

21D04120402

DASAR ELEKTRONIKA

Modul 01 SERBA-SERBI ELEKTRONIKA



(versi kuliah DARLING = semi-DARing semi-LurING)
Semester Awal 2021-2022

Selintas SEJARAH

- **1995: KONSORSIUM ILMU2 TEKNIK** menetapkan: **Teknik Elektro** (*Electrical Engineering*) = (1) Teknik Tenaga Listrik, (2) Teknik Telekomunikasi, (3) **Teknik Elektronika**, (4) Teknik Kendali dan (5) Teknik Komputer

- **4(+1) DASAR KEILMUUAN Teknik Elektro** (*Electrical Engineering*):
 - (1) Rangkaian Listrik
 - (2) Elektromagnetik
 - (3) **Elektronika**
 - (4) Rangkaian Logika
 - dan (5) Isyarat dan Sistem

Cover image: Frank Wing / The Image Bank

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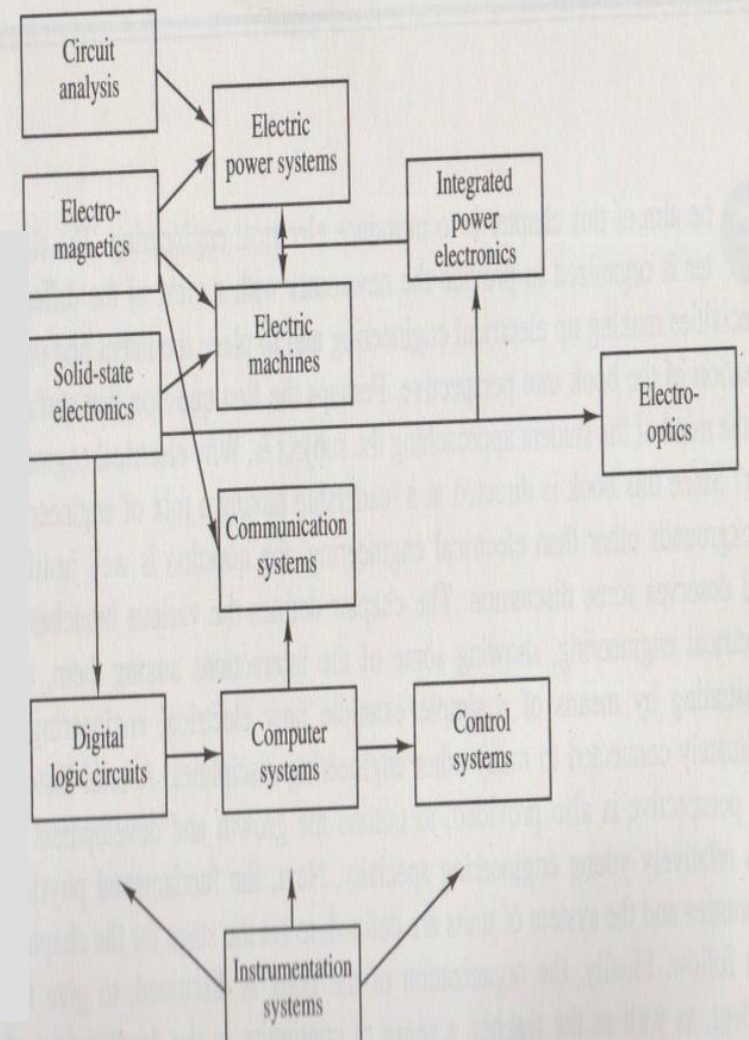
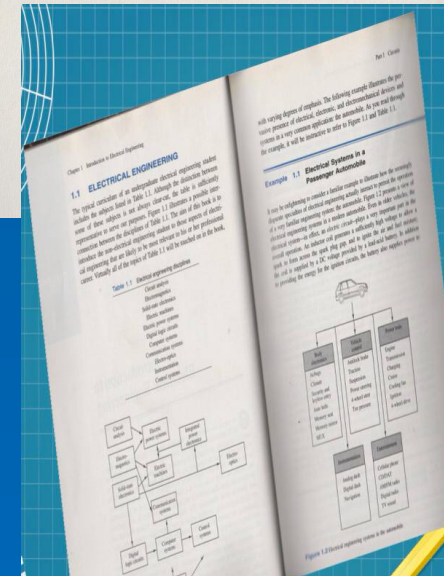
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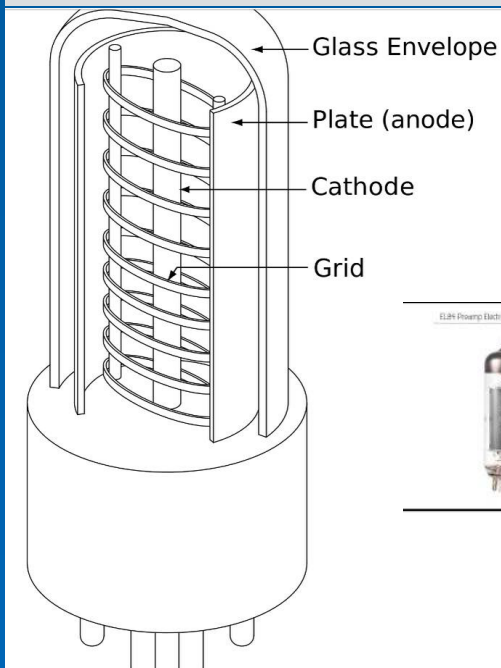
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Principles and applications of electrical engineering / Giorgio Rizzoni.

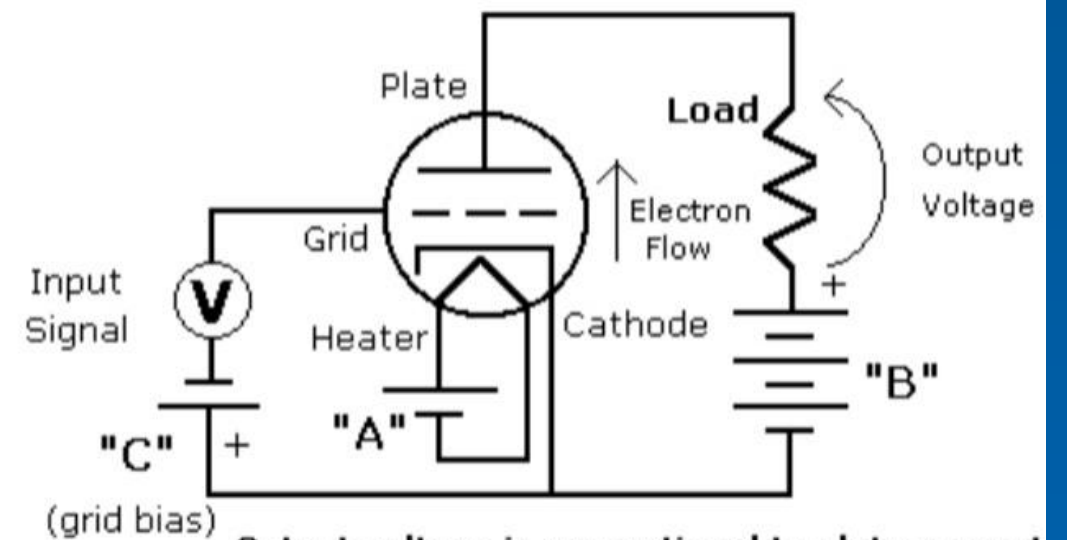


"NON-SOLID STATE ELECTRONICS"

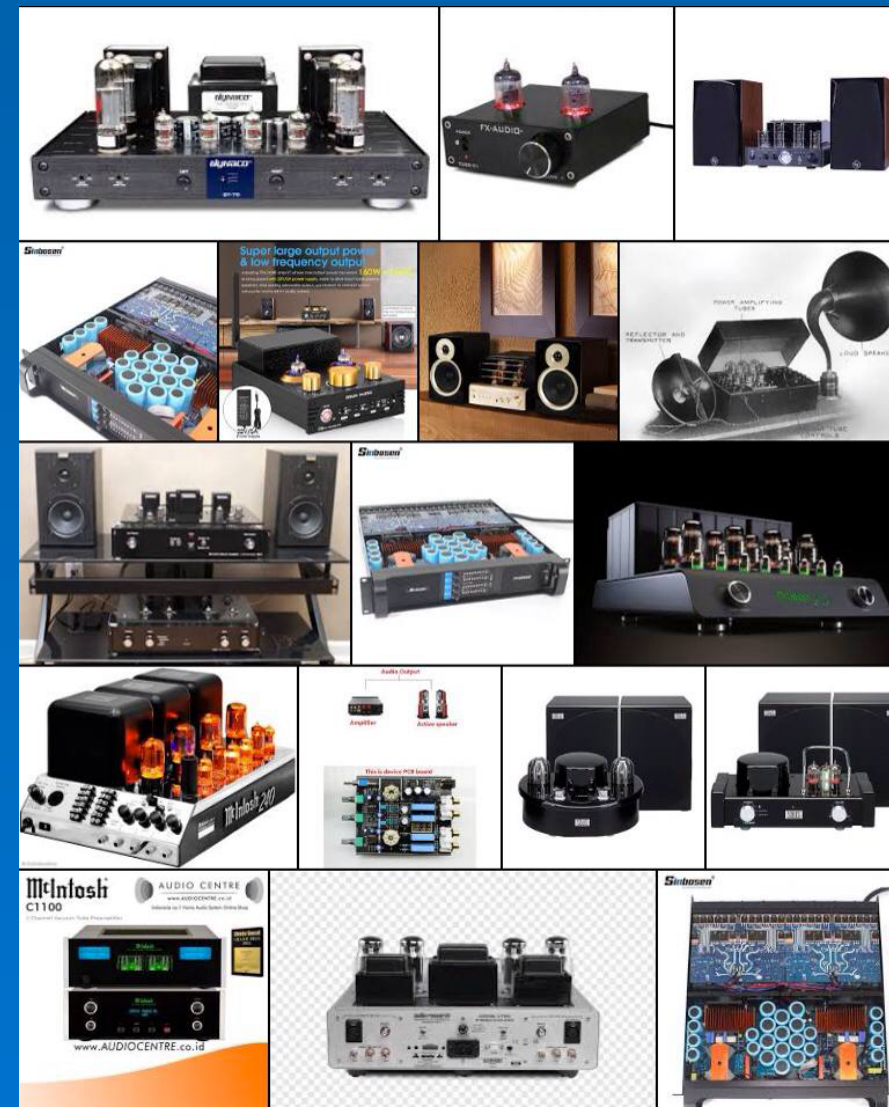
"**Solid State**" = keadaan **padat**, benda padat
Adakah Elektronika yang Bukan "**Solid State**" ???
Ada, komponen **Tabung Hampa (Vacuum Tube)**



The Common-cathode Triode Amplifier



Output voltage is proportional to plate current which is controlled by grid voltage.

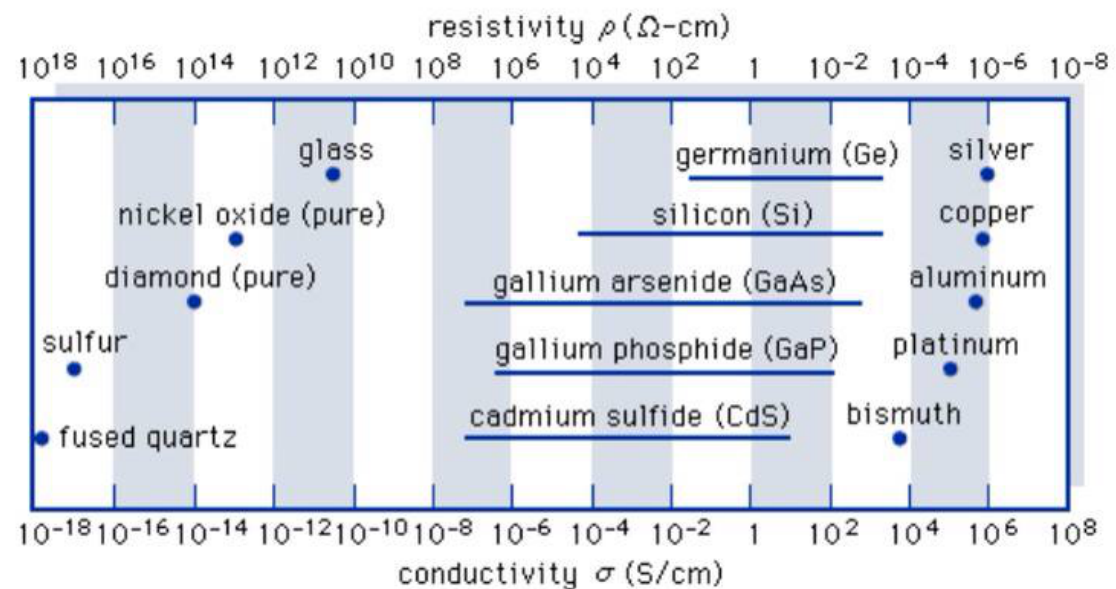


"SOLID STATE ELECTRONICS"

Silicon



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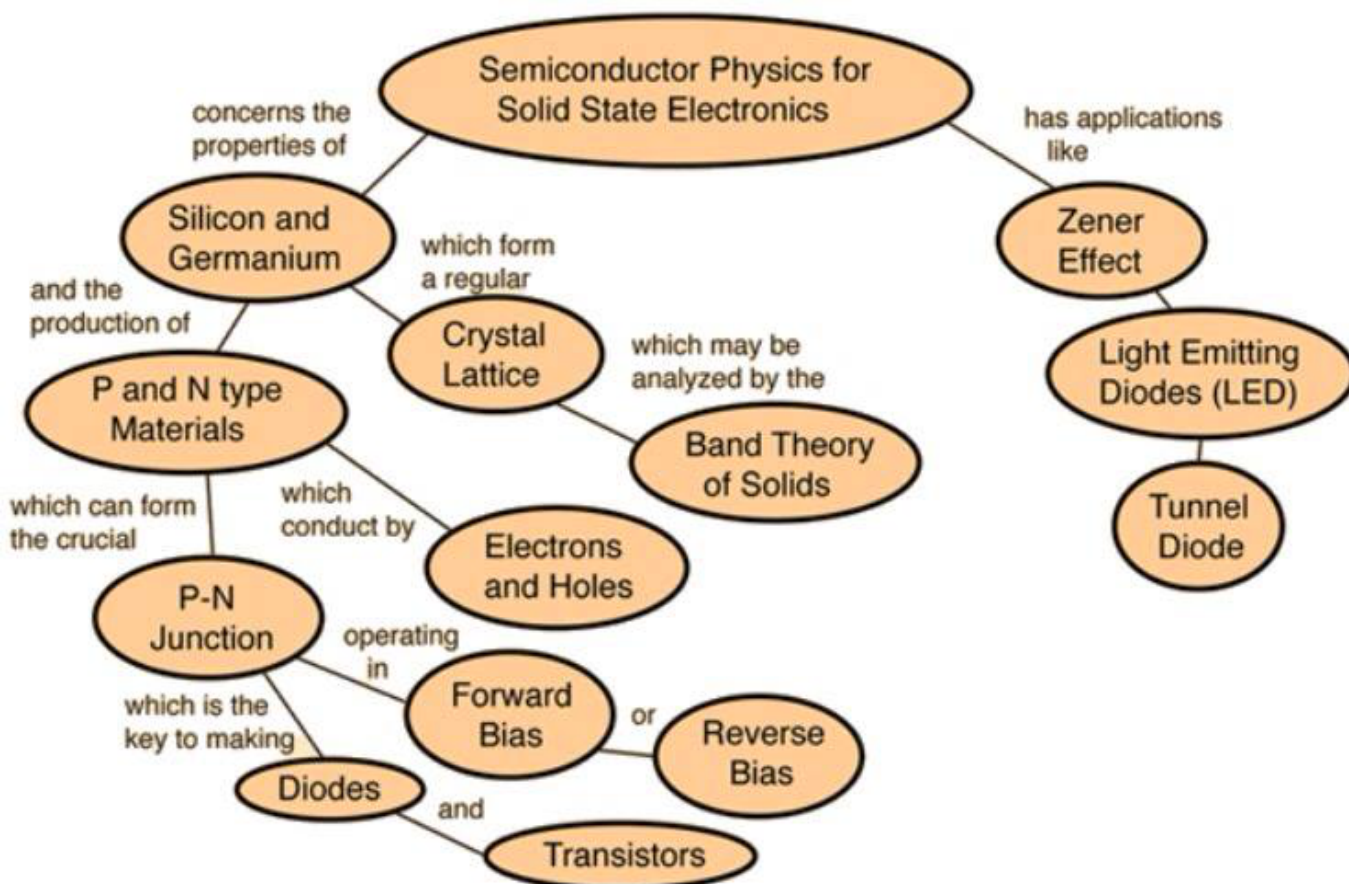
What is a Semiconductor

- A semiconductor is a material that has intermediate conductivity between a conductor and an insulator
- Also called "III-V" materials since semiconductor elements are in groups III and V of the periodic table of chemical elements.

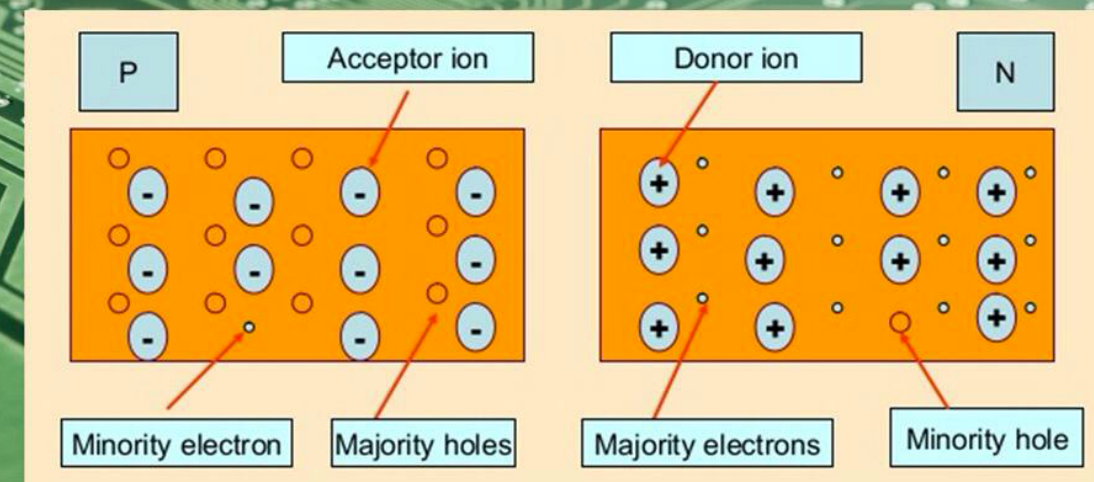


II	III	IV	V	VI
5 B	6 C	7 N	8 O	
13 Al	14 Si	15 P	16 S	
30 Zn	31 Ga	32 Ge	33 As	34 Se
48 Cd	49 In	50 Sn	51 Sb	52 Te

Examples are silicon (^{14}Si), germanium (^{32}Ge)



Types of Semiconductor



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PENEMUAN TRANSISTOR

- **1925**: **Julius Edgar Lilienfeld** mengajukan konsep **Field Effect Transistor (FET)** walau pun belum bernama “transistor” dan belum terbayangkan me-realisasi-nya
- **1947**: (**Bell Labs**) **William Shockley, John Bardeen** dan **Walter Brattain** membuat **Bipolar Junction Transistor (BJT, atau transistor)**.
- **1959**: (**Bell Labs**) **Muhammed Atalia** dan **Dawon Kahng** membuat **Metal-Oxide-Semiconductor (MOS)-FET**, selanjutnya berkembang menjadi teknologi **CMOS**.



Transistors

- History
- Transistor Types
 - **BJT**: A **bipolar (junction) transistor** is a three-terminal electronic device constructed of doped semiconductor material and may be used in amplifying or switching applications
 - **FET**: The **field-effect transistor (FET)** relies on an electric field to control the shape and hence the conductivity of a channel of one type of charge carrier in a semiconductor material
 - **Power** transistors



The Transistor is Born

- Bell Labs (1947): Bardeen, Brattain, and Shockley
- Originally made of germanium
- Current transistors made of doped silicon



PERKEMBANGAN SELANJUTNYA

- **ELEKTRONIKA ANALOG**, transistor sebagai **penguat**
- **ELEKTRONIKA DIGITAL**, transistor sebagai **saklar**
- Teknologi **Integrated Circuits (IC)**
- **ELEKTRONIKA DAYA (Power Electronics)**, untuk **sistem tenaga listrik**, SCR, thyristor, Power-MOSFET dll.
- **ELEKTRONIKA TELEKOMUNIKASI**, untuk **sistem telekomunikasi**, frekuensi tinggi.
- **ELEKTRONIKA KEDOKTERAN (Medical Electronics)**, untuk **sistem instrumentasi** kedokteran.
-dan lain-lain

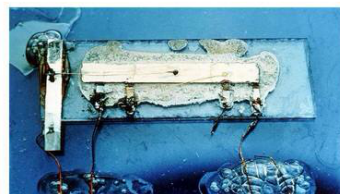
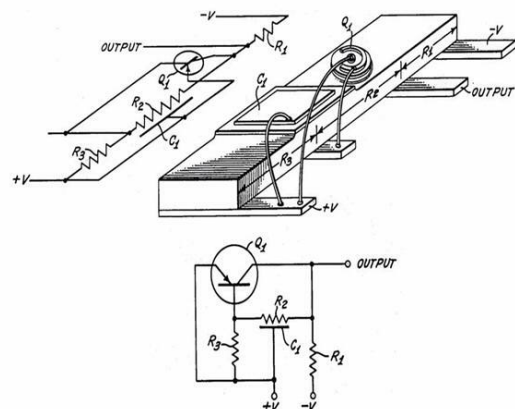
History of Integrated Circuits

- In 1961 the first commercially available integrated circuits came from the Fairchild Semiconductor Corporation.
- The original IC had only one transistor, three resistors and one capacitor.



The First (2D) Integrated Circuit
Jack Kilby, Texas Instruments, 1958

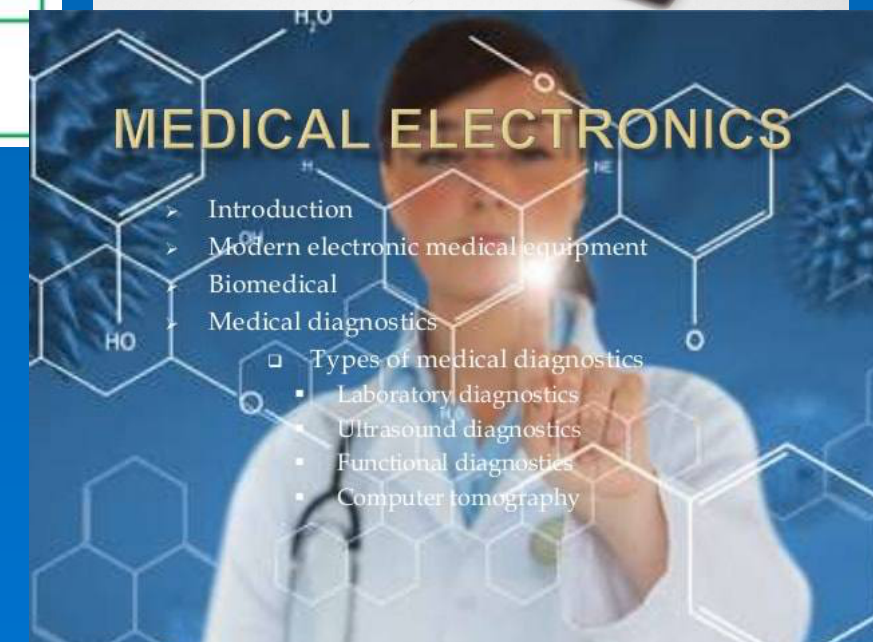
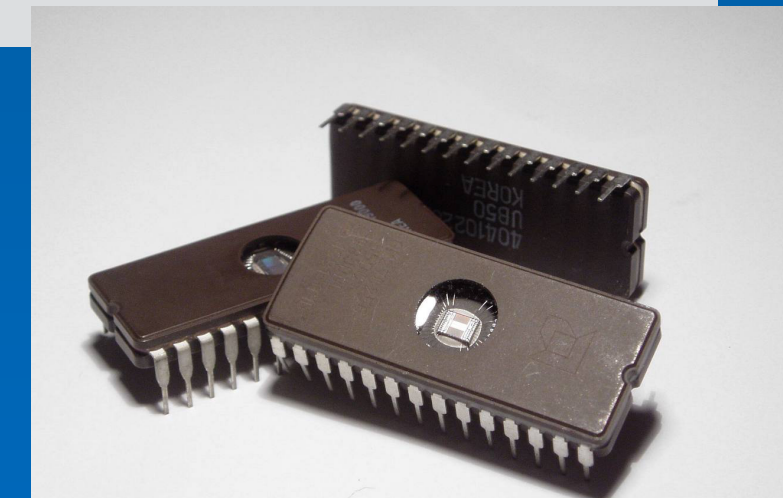
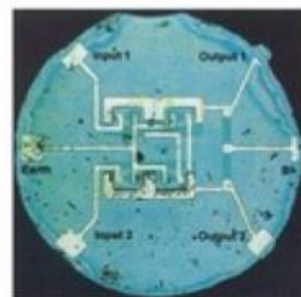
- Transistor, Resistors and Capacitors on the same piece of semiconductor
- **Interconnects between components not integrated**
→ Low connectivity between components



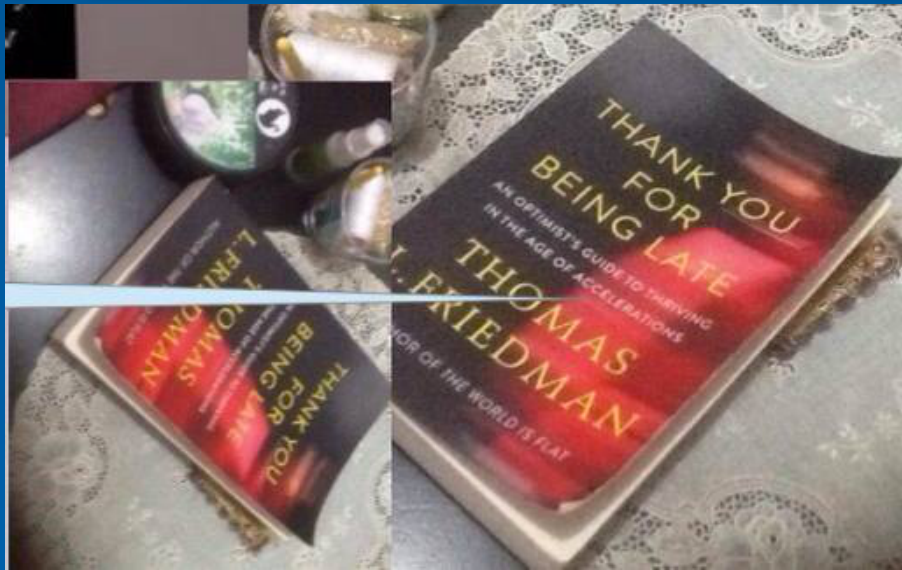
Date	Type of component integration	Level of component integration
1964	Small scale integration	Up to 10 components or gates
1968–1969	Medium scale integration (MSI)	Up to 100 components or gates
1970	Large scale integration (LSI)	Up to 1000 components or gates
Early 1980s	Very large scale integration (VLSI)	1000 or more components or gates
Late 1980s	Mega integration	1 million or more components per chip

The First Monolithic (2D) Integrated Circuit
Robert Noyce, Fairchild Semiconductor, 1961

- Transistor, Resistors and Capacitors on the same piece of semiconductor
- **Interconnects between components integrated**
→ High connectivity between components



PERKEMBANGAN KE DEPAN



5 (LIMA) FAKTOR PENENTU

Menurut Friedman [2016, page 37]:

- Teknologi *Integrated Circuits*
- *Memory units*
- Teknologi Jaringan
- Rekayasa Perangkat Lunak
- Teknologi Sensor

Teknologi *Integrated Circuits*

- *Micro-chips* ----> *Processor* ----> *Multicore*
- *Dual-core* -----> *16 Core* -----> *256 Core* -----> ?
- *14 nm* -----> *10 nm* -----> -----> *1 nm* -----> ?



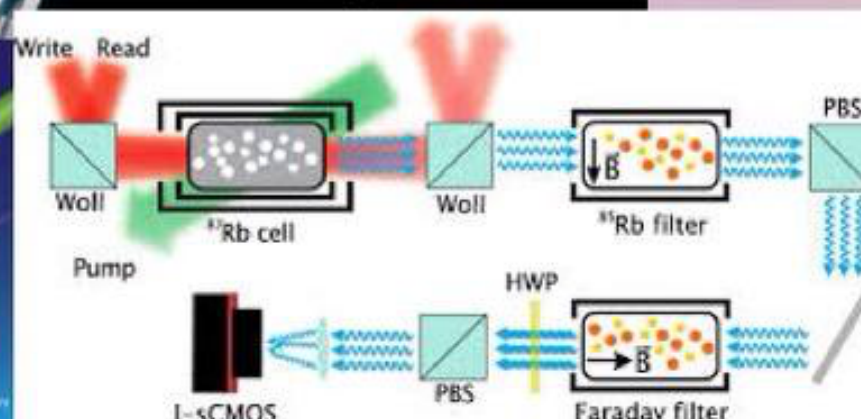
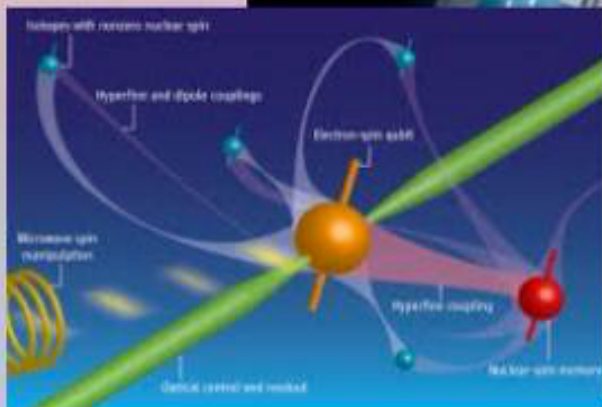
Visible light is usually defined as having **wavelengths** in the range of 400–700 **nanometres** (nm)



Memory units

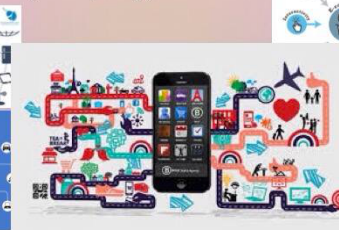
- 1 bit memory, "0" atau "1" ----> slot
- *Quantum Memory* -----> 1 qbit

First On-chip **Nanoscale Optical Quantum Memory** Developed

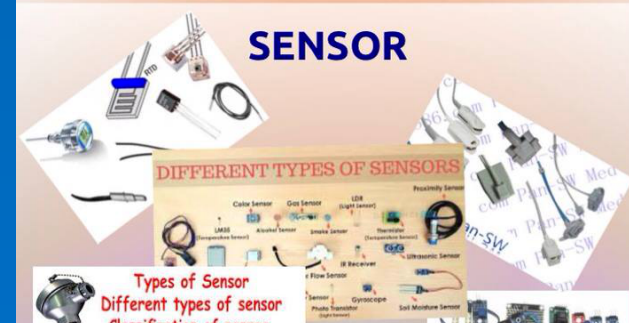


Teknologi Jaringan

- Kecepatan (speed)
- Akses (accessibility)
- Penyebaran (obiquity)



SENSOR



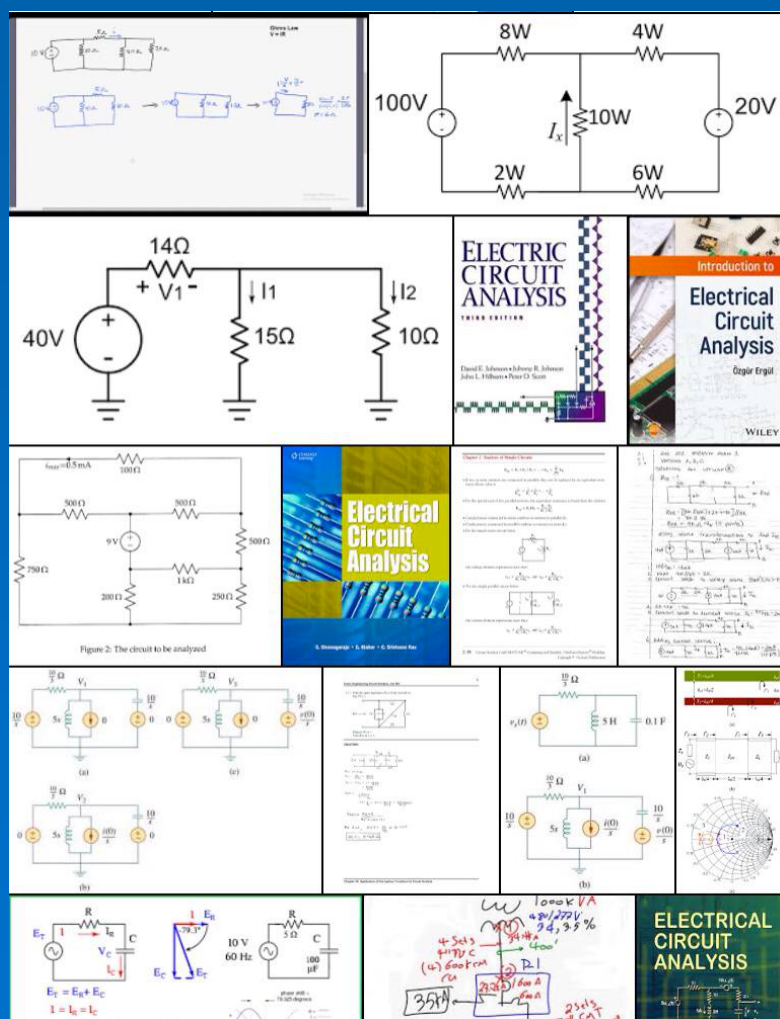
Rekayasa Perangkat Lunak

- ALGORITMA
- Kecerdasan Buatan (AI)
- Kemampuan "BELAJAR", trainability



KOMPONEN ELEKTRONIKA

- **PASIF**: Resistor (**R**), Induktor (**L**), Kapasitor (**C**), atau yang dapat di-model-kan/di-substitusi oleh **R**, **L**, dan/atau **C**
- **AKTIF**: Tidak dapat di-model-kan hanya dengan **R**, **L**, dan/atau **C** saja.



6 (enam) KOMPONEN DASAR Rangkaian Listrik:

1. Resistor (**R**),
2. Induktor (**L**),
3. Kapasitor (**C**),
4. Sumber Tegangan
5. Sumber Arus
6. Saklar

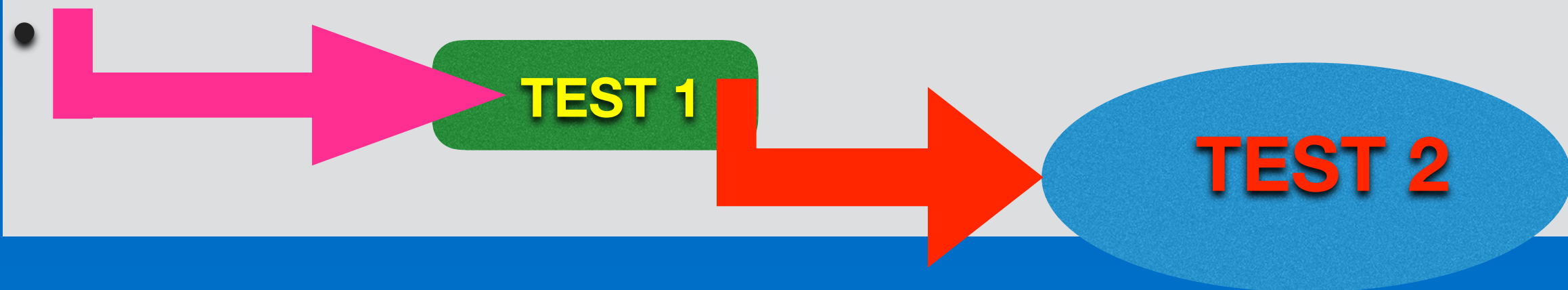
• RANGKAIAN LISTRIK:

Alat **ANALISIS** dan **DESAIN** Rangkaian/Komponen **ELEKTRONIKA**

MODUL PEMBELAJARAN

(tentatif, sewaktu-waktu berubah)

- **MODUL 0: PENGANTAR KULIAH**
- **MODUL 1: SERBA-SERBI ELEKTRONIKA**
- **MODUL 2: KOMPONEN-2 ELEKTRONIKA**
 - Sub-MODUL 2A: **Komponen PASIF**
 - Sub-MODUL 2B: **Komponen AKTIF**



SELAMAT BELAJAR

Semoga SUKSES meraih PRESTASI!

