays by capacitor	LabQuiz3

Date	Topics	Note
Sep-23	4. Counter, ADC DAC Part-I	Quiz4
Sep-27	Lab4: Oscillator circuit	LabQuiz4
Sep-30	5. ADC DAC Part-II	Quiz5
Oct-4	Lab5: 2bits asynchronous counter	LabQuiz5
Oct-7	6. Memory unit	Quiz6
Oct-11	Lab Exam	

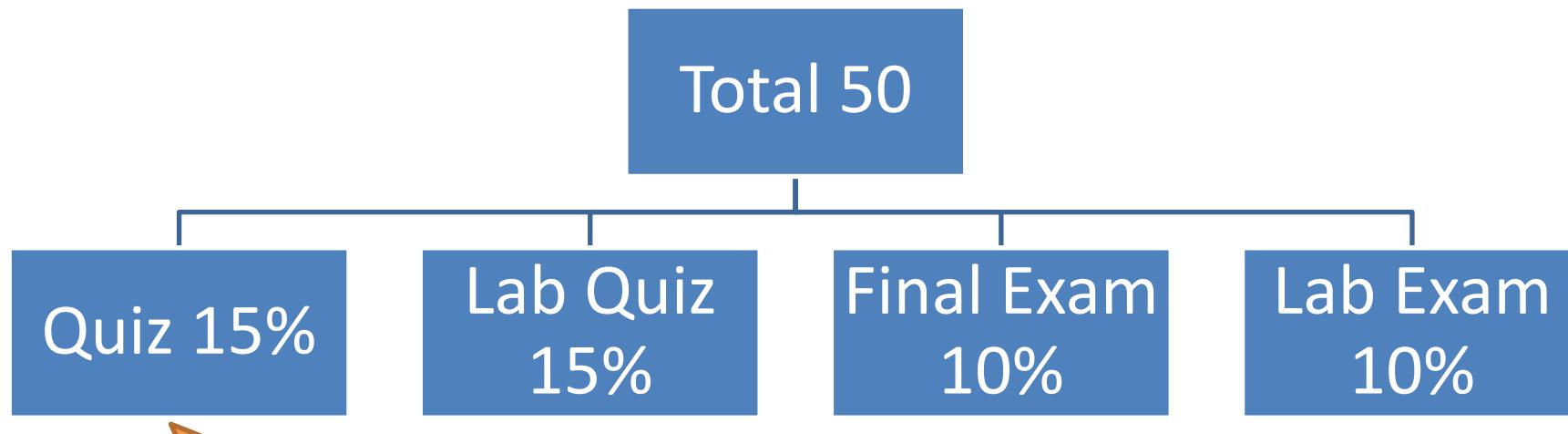
Schedule

Date	Topics	Note
Oct-14 Online	7. ALU+ 8. Instruction set and CPU	Quiz7
	Final exam week	Final Exam

Score

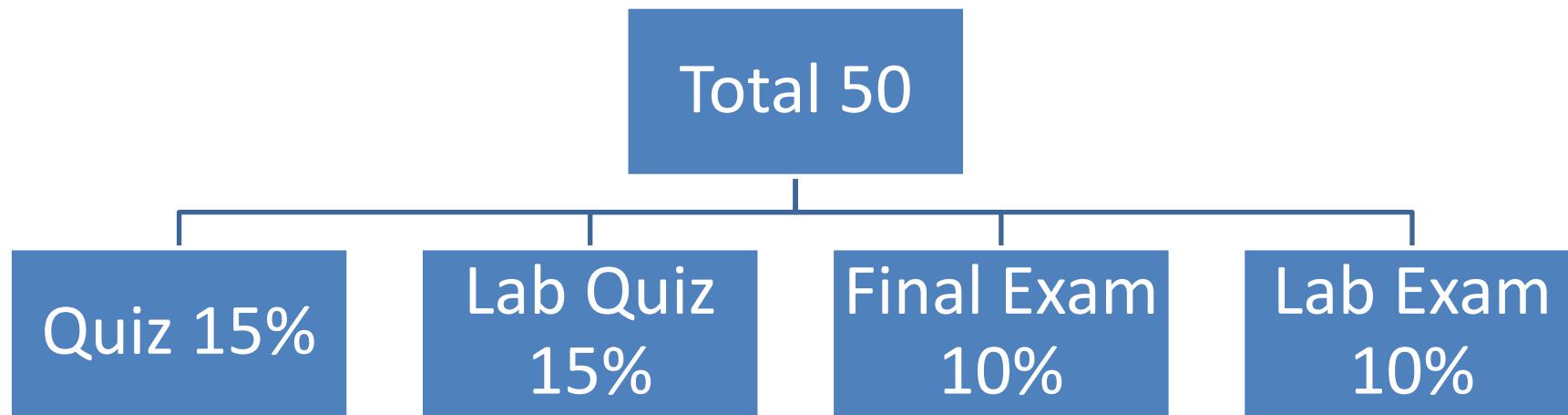


Score



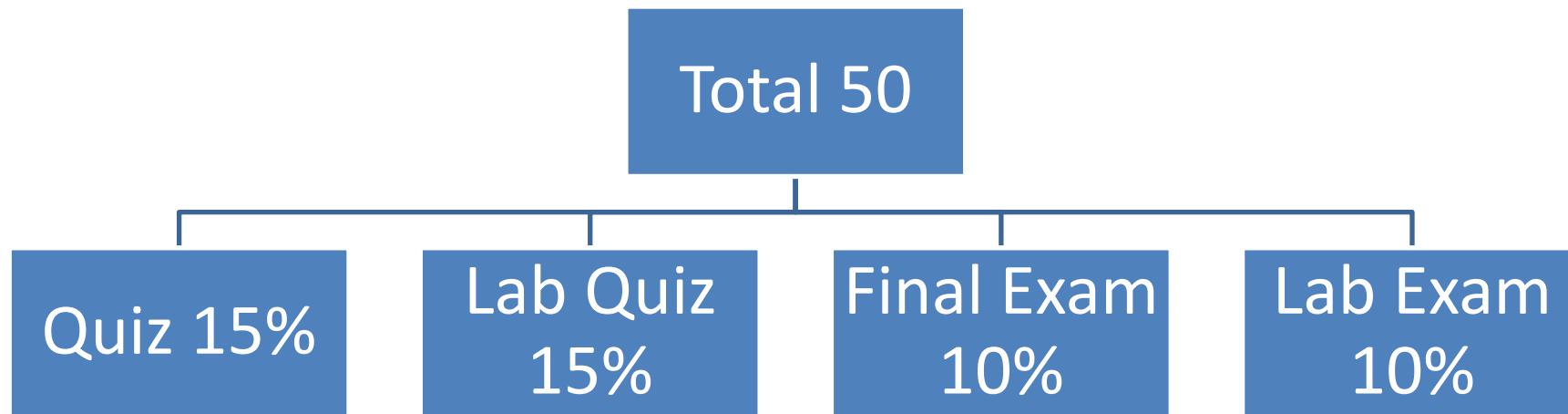
- สอบทฤษฎี เนื้อหาที่เรียนในสัปดาห์ก่อน
- สอบหลังคาบเรียน ประมาณ 5-10 นาที
- ข้อสอบประมาณ 5-8 ข้อ

Score



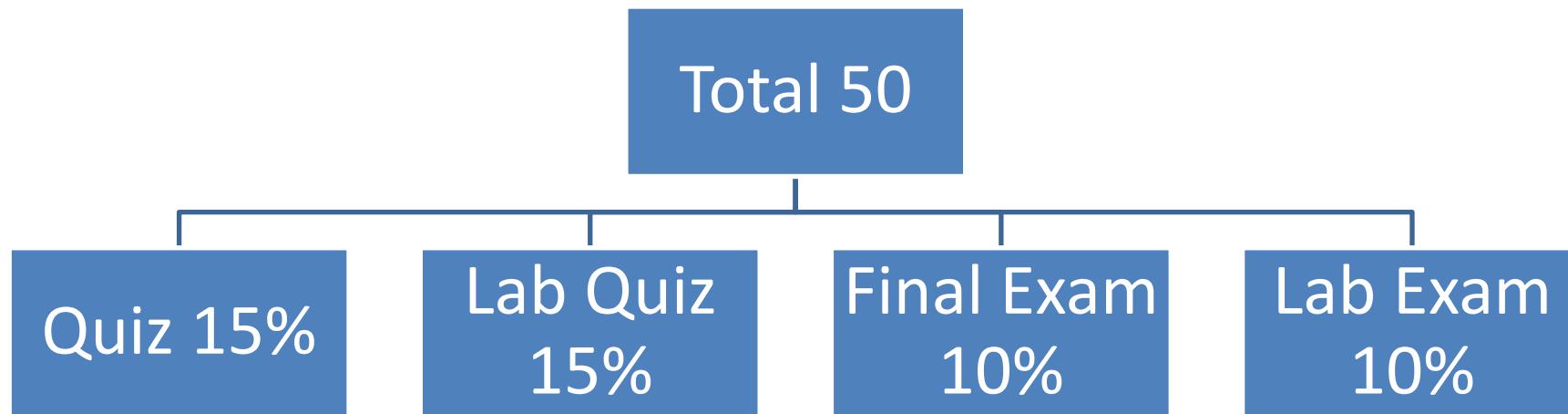
- คะแนนจากการส่งงาน lab แต่ละครั้ง

Score



- สอดคล้องตามตารางสถาบัน
- เนื้อหาเฉพาะ ที่เรียนหลังสอบกลางภาค
- ระยะเวลาประมาณ 120-180 นาที

Score



- สอบสัปดาห์สุดท้ายของ Lab
- สอบปฏิบัติต่อวงจร
- ระยะเวลาประมาณ 60 นาที



Chapter1: Computer System

Asst.Prof.Dr.Supakit Nootyaskool

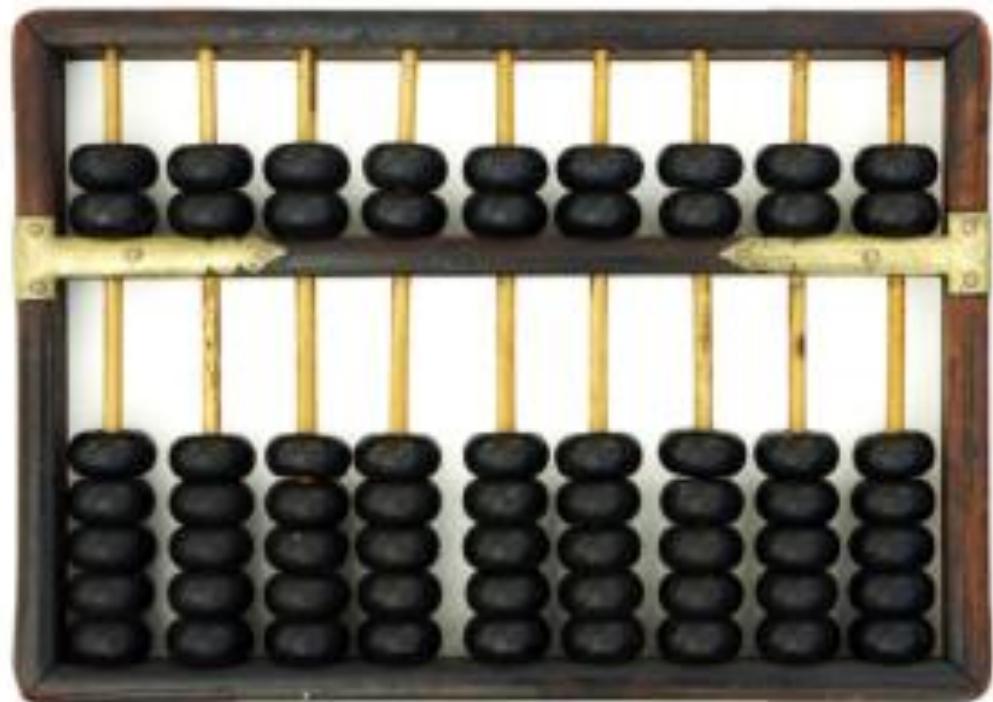
Learning Outcome

- Explain the evolution from the mechanical to semiconductor.
- Describe the produce N type and P type.

MECHANICAL COMPUTERS

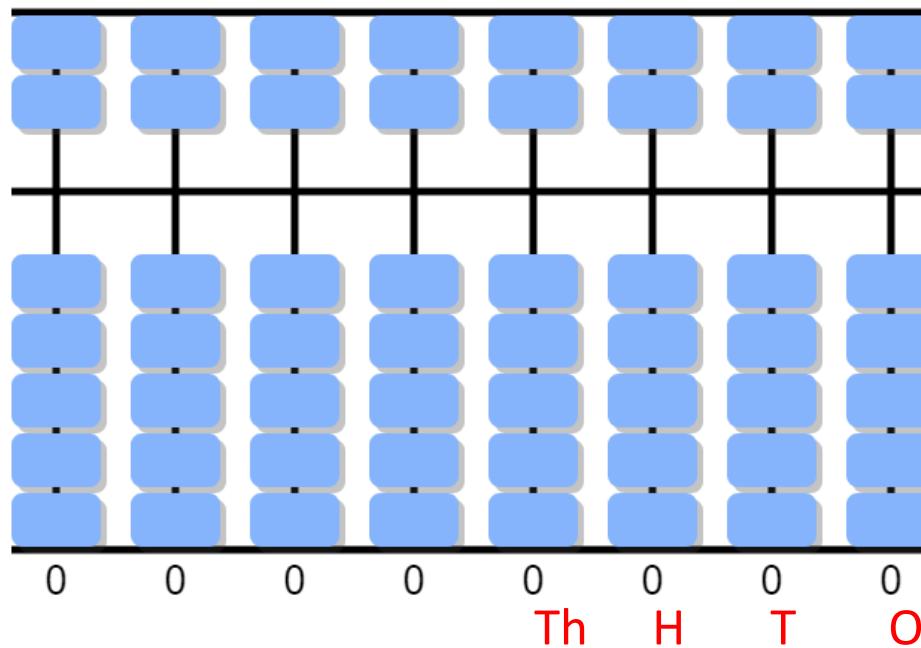
Abacus

- ລູກຄືດ
 - Used in China, Europa and Russia



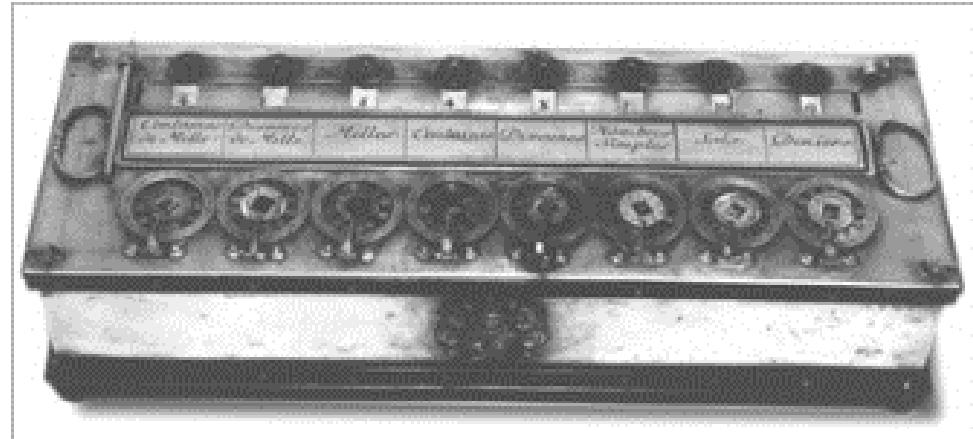
Activity 1.1 Play abacus

- Click on <https://www.mathematik.uni-marburg.de/~thormae/lectures/ti1/code/abacus/sanpan.html>
- Calculate
 - $83 + 12 = ?$
 - $112 + 12 = ?$

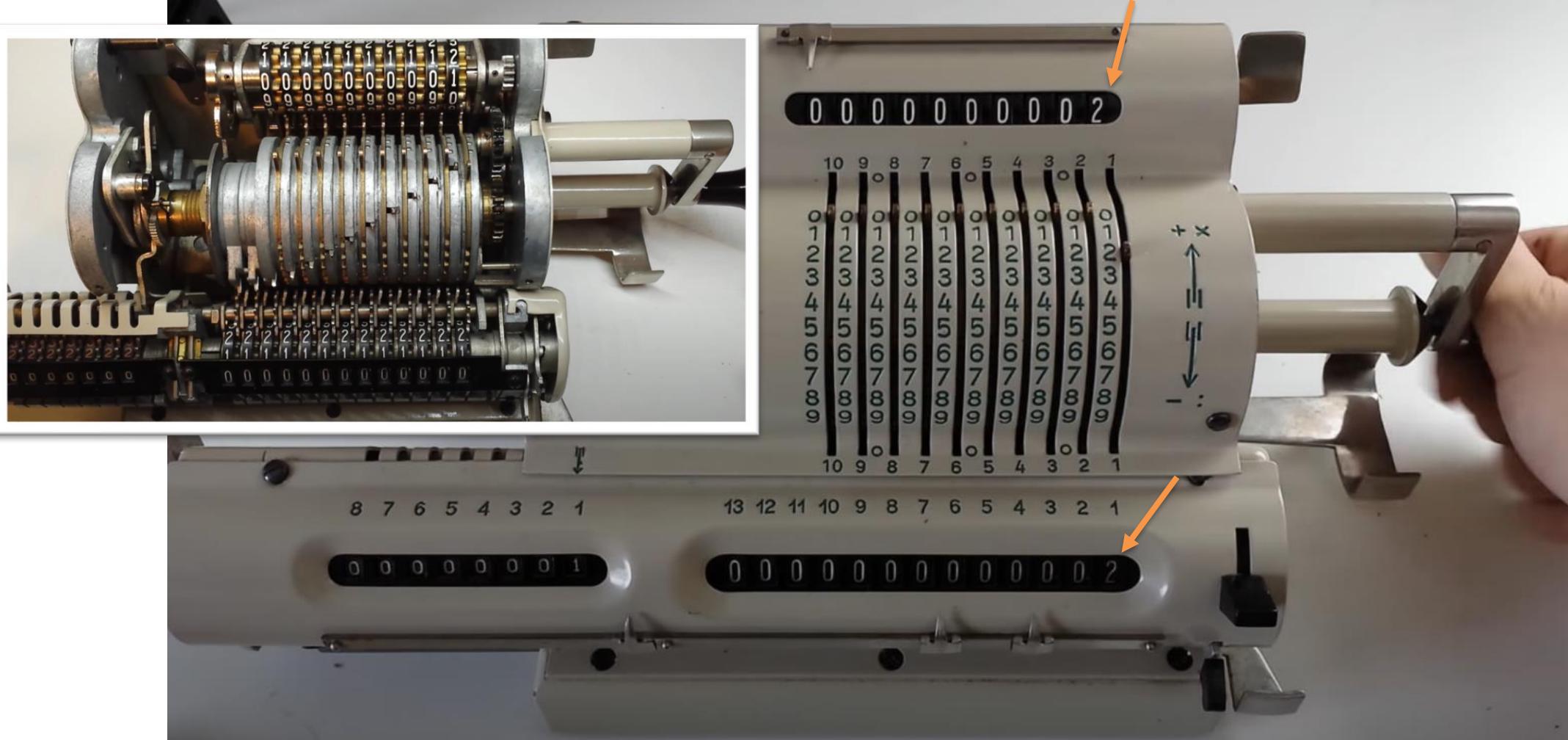


Mechanical calculator

In 1642, Blaise Pascal invented a machine to assist his father in his work. This early mechanical calculator was capable of performing basic arithmetic operations, specifically addition and subtraction.



$$2+2 = 4$$

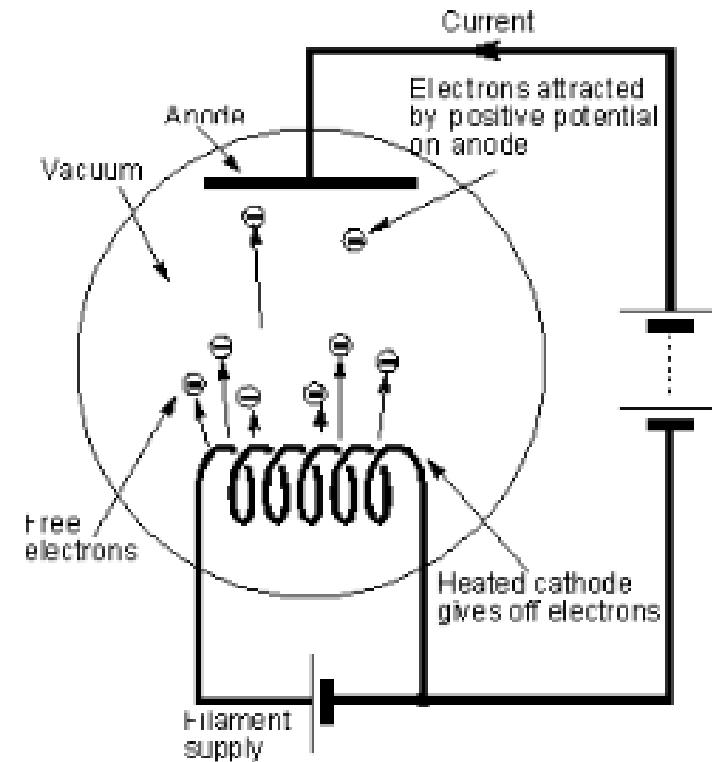
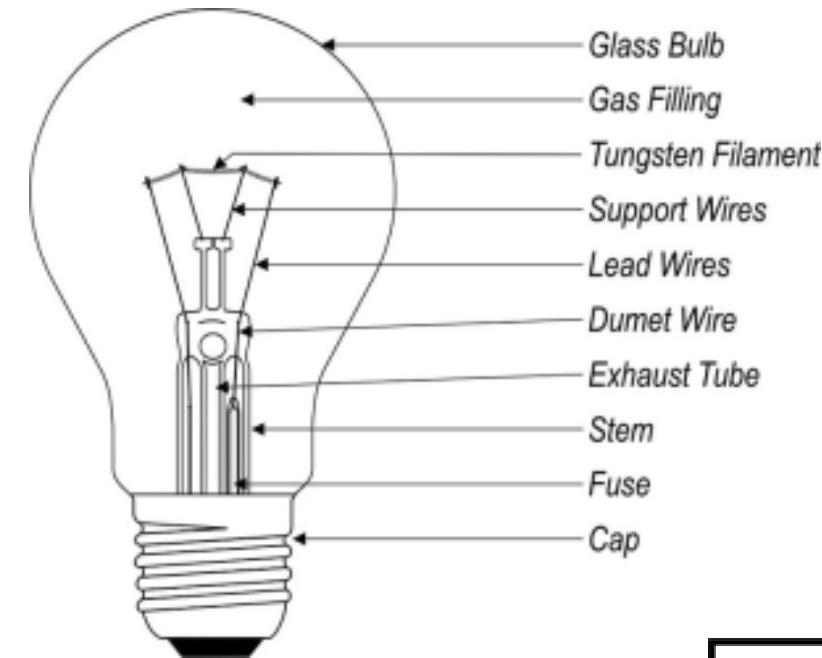


<https://youtu.be/aDN4s8ElxqE?t=144>

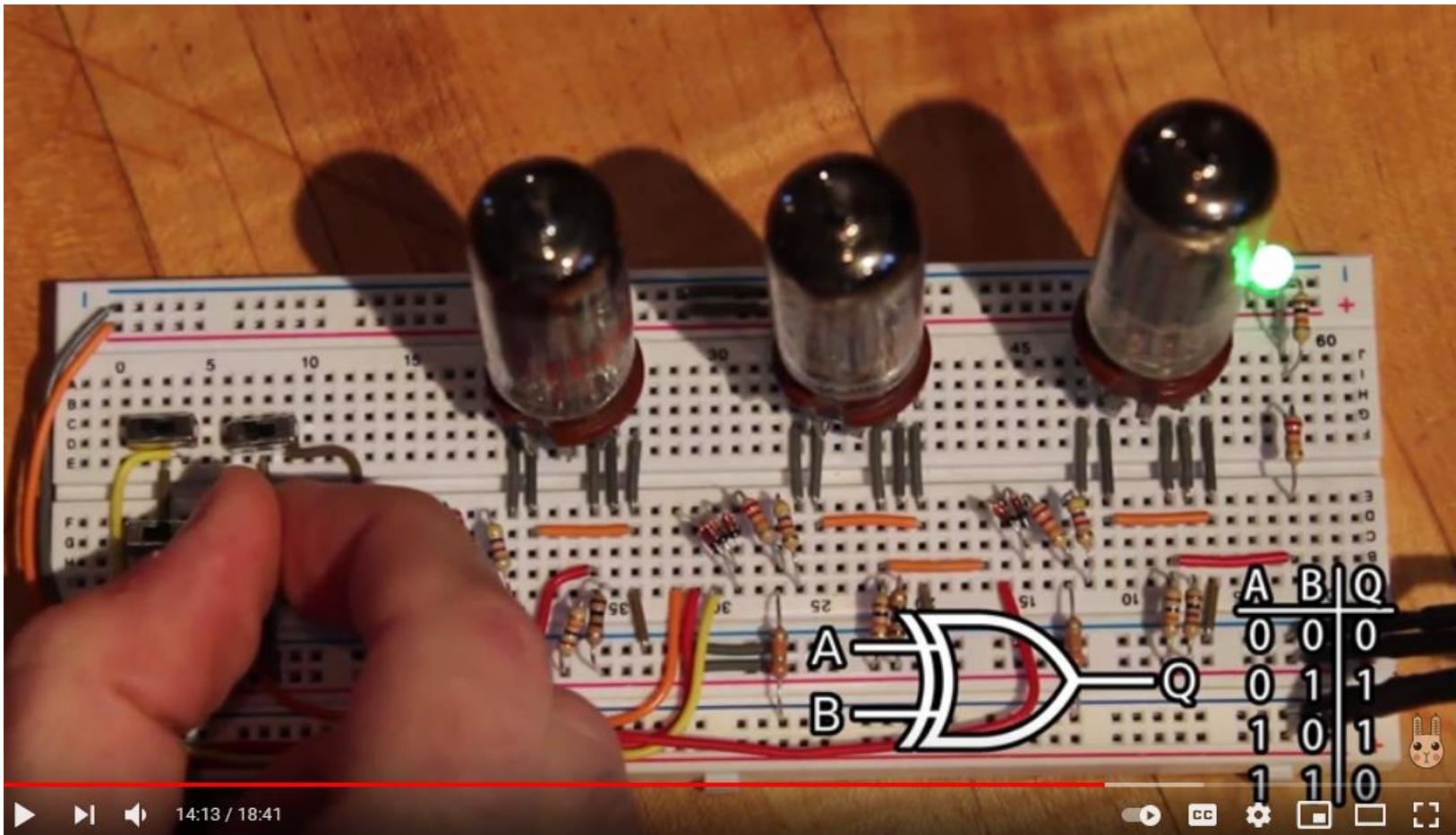
ELECTRIC AND ELECTRON

Vacuum Tube

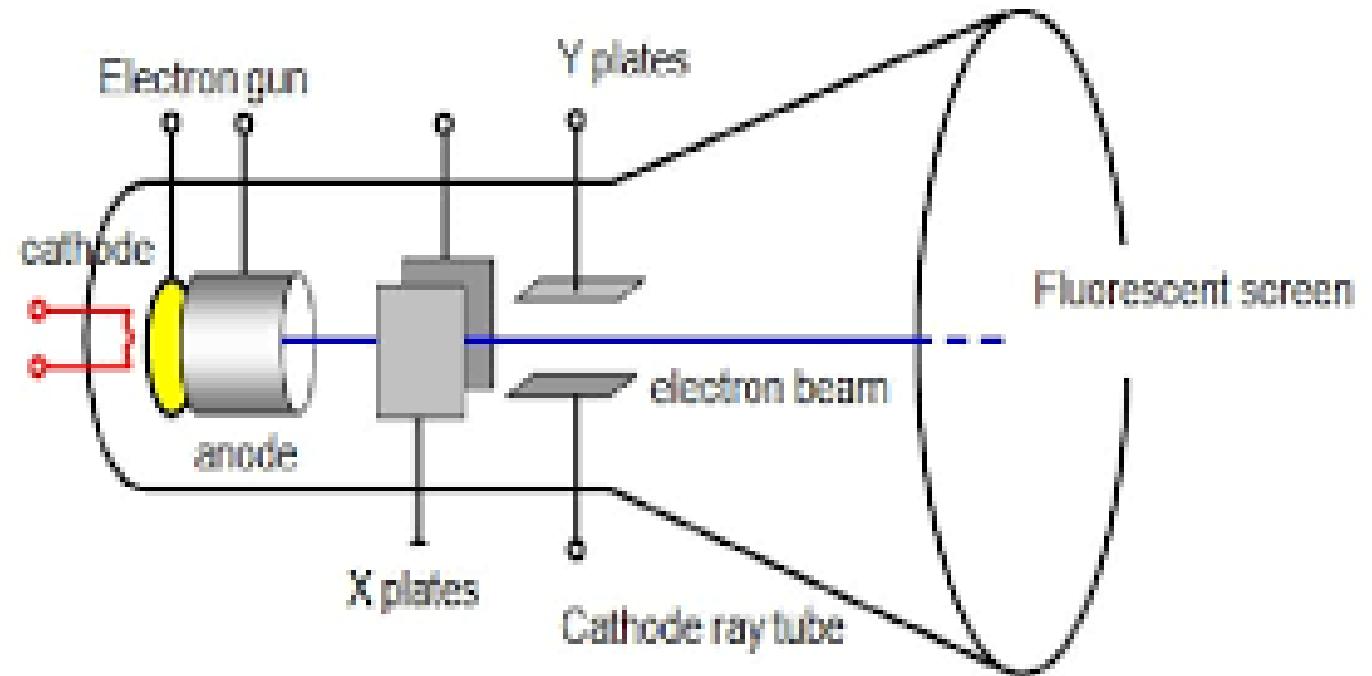
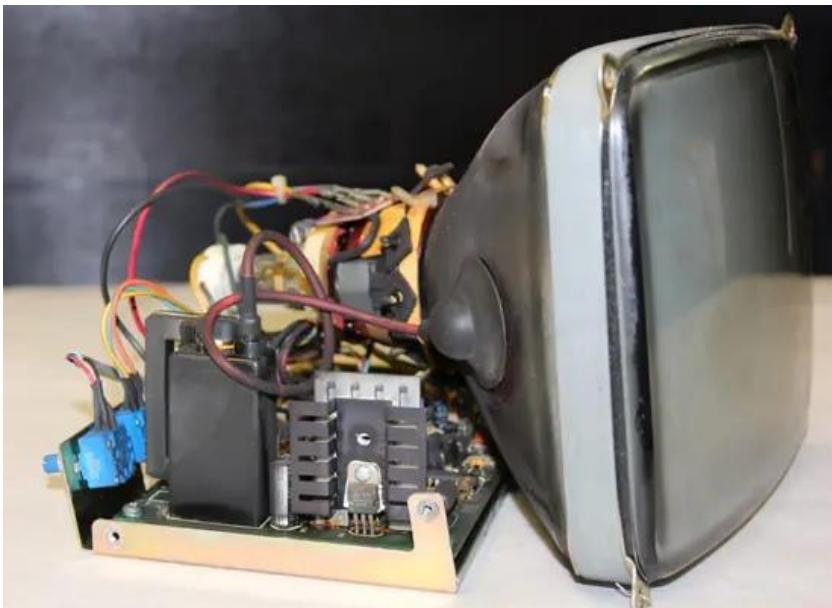
- The vacuum tube was developed from the incandescent lamp.
- When a tungsten (atomic number 74) filament is heated, it emits electrons that move toward an anode plate.
- A grid plate is used to control the number of electrons traveling from the tungsten filament to the anode plate."



Build XOR from vacuum tubes

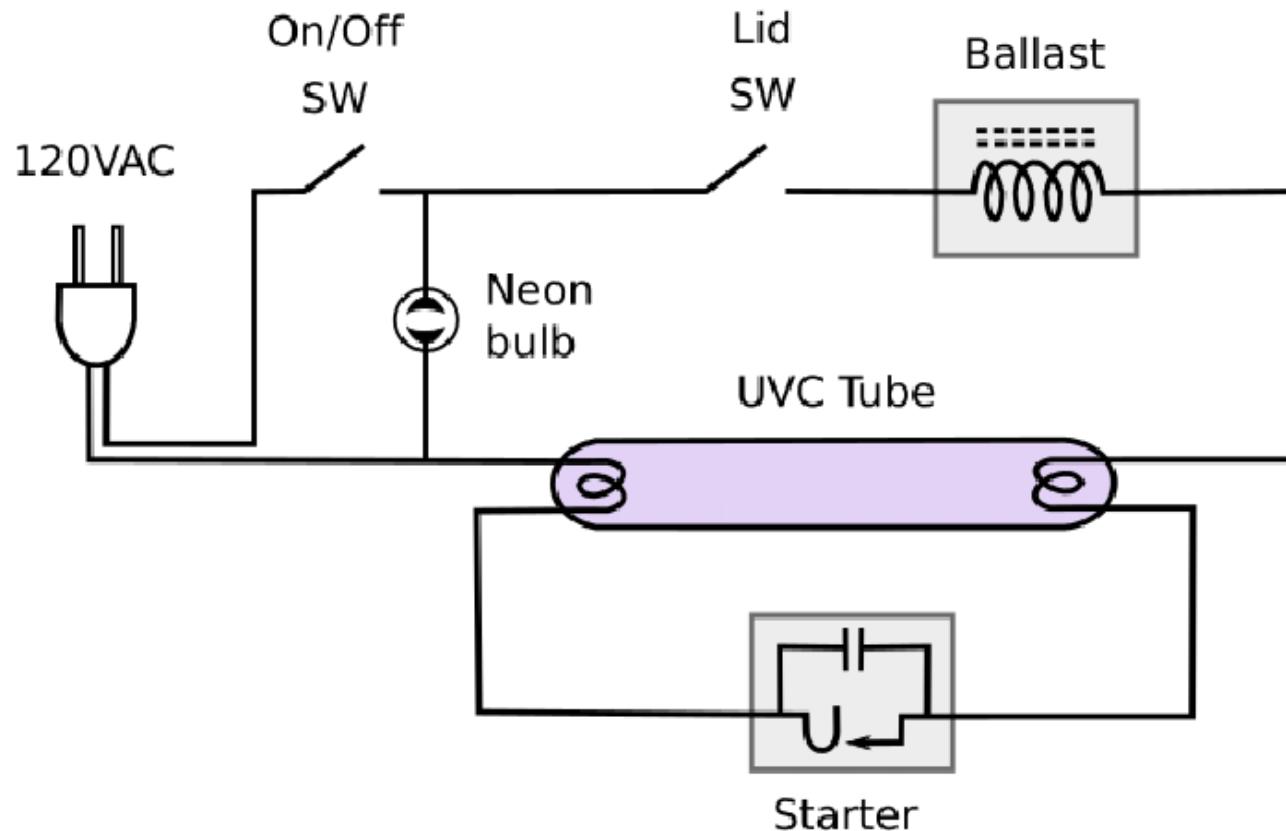


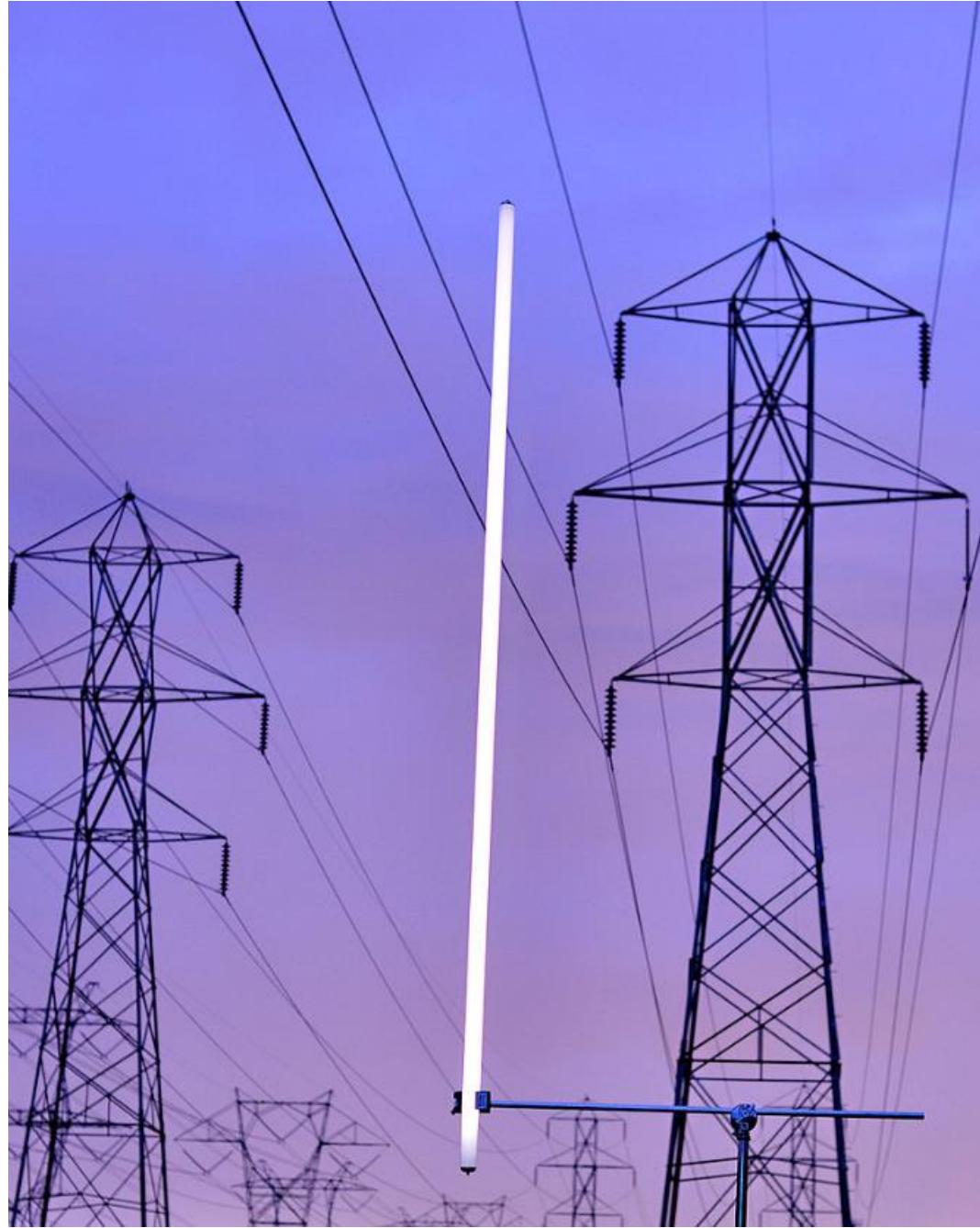
Cathod Ray Tube (CRT) in Television



Activity1.2

- The fluorescent lamp has two small tungsten coils. Do you know why a fluorescent lamp generates light? (Discussion)





SILICON CHIP

Where are Silicon, Germanium, Boron, and Antimony on the periodic table?

The periodic table displays the following information for each element:

- Symbol:** The element symbol.
- Atomic Number:** The element's atomic number.
- Name:** The element's name.
- Atomic Weight:** The element's atomic weight.
- Electrons per shell:** The number of electrons in each shell.
- State of matter (color of name):** Solid (blue), Liquid (orange), Gas (red).
- Subcategory in the metal-metallloid-nonmetal trend (color of background):**
 - Alkali metals (red)
 - Alkaline earth metals (orange)
 - Transition metals (blue)
 - Lanthanides (light blue)
 - Metalloids (yellow)
 - Post-transition metals (purple)
 - Actinides (green)
 - Reactive nonmetals (pink)
 - Noble gases (light pink)
- Unknown chemical properties:** Indicated by a question mark icon.

Periodic Trends:

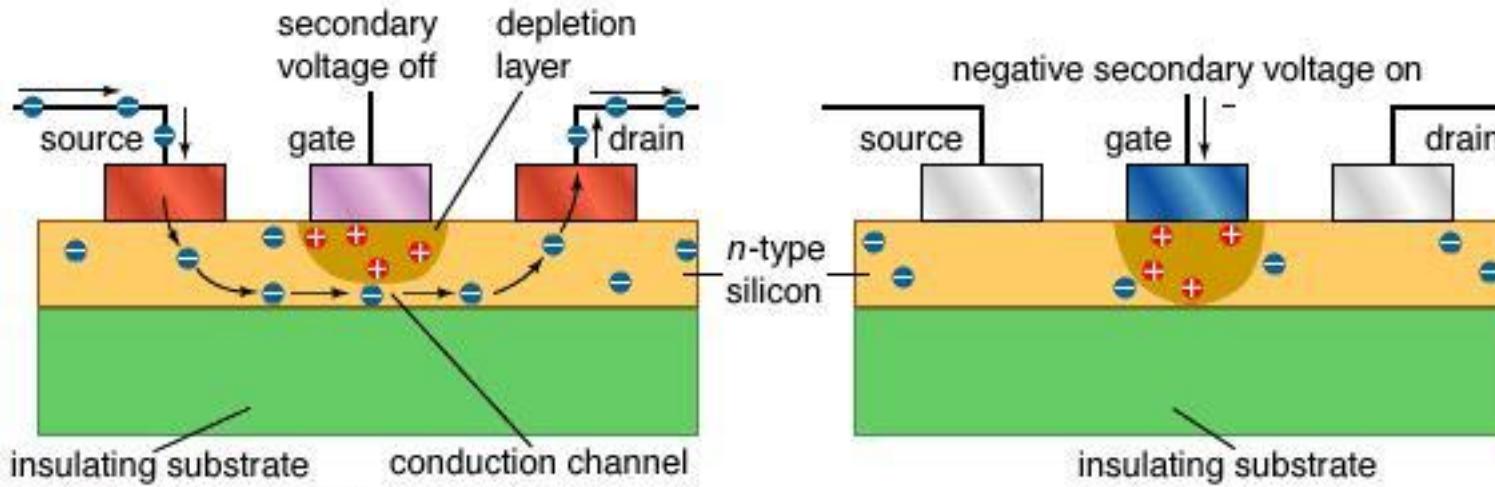
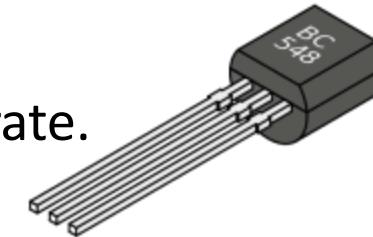
- Electron Configuration:** Shown as a sequence of numbers representing the number of electrons in each shell (e.g., 1s², 2s², 2p⁶, 3s², etc.).
- Ionization Energy:** The energy required to remove an electron from a neutral atom.
- Electron Affinity:** The energy released when an electron is added to a neutral atom.
- Electronegativity:** A measure of an atom's ability to attract electrons.
- Pauli Exclusion Principle:** States that no two electrons can have the same set of quantum numbers.
- Heisenberg Uncertainty Principle:** States that the position and momentum of a particle cannot be precisely determined simultaneously.
- Bohr Model:** A model of the atom where electrons orbit the nucleus in discrete orbits.
- Quantum Numbers:** Four quantum numbers (n, l, m_l, m_s) that describe the state of an electron.
- Angular Momentum:** The spin of an electron.
- Hydrogen Atom:** A single electron system.
- Multi-electron Atoms:** Atoms with more than one electron.
- Periodic Table:** A tabular arrangement of elements based on their atomic number and chemical properties.
- Period:** A horizontal row of elements.
- Group:** A vertical column of elements.
- Periodic Trends:** Trends observed across groups and periods.
- Periodic Law:** Elements with similar properties appear at regular intervals in the periodic table.
- Periodic Properties:** Properties that repeat in a periodic manner.
- Periodic Function:** A function that describes the periodic nature of physical properties.
- Periodic Table:** A table showing the elements in order of increasing atomic number.
- Periodic Trends:** Trends observed in the periodic table.
- Periodic Law:** Elements with similar properties appear at regular intervals in the periodic table.
- Periodic Properties:** Properties that repeat in a periodic manner.
- Periodic Function:** A function that describes the periodic nature of physical properties.

Silicon Transistor

ໄຕກອນໂທນາຍ

(ເຫດສົ່ວງຈະລືມ covalent e⁻ ເນັດໃບ)

- Semiconductor is created from Silicon¹⁴ and Germanium³².
- Electron movement from a source pin to a drain pin is controlled by a gate pin.
- SGD pins are installed in a silicon or germanium substrate.



Silicon chip-making process

- Silicon
 - Make from the ordinary sand, quartz, rock crystal, amethyst, agate, flint, jasper, and opal.



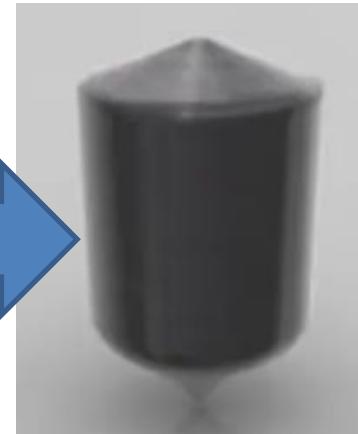
Silicon chip-making process



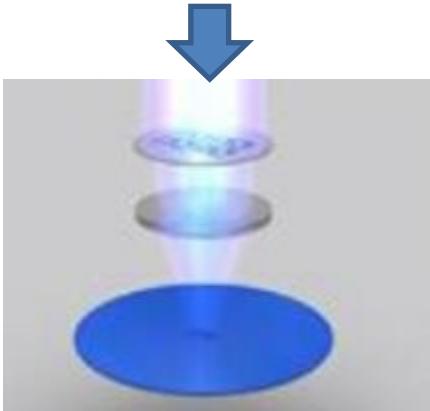
Burn



set



Engineer design circuit

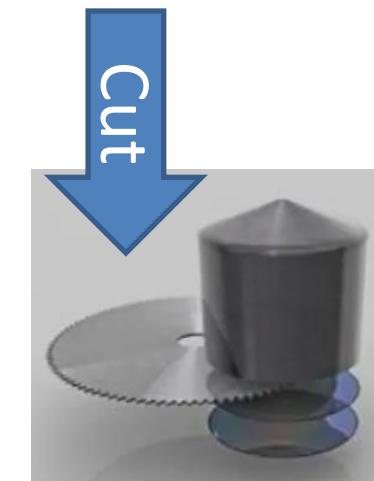


Exposure



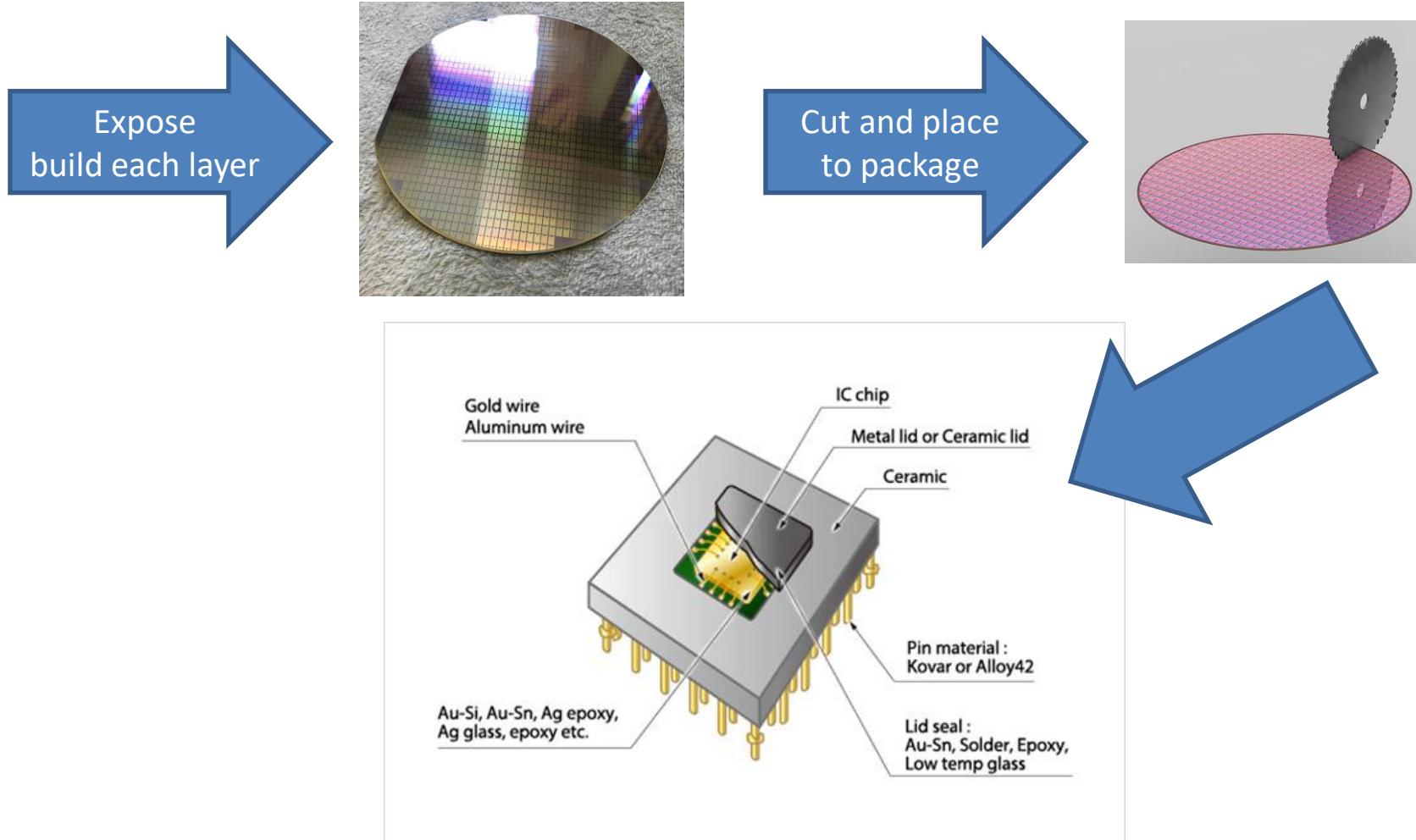
Wafer

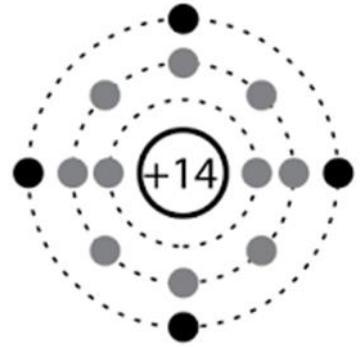
Pure silicon



Cut

1.1.3 Silicon chip-making process





Silicon

Pure silicon



Mixing

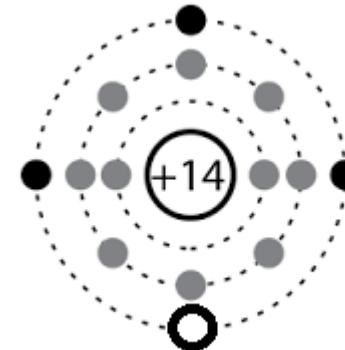
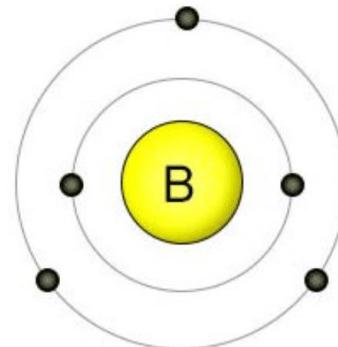
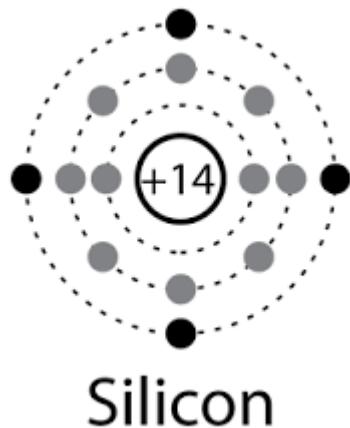


Impure
silicon



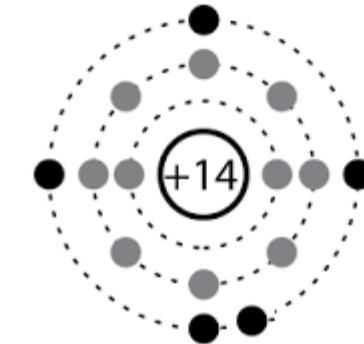
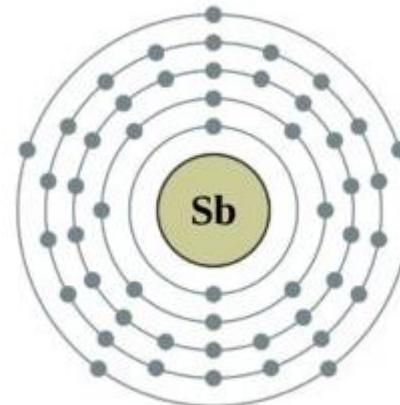
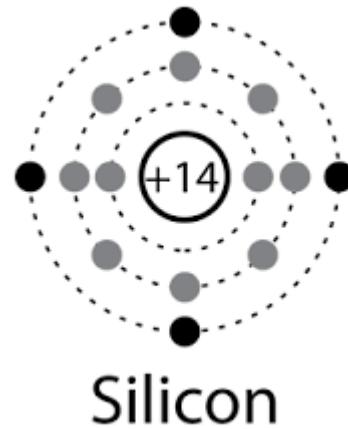
Another
substance

P-type created by mixing silicon(*4) with boron(*3).



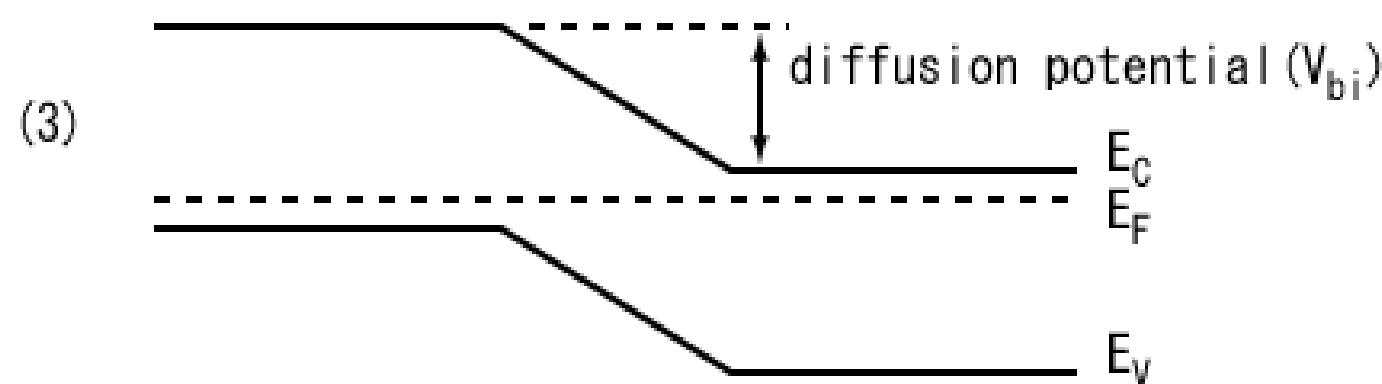
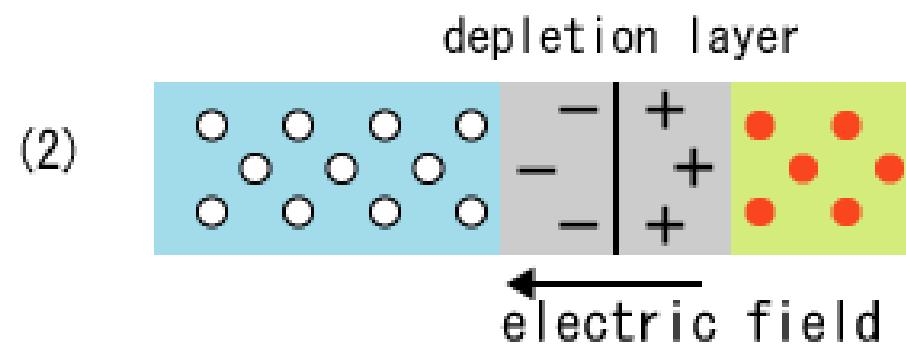
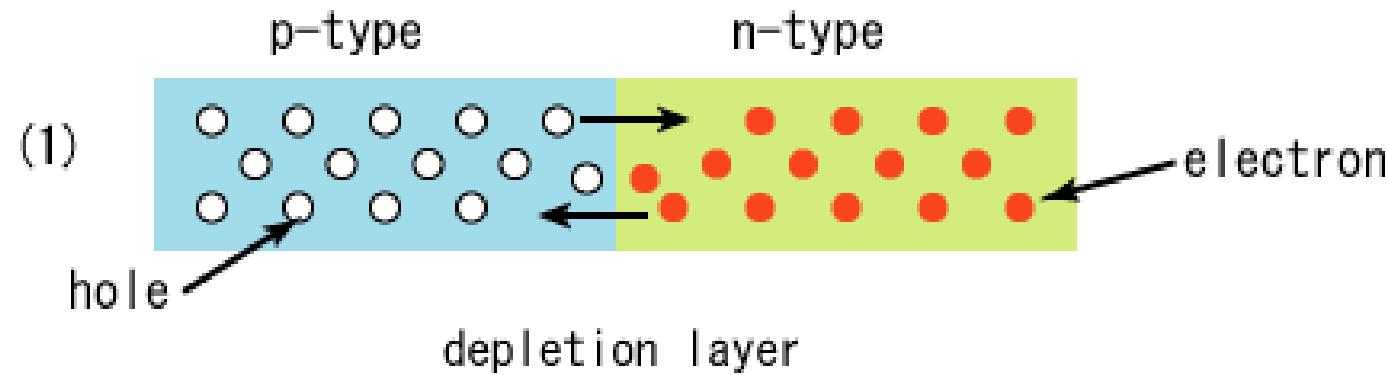
Impure silicon
(P-type)

N-type created by mixing silicon(*4) with antimony(*5).



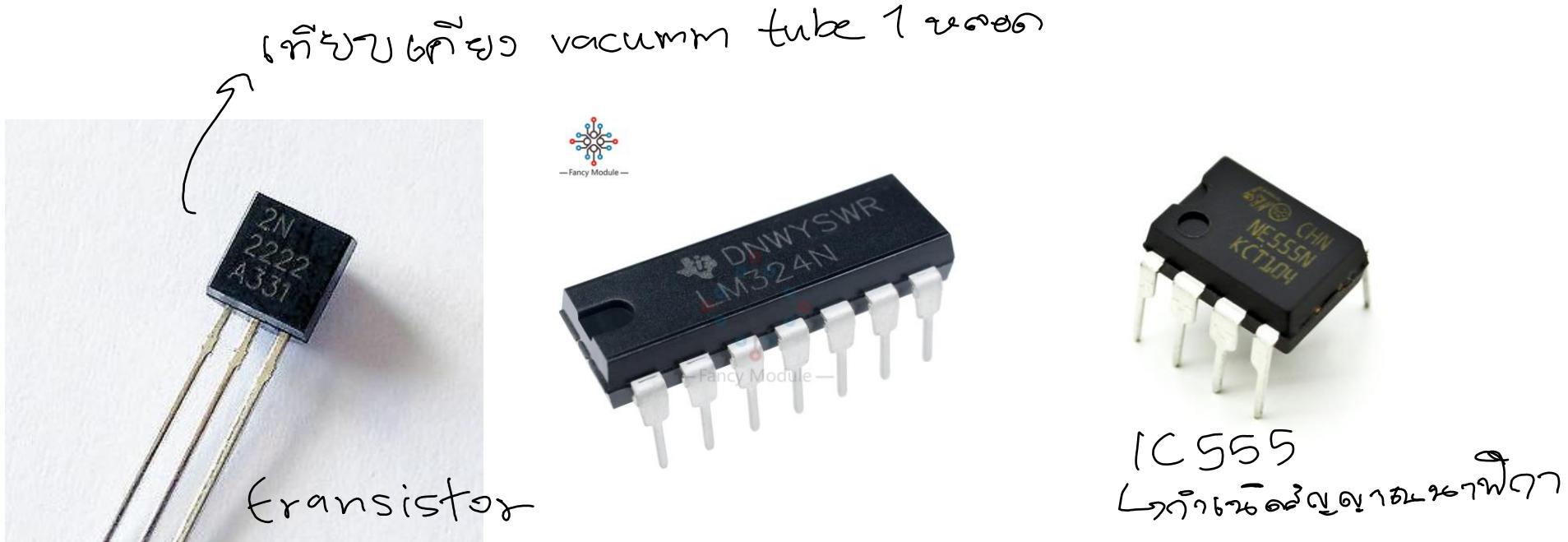
Impure silicon
(N-type)

N-type and P-type



Activity 1.3

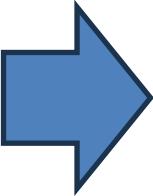
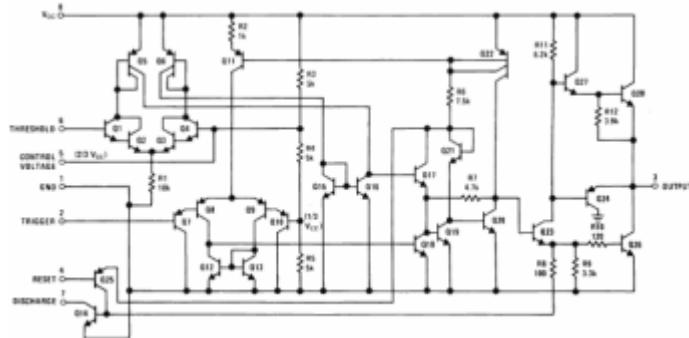
- Search online for information or specifications related to ICs or transistors



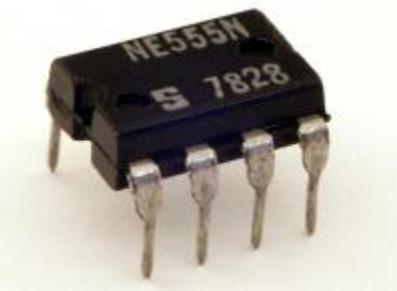
Integrated Circuit

- Discrete Circuit

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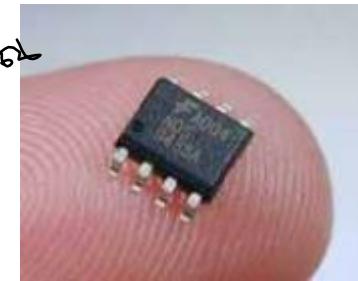


- Integrated Circuit ; IC

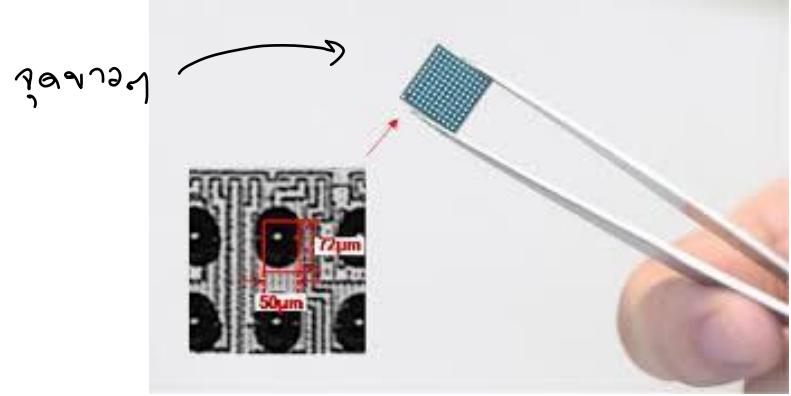


transistor
≈ 30 လျှောက်

→ ကိုယ့်တွင်သော
အပါးပါတာ



Chip Size



Name	Number of Transistors	Year	Size of the transistor in chip
Small Scale IC (SSI)	10	1971 - 1985	10 μm – 1 μm
Medium SI (MSI)	10 – 1000	1989 - 1999	800nm – 180nm
Large SI (LSI)	1K – 100K	2001 - 2010	130nm – 32nm
Very LSI (VLSI)	100K – 1M	2012 - 2017	22nm – 10nm
Ultra LSI (ULS)	> 1M	App. 2018	7nm
		App. 2020	5nm

Latest
3 nm

What are the advantages of developing smaller-sized chips?

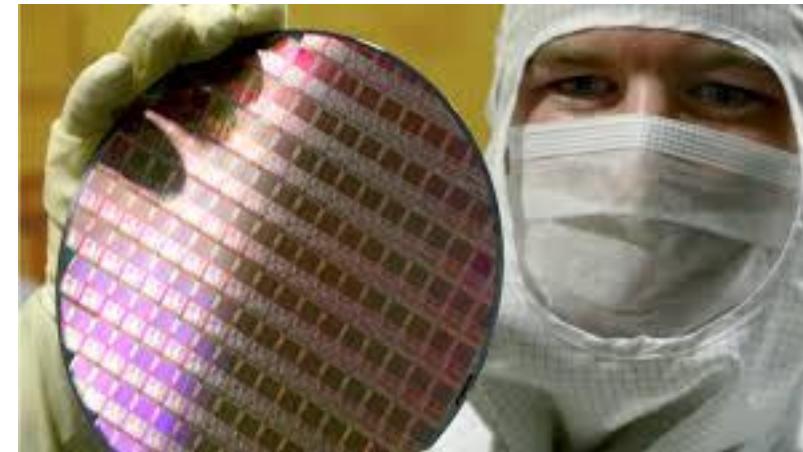
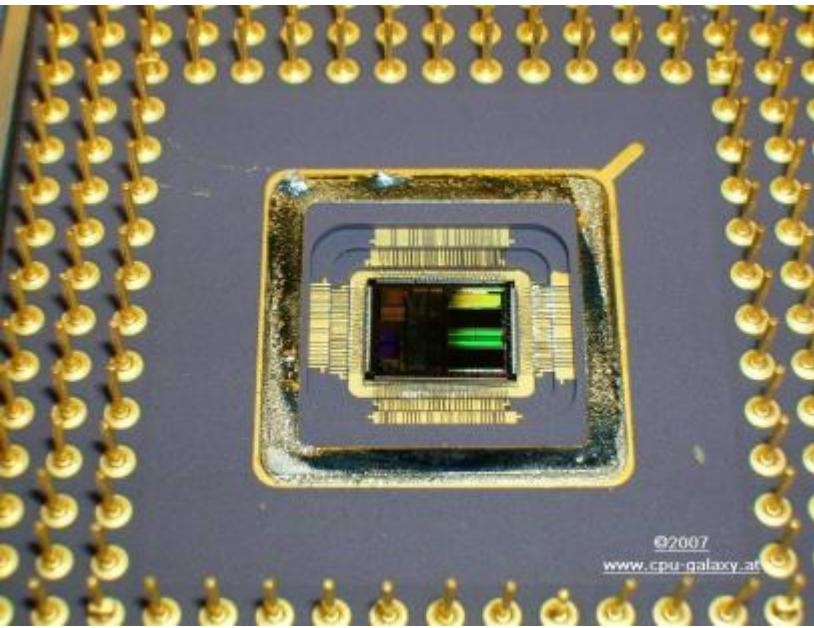
ຈະນາຄາ ລົມ $\rightarrow 1.6 \times 10^{-19}$ ↙ ຢື່ນເຈົ້າໂລ່ ອົ່ວຍອນຮັກຕີ
ຈຳນວຍເຫຼືດ e^-

CPU die size

Years	Marketing names	Fabrication process
1971	Intel 4004	10um
1982	Intel 80286	1.5um
1994	Intel 80486	180nm
2004	Pentium IV (Prescott)	90nm
2006	Pentium IV (Cedar Mill)	65nm
2007	Core 2, Dual-core	45nm
2010	Core i3-i7	32nm
2012	Core i3-i7 (ivy bridge)	22nm
≈2014		14nm
≈2016		10nm
≈2018		7nm
≈2020		5nm



Chip



ELECTRONIC DEVICES

Electronic devices

Passive Active

- Passive device → යැක්කුවනු ලැබේයා
චාරු සිලුගාස්

– Capacitor ; C

– Resistor

– Inductor

– Transformer

↗ primary/secondary coil



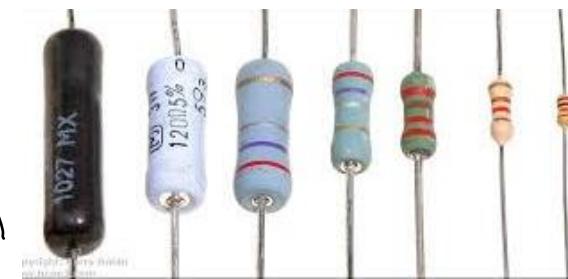
Transformer

- ජංගා 220V 10kV

- ප්‍රධාන ප්‍රතිශ්‍රාව/මා

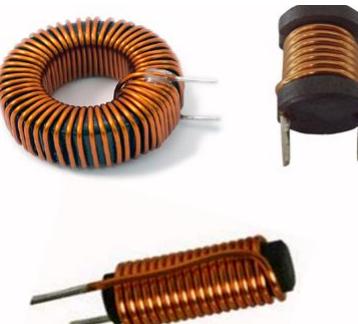
- දෙනා නාඟා ප්‍රතිශ්‍රාව

1 : 10



Capacitor
- මින්ඩු එක්ස් / මිකුන්ස්
- අවශ්‍ය ප්‍රතිශ්‍රාව Battery
රේඛ්‍ය ප්‍රතිශ්‍රාව

Resistor; එක්කා ගාන්ගා ඇ
- අවශ්‍ය ප්‍රතිශ්‍රාව



Inductor

- ගිවුන්වන්වා නුවා ප්‍රතිශ්‍රාව

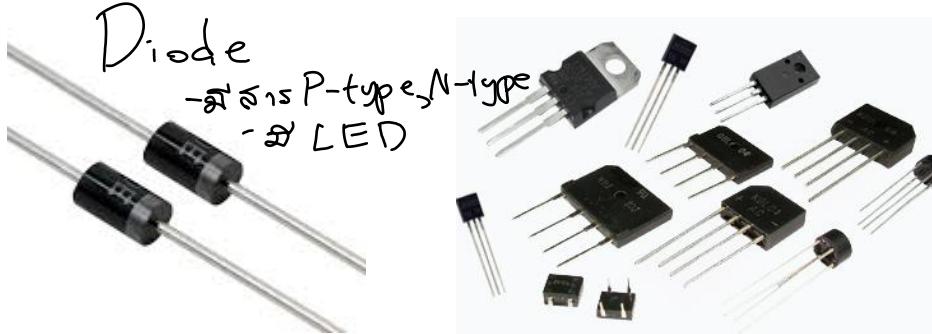
- ප්‍රතිශ්‍රාව ප්‍රතිශ්‍රාව

→ ගැඩිජ්‍යෝනික් ත්‍රියිං

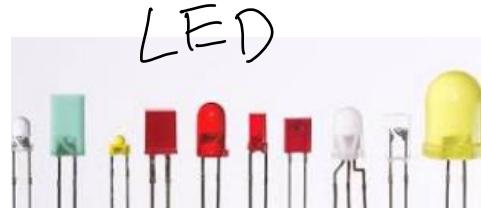
Electronic devices

- Active device
 - Diode
 - Transistor
 - Light Emitting Diode (LED)
 - IC, Chip
- Component
 - Print Circuit Board (PCB)

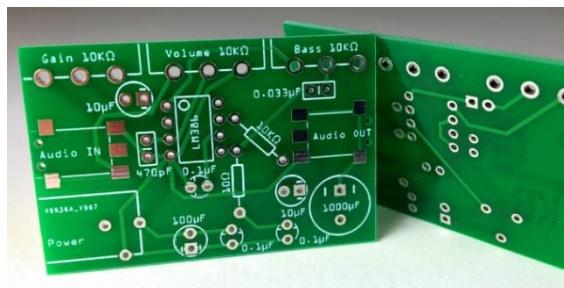
សការការណ៍នៃបច្ចេកទេស



ការអនុញ្ញាត



ទេស, ទីផ្សារ, ស្នើ → ថ្មី
ការបង្កើត
{ ការលែងនៃការបង្កើត
ការស្ថាបនការងារសំខាន់ខាងក្រោម

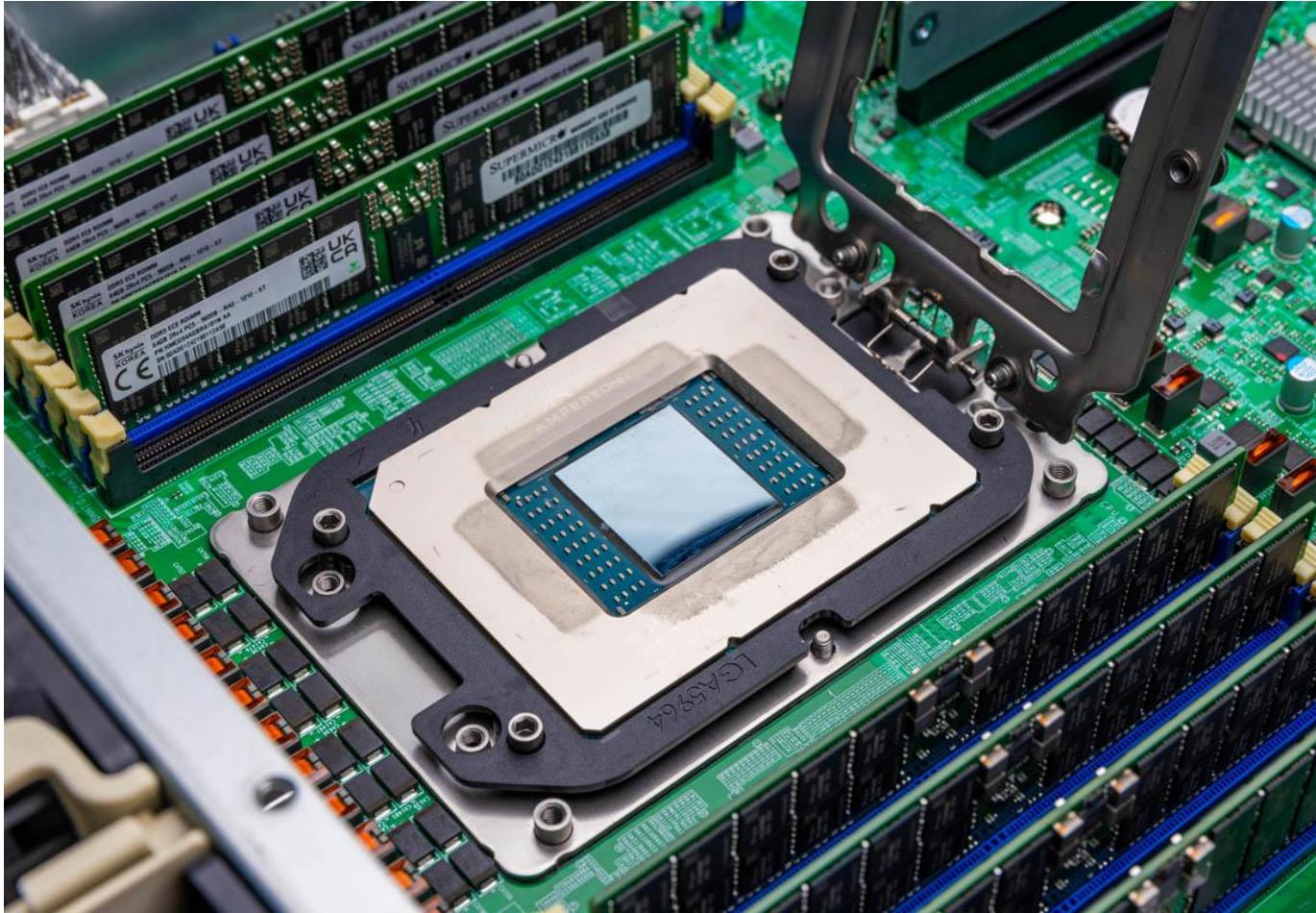


DIFFERENT TYPES OF PROCESSORS

Processor vs CPU vs Core → ພັນຍາກະນະລູ້ງ C PU

- Processor = CPU
- The processor, also known as the CPU, provides the instructions and processing power the computer needs to do its work.
- Central Processing Unit
 - Central = Main
- Core is a processing unit of the CPU
- CPU ອາຈີນ processor ແລະ ຖີມ

the AmpereOne processor with 256 cores



Computer Inside

- Processor
- Main memory
- System bus
- I/O Module

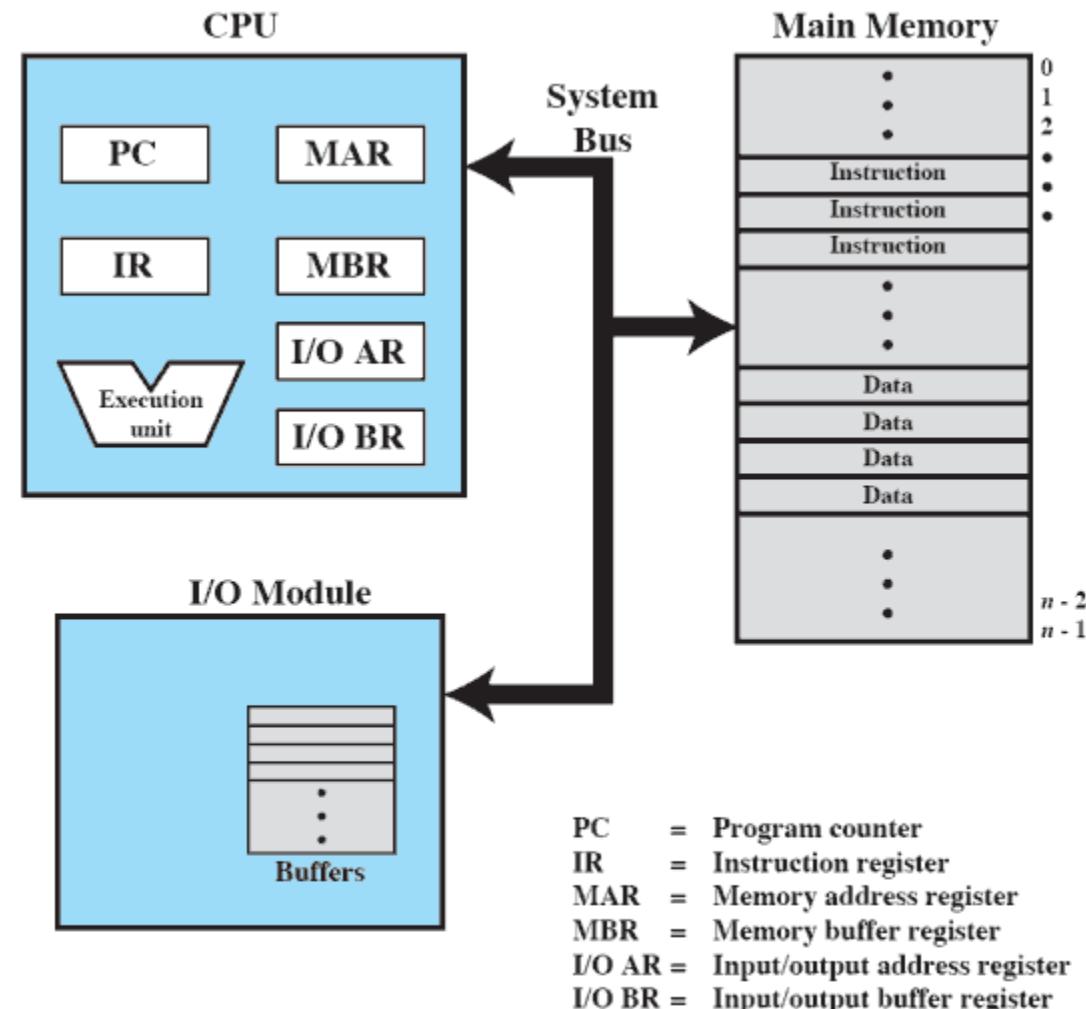
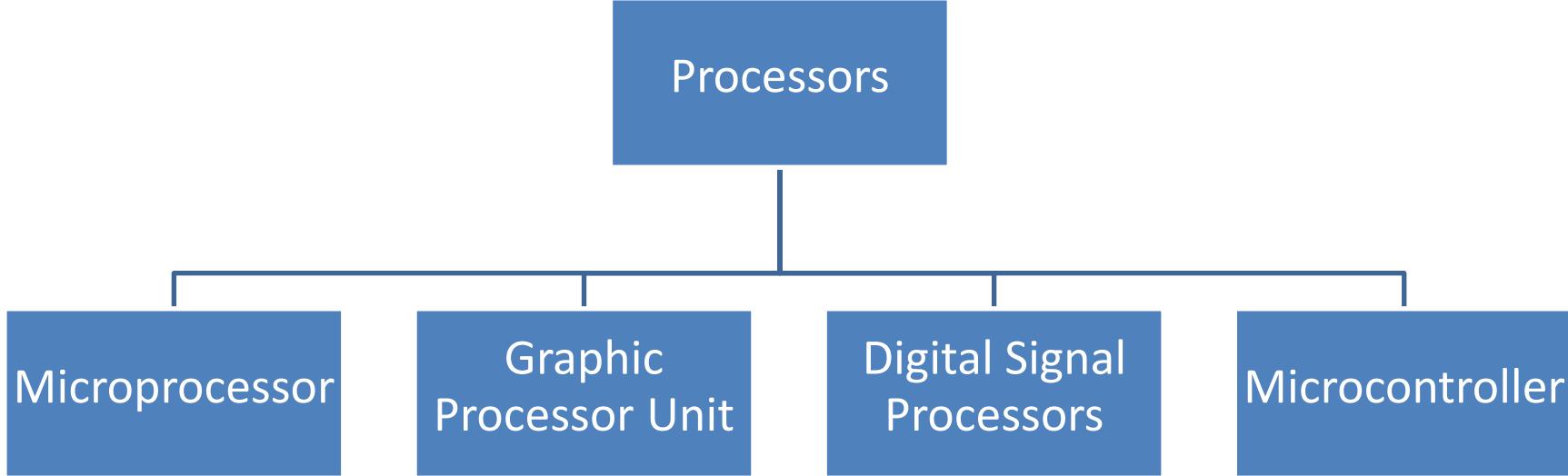
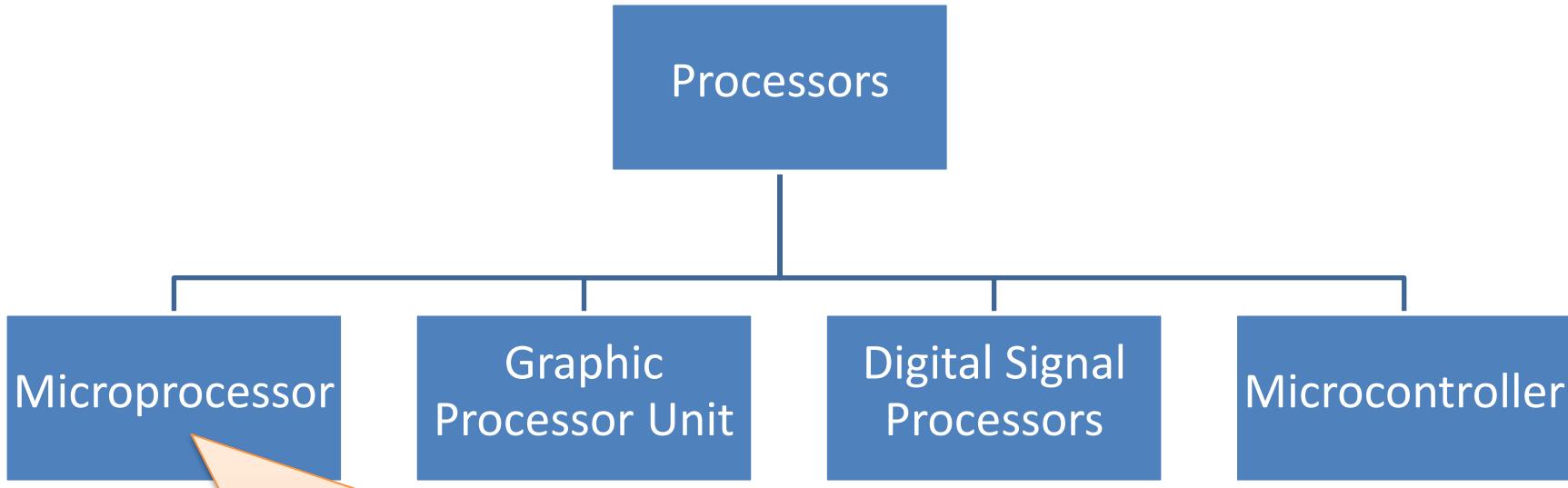


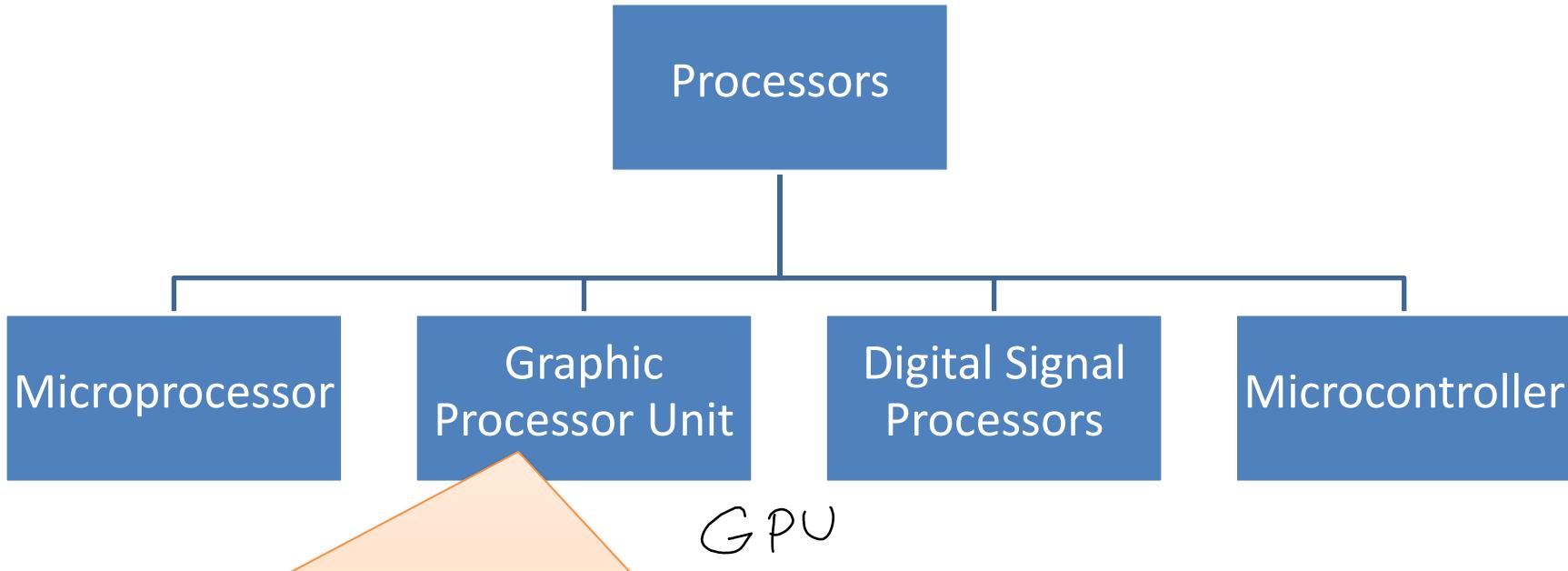
Figure 1.1 Computer Components: Top-Level View





- General instruction set for general works
- No I/O ports directly
- Example
 - x86 CPUs
 - x64 CPUs

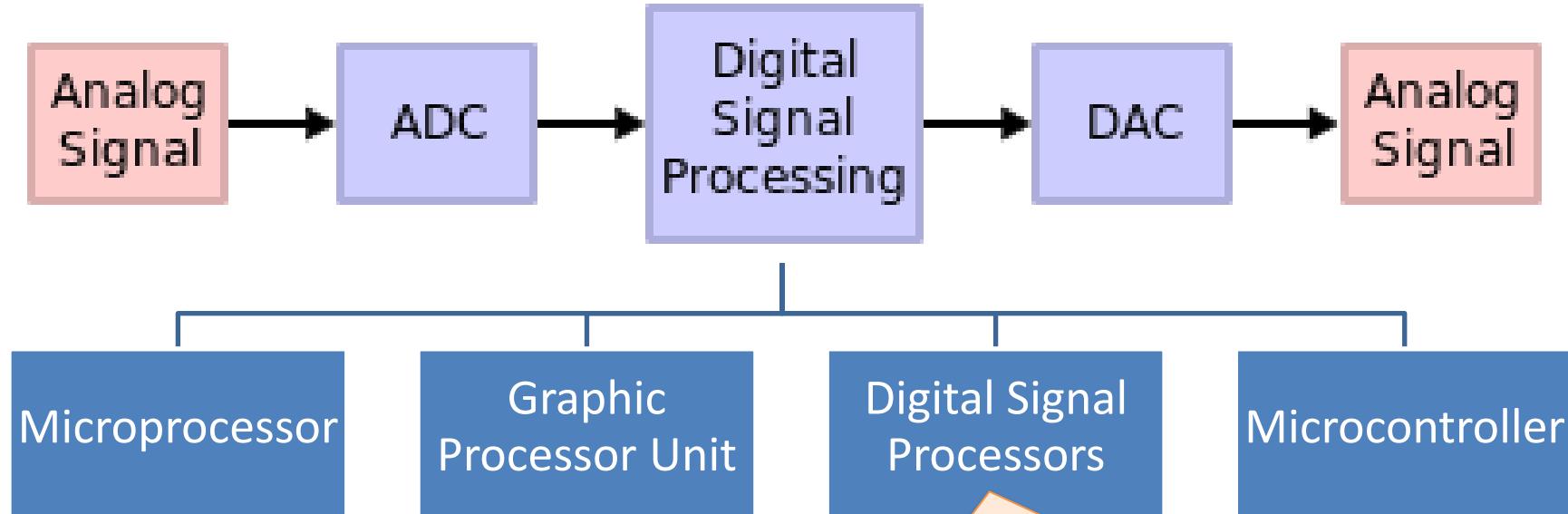
ໄຟລົມກໍາລົມ ດືອນ/iPad



- Specific instruction set for vector and graphic computing and video rendering
- Dual ports memory interface
- Multicores
- Example family chips
 - GeForce, Radeon
 - Quadro, FirePro



• មេដឹកជញ្ជូនការគ្រប់ការងារ
ក្នុងការគ្រប់ការងារ



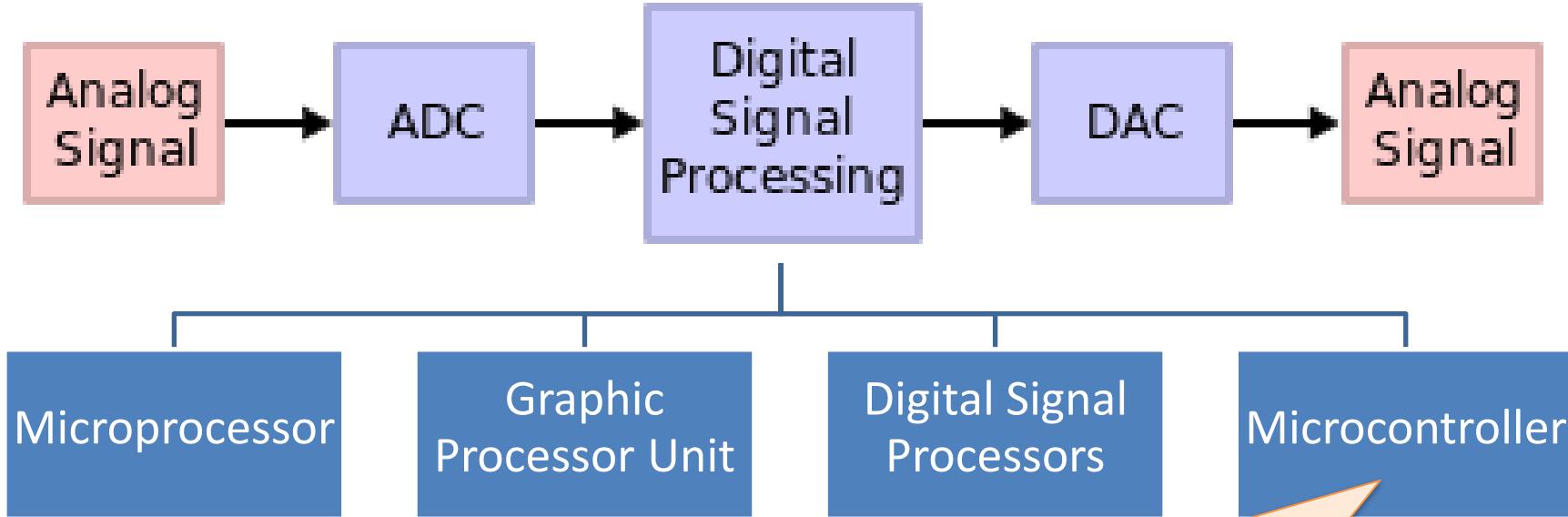
DSP Processor

- Specific instruction set for streaming signal
 - Encoding audio/video
 - Decoding audio/video
- Example family chips
 - C6000 (Texas Instrument)
 - SHARC (Analog Devices)
 - EMU10K (Creative)



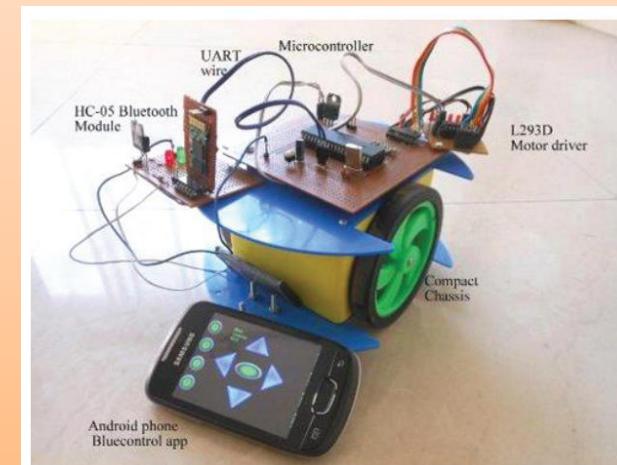
• ග්‍රැංචාලයනිශ්චල



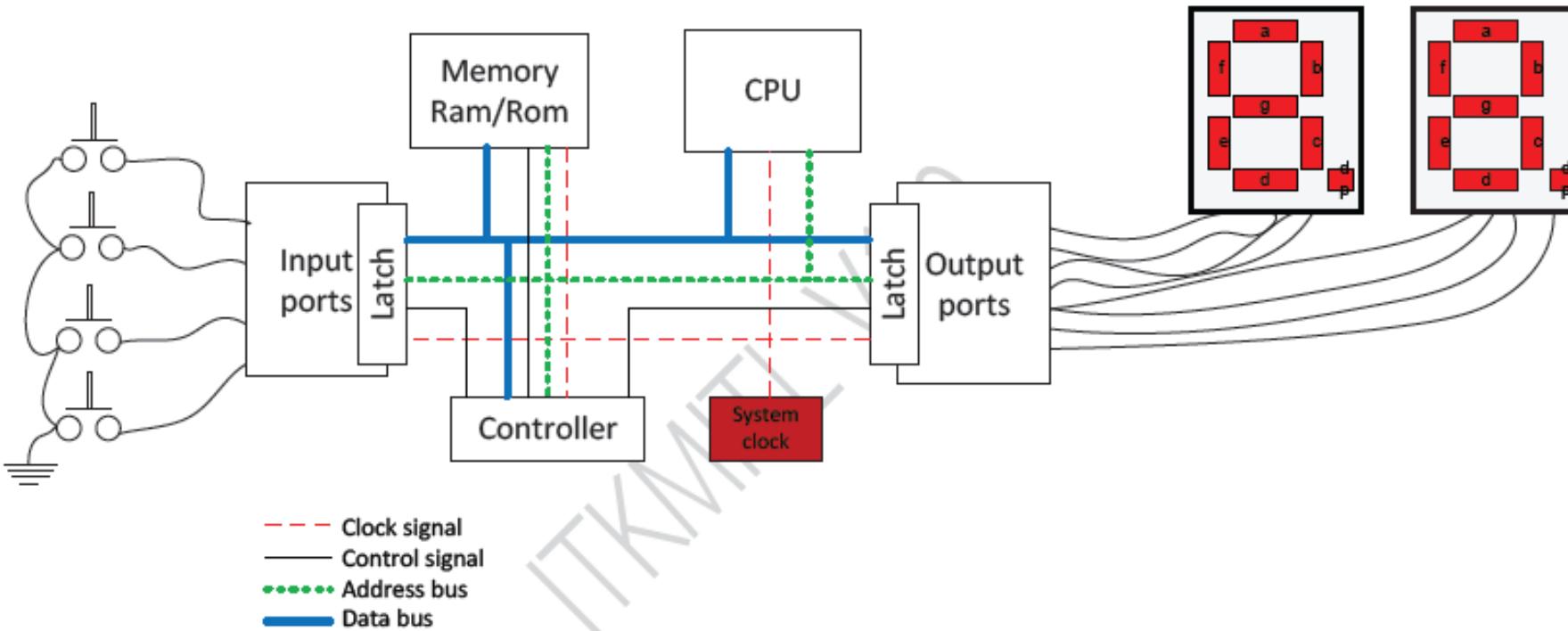


ex. Arduino, Raspberry Pi

- Specific instruction set for input/output controlling
- I/O ports and timers
- Example family chips
 - PIC
 - MCS-51
 - ARM

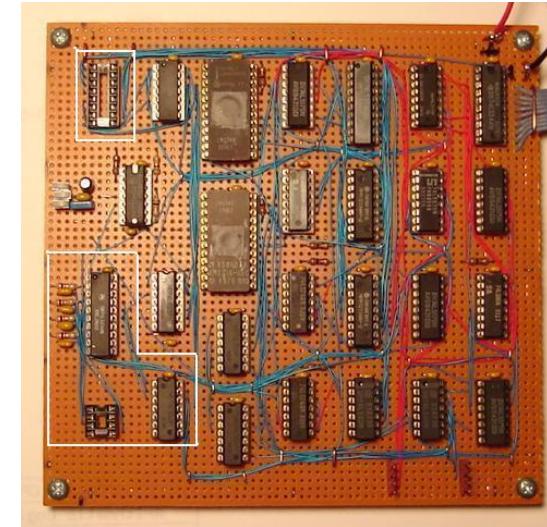
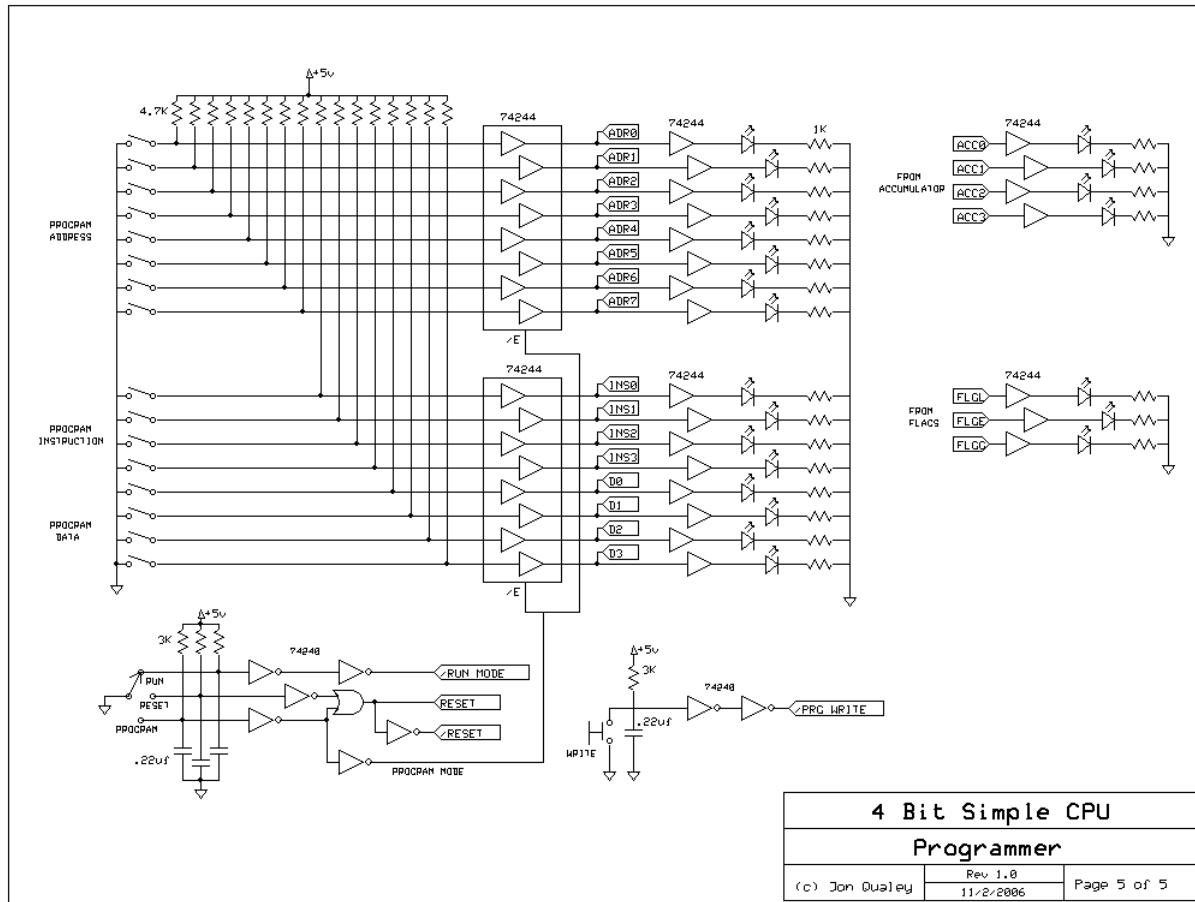


Device Connectivity in the computer



Why does the digital circuit become the computer?

CPU 4-bit



http://www.galacticelectronics.com/4BitCPU_Programmer.HTML

Activity 1.4

- Find the CPU specification from the list below with the Internet.

- Z80 microprocessor 8-bit
- 8051 microcontroller 8-bit
- 68HC11 microcontroller 16-bit → neural engine ⚡
- PIC 16Fxx microcontroller 8-bit → smart plug
↪ IoT connection (No WiFi)

IOT

- Arduino microcontroller
- ↓
↳ Internet ↳
- 8088 microprocessor
- 80286 CPU 16-bit
- 80386 CPU 32-bit
- Pentium CPU 64-bit

Summary