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- * ARM Microcontroller
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 - * Assembly language
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- * C Programming -- Target board

Pre-requisites

- * Embedded C Programming
 - * Bitwise operators
 - * Structures
 - * Functions
 - * Makefile
 - * Volatile
 - * Debugging (gdb)
- * Computer Fundamentals
 - * Processor Architecture
 - * Interrupts & Polling

Evaluation

- Theory -- CCEE -- 40 marks (MCQ based)
- Lab -- C Programming -- STM32F407G-DISC1 -- 40 marks
- Internal -- 20 marks

Reading

- * Mazidi -- AVR Microcontroller
 - * Chapter 0 -- Introduction to Embedded
 - * Chapter 1, 2 & 3 -- Concepts
 - * Protocols -- RS232, SPI, I2C
- * Slos -- ARM System Developer's Guide (Cortex-A)
- * Yiu -- Definitive guide to Cortex M3/M4

- * STM32 User manual
- * STM32F407G-DISC1 User manual

Von Neumann vs Harvard

- V: addr & data bus is common for program memory (ROM) and data memory (RAM).
- H: separate addr & data buses for program memory (ROM) and data memory (RAM).
- V: instruction and data cannot be fetched simultaneously.
- H: instruction and data can be fetched simultaneously.
- V: op code and operands are not fetched in single cycle. So slower execution.
- H: op code and operands are fetched in single cycle. So faster execution.
- V: unified Cache (i.e. common cache for instruction & data).
- H: separate cache of instruction & data.
- V: e.g. x86 arch
- H: e.g. AVR

Super Harvard Architecture

- Flash/ROM --> Program (Instructions)
- RAM --> Data
- However readonly data (e.g. lookup tables) can be stored in ROM.
- Flash --> Program + readonly data
- RAM --> Data
- This arch is called "Super-Harvard Architecture" (SHARC). Used for DSP processors.

uP vs uC

- uP: general purpose computing machine/chip.
- uC: dedicated processing chip.
- uP: contains CPU [ALU, registers], cache and/or MMU.
- uC: contains CPU, RAM, ROM, peripherals (timers, gpio, adc, dac, spi, i2c, can, etc.) on same chip.
- uP: usually works on high clock speed and hence higher power consumption.
- uC: usually works on lower clock speed and hence lower power consumption.
- uP: requires more space and cost.
- uC: requires less space and cost.
- uP: system design is flexible -- designer can choose required amount of RAM, ROM & peripherals.
- uC: cannot customize a controller -- but can choose from variety of controllers as per need.