**CS4100 Computer Architecture**

**Fall, 2024**

**Outlines (Sep. 2)**

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| Week 1 (9/2) | Introduction[Ch1-1 Computer: A historical perspective, abstractions (10:03) (page 1-12)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=355&vid=2668) |
| Week 2(9/9)助教：林承賢 | **Chapter 1: Computer Abstractions and Technology**[Ch1-2.1.1 Technology - Performance (1) (11:09) (page 13-21)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=355&vid=2669)[Ch1-2.1.2 Technology - Performance (2) (11:08) (page 22-31)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=355&vid=2670)[Ch1-2.2 Power trends, measuring performance, cost (13:32) (page 32-49)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=355&vid=2671) | **H1:** Bench-marking |
| Week 3(9/16)助教：王睿杰 | **Chapter 2: Instruction Set Architecture**[Ch2-1 Instruction set architecture (5:15) (page 1-6)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2672)[Ch2-2.1 Operands - Register operands and their organization (13:37) (page 7-14)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2673)[Ch2-2.2.1 Operands - Memory operands, data transfer (1) (11:19) (page 15-21)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2674)[Ch2-2.2.2 Operands - Memory operands, data transfer (2) (8:27) (22-26)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2675)[Ch2-2.3 Operands - Immediate operands (6:04) (page 27-31)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2676) |
| Week 4(9/23)助教：唐梧遷 | [Ch2-4 Representing instructions (19:30) (page 32-43)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2677)[Ch2-5.1 Operations - Logical (10:47) (page 44-54)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2678)[Ch2-5.2 Operations - Decision making and branches (15:55) (page 55-63)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2679) | **H2:**(MIPS)if-then-else,loop inst.  |
| Week 5(9/30)助教：林承賢 | [Ch2-6.1 Supporting procedures in hardware (1) (16:01) (page 64-74)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2680)[Ch2-6.2 Supporting procedures in hardware (2) (10:11) (page 75-79)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2681)[Ch2-7 Communicating with people (4:00) (page 80-83)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2682)[Ch2-8 Addressing for 32-bit addresses (15:31) (page 84-94)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2683)[Ch2-9 ARM and x86 instruction sets (10:12) (page 95-103)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=356&vid=2684) | **H3**:(MIPS) procedure call, recursive call |
| Week 6 (10/7)助教：王睿杰 | **Chapter 3: Computer Arithmetic**[Ch3-1 Add, sub, and, or, nor (11:44) (page 1-14)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2685)[Ch3-2.1 SOLT, overflow detection, zero detection (13:58) (page 15-26)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2686)[Ch3-2.2.1 Cascaded carry look ahead adder (12:42) (page 27-35)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2687)[Ch3-2.2.2 Multiple level carry look ahead adder (7:44) (page 36-43)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2688) |
| Week 7 (10/14)助教：唐梧遷 | [Ch3-3.1 Unsigned multiply (18:47) (page 44-54)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2689)[Ch3-3.2 Signed multiply (13:41) (page 55-60)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2690)[Ch3-4 Division (21:35) (page 61-72)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2691)[Ch3-5.1.1 Floating point representations (1) (15:48) (page 73-85)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2692)[Ch3-5.1.2 Floating point representations (2) (8:34) (page 86-99)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2693)[Ch3-5.2 Floating point addition and multiplication (15:26) (page 100-111)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=357&vid=2694) |

| Week 8 (10/21) | **Midterm exam**, 1:20 – 3:10 PM, Chaps 1-3 |
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| Week 9 (10/28) 助教：林承賢 | **Chapter 4: Designing a Single-Cycle Processor**[Ch4-1 Introduction to designing a processor (15:19) (page 1-12)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=358&vid=2695)[Ch4-2 Analyzing the instruction set (10:08) (page 13-17)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=358&vid=2696)[Ch4-3 Buliding the datapath (14:34) (page 18-28)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=358&vid=2697)[Ch4-4 A single cycle implementation (8:51) (page 29-34)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=358&vid=2698)[Ch4-5.1 Control of CPU operations (10:19) (page 35-45)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=358&vid=2699) |
| Week 10 (11/4)助教：王睿杰 | [Ch4-5.2 ALU controller (9:26) (page 46-57)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=358&vid=2700)[Ch4-6 Main controller and jump instruction (10:33) (page 58-68)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=358&vid=2701)**Chapter 5: Pipelining**[Ch5-1 An overview of pipelining (9:52) (page 1-8)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2702)[Ch5-2 A pipelined datapath (15:21) (page 9-33)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2703)[Ch5-3 Pipelined control (7:31) (page 34-51)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2704) |
| Week 11 (11/11) 助教：唐梧遷 | [Ch5-4 Hazard: types of hazards (8:23) (page 52-58)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2705)[Ch5-5-1 Handling data hazard Inserting NOP (4:56) (page 59-62)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2706)[Ch5-5-2 Handling data hazard Forwarding, R Type use (13:48) (page 63-73)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2707) [Ch5-5-3 Handling data hazard Stall, load use (10:51) (page 74-82)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2708) |
| Week 12 (11/18)助教：林承賢 | [Ch5-6 Handling branch hazards (10:23) (page 83-92)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2709)[Ch5-7 Exceptions (7:17) (page 93-101)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2710)[Ch5-8 Superscalar and dynamic pipelining (19:38) (page 102-119)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=359&vid=2711) |
| Week 13(11/25)助教：王睿杰 | **Chapter 6: Memory Hierarchy**[Ch6-1 Memory hierarchy (14:32) (page 1-10)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2712)[Ch6-2-1 Basics of caches - Direct mapped cache (11:46) (page 11-26)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2713)[Ch6-2-2 Basics of caches - Address sub division (10:33) (page 27-34)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2714)[Ch6-2-3 Basics of caches - Cache hit and miss (6:32) (page 35-40)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2715) | **Project:**(C/C++)Cache  |
| Week 14 (12/2) 助教：唐梧遷 | [Ch6-2-4 Basics of caches - Memory support (9:01) (page 42-47)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2716)[Ch6-3 Measuring cache performance (6:36) (page 48-53)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2717)[Ch6-4-1 Improveing cache performance - Set associative cache (17:00) (page 54-65)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2718)[Ch6-4-2 Improveing cache performance - Multiple level cache (9:19) (page 66-72)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2719)[Ch6-5-1 Virtual memory - Basic (10:33) (page 73-80)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2720) |
| Week 15 (12/9) 助教：林承賢 | [Ch6-5-2 Virtual memory - Issues in virtual memory (13:44) (page 81-90)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2721)[Ch6-5-3 Virtual memory - Handling huge page table and TLB (11:20) (page 91-100)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2722)[Ch6-5-4 Virtual memory - TLB and cache (9:37) (page 101-105)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2723)[Ch6-6 A common framwork for memory hierarchy (11:27) (page 106-114)](http://mooc.nthu.edu.tw/sharecourse/course/content/chapter/26?chid=360&vid=2724) |
| Week 16(12/16) | **Final exam**, 1:20 – 3:10 PM, Chaps 4-6 |