



BITS Pilani

Hyderabad Campus

Department of Electrical Engineering



Microprocessor Programming and Interfacing

Lecture-1 : Introduction

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About the Course

***Course No.* : CS/ECE/EEE/INSTR F241**

***Course Title* : Microprocessor Programming & Interfacing**

***Lecture Class Timings* : **Tue, Thus, Sat** 9:00 to 9:50 AM**

***Tutorial Timing* : **Mon, Tue, Wed** 8.00 AM**

***Lab Timings* : Mon, Tue, Wed, Thus, Fri 14:00 to 16:00
Mon, Wed, **Fri - 11:00 AM to 1:00 PM****

***Google Class Code* : 4n5fmjk**

Course description

- Study of Programmer model of X86 processors, processor architecture, addressing modes and instructions set of X86 processors.
- Assembly programming using different instructions, subroutines and macros etc.
- Concept of Interrupts.
- Memory Interfacing.
- Programmable peripheral devices.

Text Books

Text Book:

Barry B Brey, The Intel Microprocessors .Pearson, Eight Ed. 2009.

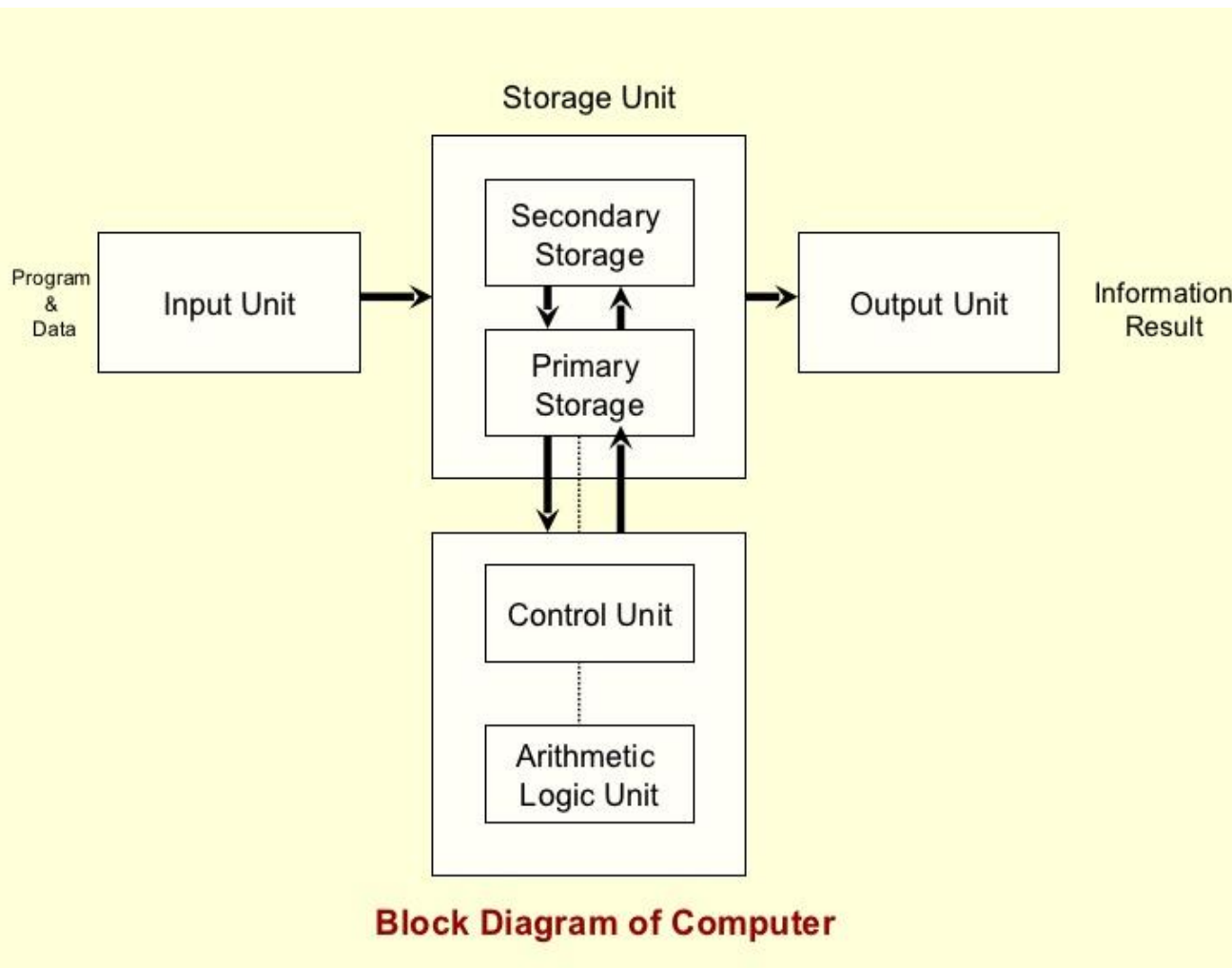
Reference Book:

Douglas V Hall, Microprocessor and Interfacing, TMH, Second Edition.

Motivation to Study Microprocessors

- Microprocessor is the heart of all Computers
- Microprocessors/Micro-controllers can be programmed to do a wide variety of practical-oriented tasks. (Automation)

Introduction to Microprocessors



History

- First general-purpose, programmable electronic computer system developed in 1946. (at University of Pennsylvania)
- ⌘ **Electronic Numerical Integrator and Calculator (ENIAC), a huge machine.**
 - × over 17,000 vacuum tubes;
 - × 500 miles of wires
 - × weighed over 30 tons
 - × about 100,000 operations per second



History

- ⌘ Programmed by rewiring its circuits.
 - ✧ process took many workers several days
 - ✧ workers changed electrical connections on plug-boards like early telephone switchboards
- ⌘ Required frequent maintenance.
 - ✧ vacuum tube service life a problem

History

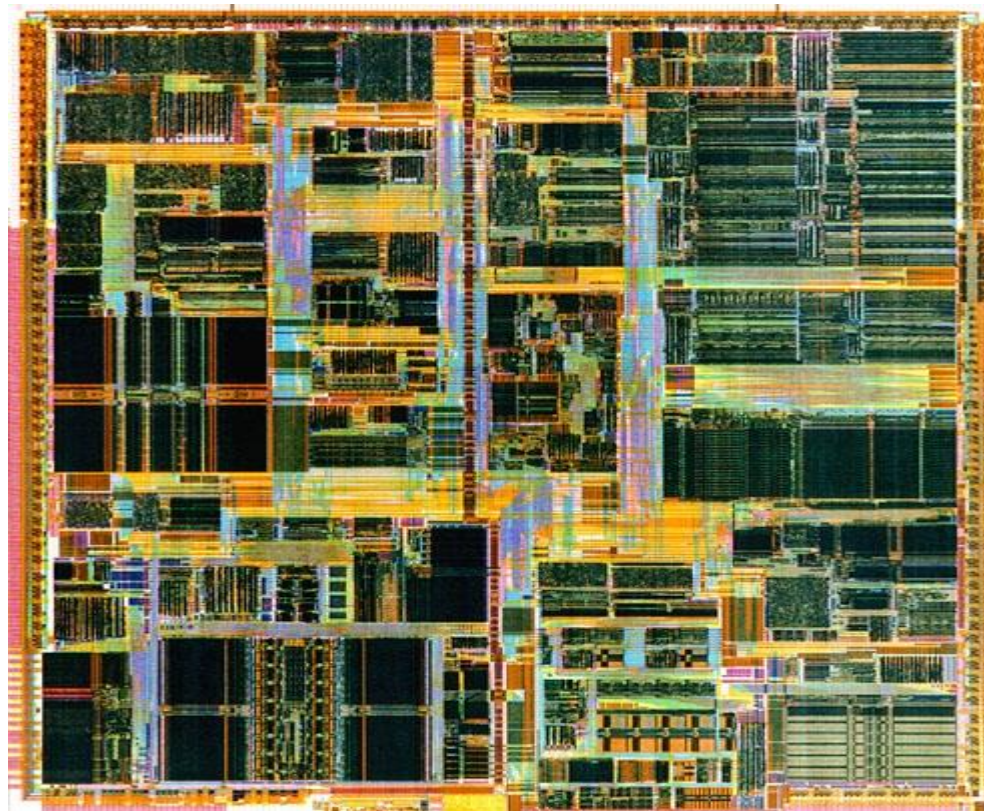
- ⌘ December 23, 1947, John Bardeen, William Shockley, and Walter Brattain develop the **Transistor** at Bell Labs.

The First Integrated Circuit – Jack Kilby, Texas Instruments
1 Transistor and 4 Other Devices on 1 Chip
In the year 1958



History

In the early 1970s, CMOS technology replaced NMOS-only logic which started suffering from high power consumption. Ever since, CMOS has been the dominant digital technology.

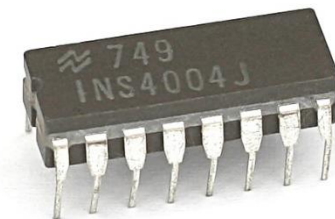
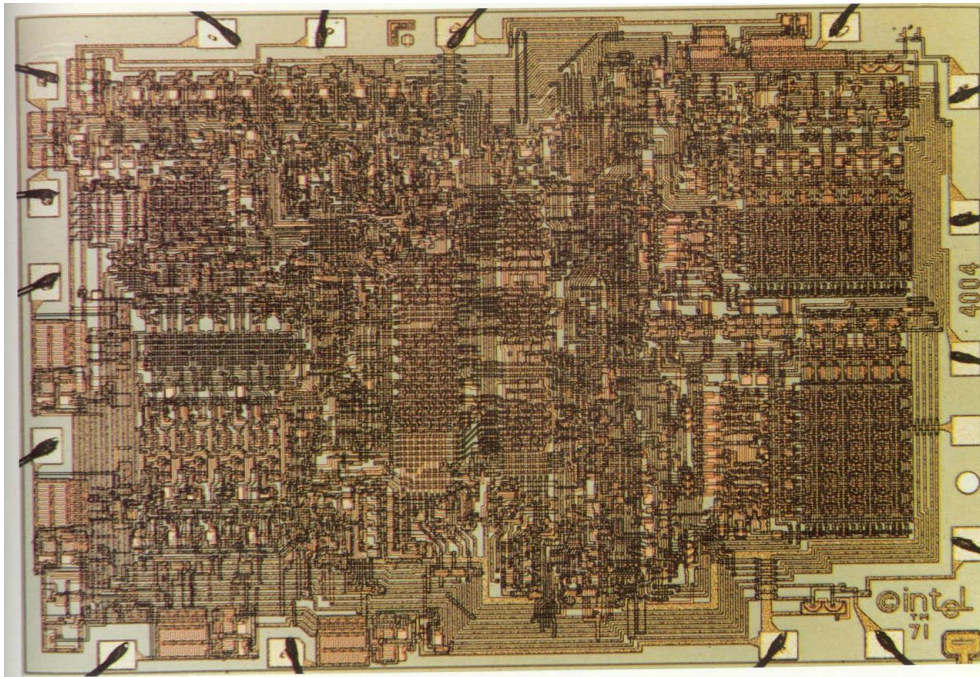


The First Microprocessor -- 1971

The Intel 4004 – 2,300 Transistors, **1 MHz operation**

THE FIRST COMPUTER ON A SINGLE CHIP

BEGINNING OF LARGE SCALE INTEGRATION TECHNOLOGY



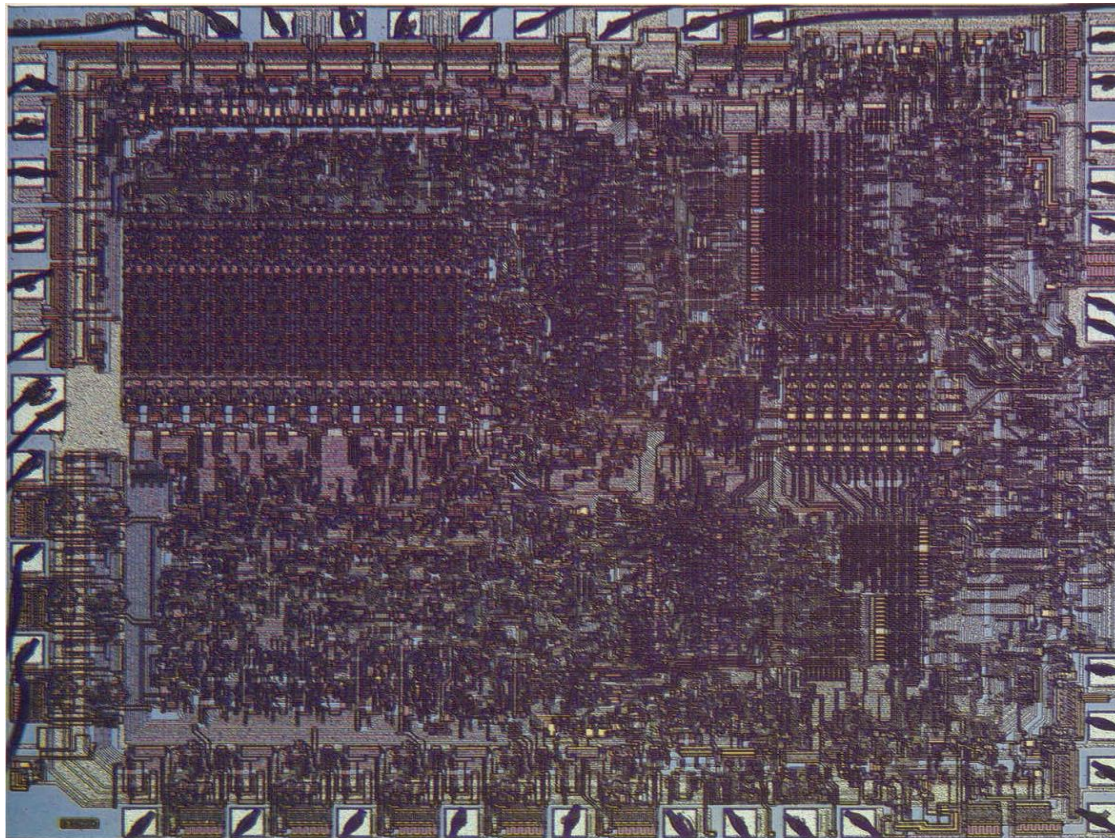
10 μ m process

The First Microprocessor -- 1971

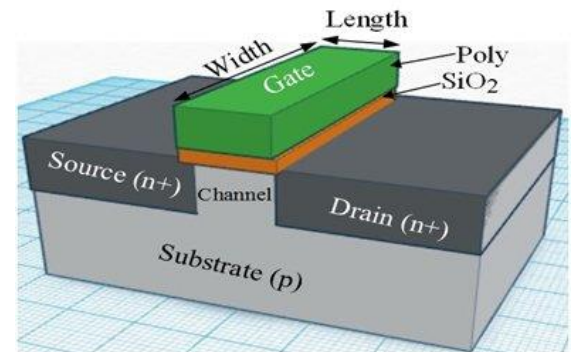
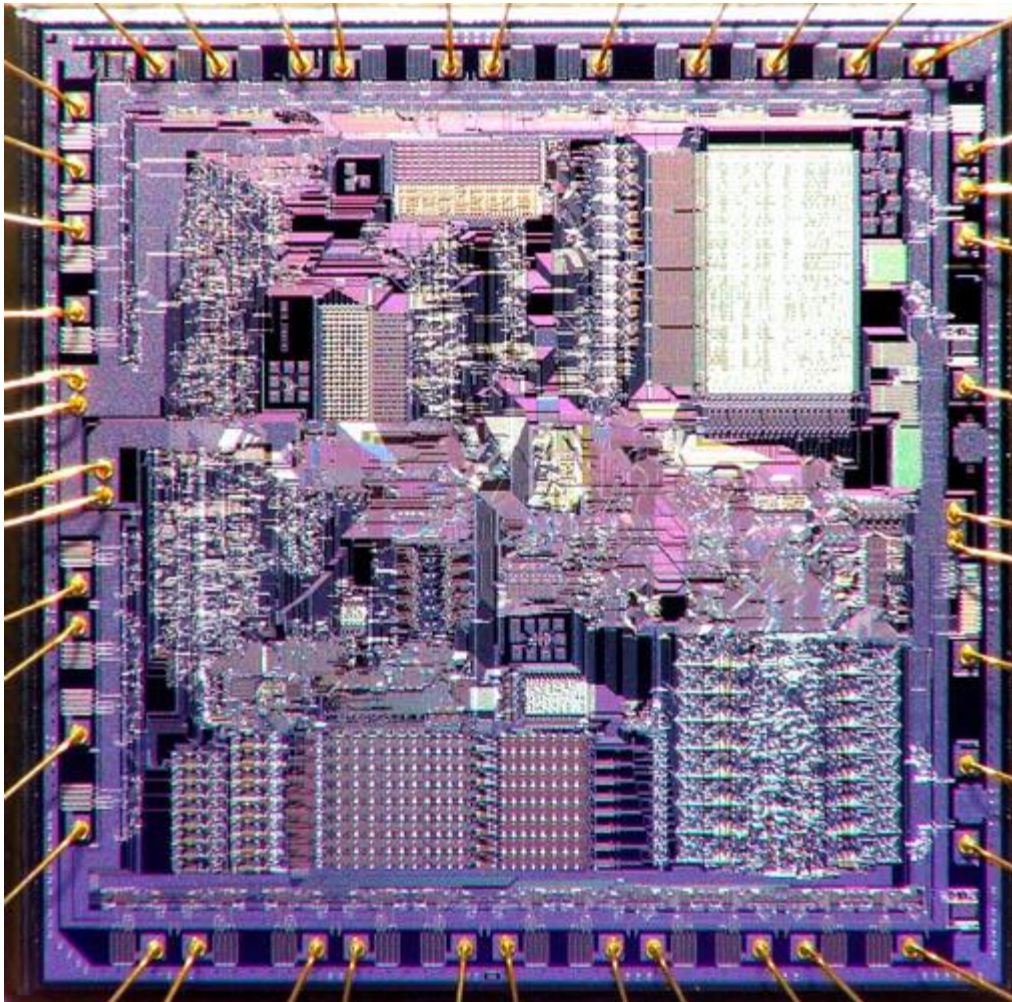
- The world's first microprocessor, the Intel 4004, was a 4-bit microprocessor—a programmable controller on a chip.
- It addressed a mere 4096 (12 address lines).
- Its instruction set contained only 45 different instructions.

First General-Purpose Microprocessor -- 1974

8-Bit Intel 8080 and 8085 , Intel Corporation – 4,500 Transistors



Intel 8086 microprocessor (1978)



3 μ m process

Advancement in Microprocessors

- Microprocessors that are common today include the 8086/8088, which were the first 16-bit microprocessors.
- Following these early 16-bit machines were the 80286, 80386, 80486, Pentium, Pentium Pro, Pentium II, Pentium III, Pentium 4, and Core2 processors.
- The architecture has changed from 16 bits to 32 bits and to 64 bits. **32-bit is also an 86 series architecture. Max RAM supported in 32-bit architecture is 4 GB.**



The screenshot shows a Windows File Explorer window with the following details:

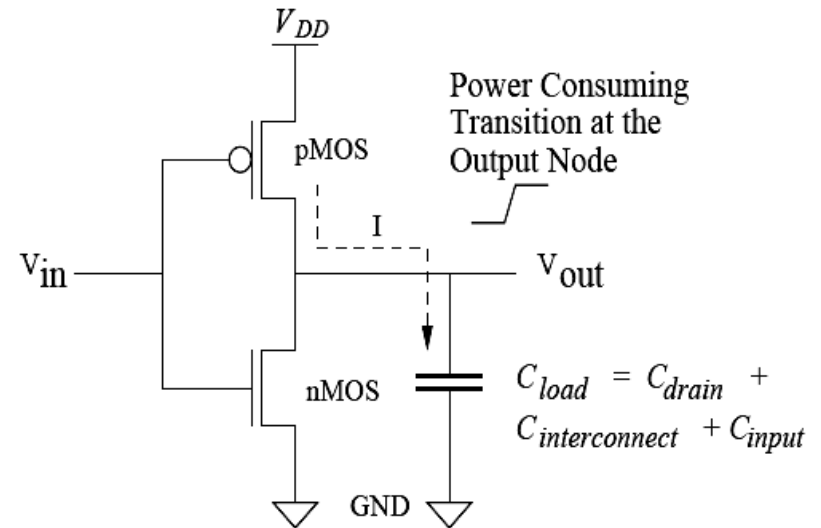
- Address Bar:** This PC > OS (C:) > Program Files (x86)
- Left Pane:** Shows the navigation pane with 'Program Files (x86)' highlighted in a green box.
- Right Pane:** Displays a list of folders in the 'Program Files (x86)' directory.

| Name | Date modified | Type | Size |
|--|------------------|-------------|------|
| ASUS | 10-10-2020 10:13 | File folder | |
| ASUSTek COMPUTER INC | 09-10-2020 10:24 | File folder | |
| Bandicam | 10-10-2020 01:06 | File folder | |
| BandiMPEG1 | 10-10-2020 01:06 | File folder | |
| Common Files | 09-10-2020 10:14 | File folder | |
| Dashlane | 11-10-2020 14:04 | File folder | |
| Dropbox | 17-12-2020 10:16 | File folder | |
| Foxit Software | 09-10-2020 19:46 | File folder | |
| GetData | 14-11-2020 21:13 | File folder | |
| Google | 15-12-2020 15:54 | File folder | |
| Hewlett-Packard | 23-10-2020 14:20 | File folder | |
| HP | 23-10-2020 14:20 | File folder | |
| HP Photo Creations | 23-10-2020 14:20 | File folder | |
| ICEpower | 09-10-2020 10:16 | File folder | |
| InstallShield Installation Information | 10-10-2020 10:21 | File folder | |
| Intel | 09-10-2020 10:24 | File folder | |
| Internet Explorer | 09-10-2020 22:18 | File folder | |
| LyX 2.3 | 11-10-2020 23:01 | File folder | |
| Microsoft | 10-10-2020 01:23 | File folder | |
| Microsoft SQL Server Compact Edition | 09-10-2020 10:24 | File folder | |
| Microsoft Synchronization Services | 09-10-2020 10:24 | File folder | |
| Microsoft.NET | 09-10-2020 10:12 | File folder | |
| Mozilla Maintenance Service | 14-01-2021 21:45 | File folder | |
| MSBuild | 09-10-2020 22:18 | File folder | |
| NCH Software | 13-10-2020 13:46 | File folder | |
| NortonInstaller | 09-10-2020 10:09 | File folder | |
| NVIDIA Corporation | 10-11-2020 20:06 | File folder | |

1/19/2021

Advantages of CMOS Scaling

- Faster
- Lower Power
- Higher packing density



Limitations of CMOS Scaling

- High Power

Increase in Freq due to improvement in :
Technology + Architecture

Higher Packing Density due to improvement in :
Technology + Routing Algo

- Low Noise Margins

- V_{DD} reduced to keep Electrical Field Constant
- High Static Currents

Limitations of CMOS Scaling





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Thankyou

ELECTRICAL

ELECTRONICS

COMMUNICATION

INSTRUMENTATION