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| ***logobb*** | FAKULTI SAINS KOMPUTER DAN TEKNOLOGI MAKLUMAT |

**Course Title :** Computer Organization and Architecture

**Course Code :** CCS3200 (Group 2)

**Credit :** 3(3+0)

**Contact Hours :** 3 hours of lecture per week

Wednesday 12.00–1.00 p.m. at A1-03 Bilik Kuliah Akademik Pusat Thursday 9.00–11.00 a.m. at A1-03 Bilik Kuliah Akademik Pusat

**Prerequisite** : CCS3100

**Semester :** Semester 2 2024/2025

**Instructor :** Dr. Aziah Asmawi

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**Room :** C1-51

**Telephone** : 012-2931997

**Objectives:**

Students can:

1. Describe the function and structure of the main components of a computer. (C4)
2. Design computer components using Boolean algebra, logic circuits and binary number systems. (NS)
3. Analyse the performance of single, multiple and parallel processors. (A3, LS)

**Synopsis:**

Kursus ini merangkumi organisasi dan seni bina komputer digital. Ia meliputi unit kendalian dan hubungkait di antaranya yang digunakan untuk merealisasikan seni bina komputer. Langkah untuk membina komponen dalam komputer digital dibincangkan.

(*This course contains the organization and architecture of digital computer. It covers operational units and their interconnections which are used to realize the computer architecture. Steps to construct components in digital computer are discussed.*)

| WEEK | TOPIC |
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| 1 | **Topic 1 Computer System**   * Organization and architecture * Structure and function * The main components of a computer and the linkage structure |
| 2 | **Topic 2 Number System**   * Position number system * Decimal, binary, octal and hexadecimal numbers * Conversion between binaries to other number systems |
| 3 | **Topic 2 Number System**   * Data representation * Arithmetic operations in computer systems |
| 4 | **Topic 3 Boolean Algebra and Logic Gate**   * Basic operations of Boolean Algebra * Boolean operations and logic gates * Boolean functions and logic circuits |
| 5 | **Topic 3 Boolean Algebra and Logic Gate**   * Combinational Circuit and Sequential Circuit * Truth table and Karnaugh map * Create logic circuit only using NAND gate and only NOR gate   **ASSESSMENT 1** |
| 6 | **Topic 4 Computer Memory System**   * Internal and External Memory * Main Memory * Cache Memory System |
| 7 | **Topic 5 Input/Output**   * Input/Output Unit * Input/Output Peripheral * Input/Output Techniques   **FIRST GROUP PRESENTATION - BACKGROUND** |
| 8 | **Topic 6 Processor Structure and Function**   * + Processor organization   + Register organization |
| 9 | **Topic 6 Processor Structure and Function**   * + Instruction cycle   + Command cycle with interrupt   + Pipelining Instructions |
| 10 | **Topic 7 Instruction Set**   * Characteristic of machine instructions * Types of operands and operations * Command format and addressing mode   **ASSESSMENT 2** |
| 11 | **Topic 7 Instruction Set**   * Assembly language format * Assembly language instructions |
| 12 | **Topic 8 Parallel Processing**   * Multiprocessor Organization * Shared Memory and Distributed Memory |
| **13** | **Topic 8 Parallel Processing**   * Symmetric Multiprocessor (SMP) * Non-Uniform Memory Access (NUMA) * Cluster   **SECOND GROUP PRESENTATION – FINAL REPORT** |
| 14 | **Topic 9 Multiple Core Computers**   * Multiple core organizations * Graphics Processing Unit (GPU) design * Usage of GPU as a Coprocessor |

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| Course Evaluation | **Knowledge (%) – CPS301** | **Digital and numeracy skills (%)**  **– CPS307** | **Leadership, autonomy and responsibility (%) – CPS308** | **Total (%)** |
| Assessment 1 | 20 |  |  | 20 |
| Assessment 2 | 20 |  |  | 20 |
| Final Exam | 30 | 10 |  | 40 |
| Group Assignment |  |  | 20 | 20 |

###### **Reference Books**

1. Ledin, J. (2020). Modern Computer Architecture and Organization: Learn X86 Arm, and Risc-V Architectures and the Design of Smartphones, Pcs, and Cloud Servers. Packt Publishing.
2. Null, L. (2023) *Essentials of Computer Organization and Architecture (6th Edition).* Jones & Bartlett Learning.
3. Patterson, D.A. & Hennessy, J.L. (2019) *Computer Architecture: A Quantitative Approach (6th Edition).* Elsevier Inc.
4. Stalling, W. (2021). *Computer Organization and Architecture: Designing for Performance (11th Edition).* Pearson Education.
5. Wang, S.P. (2021). *Computer Architecture and Organization: Fundamentals and Architecture Security.* Springer.

Course material: PutraBlast [(www.learninghub.upm.edu.my](http://(www.learninghub.upm.edu.my))