	Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Data Science Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Computer Architecture and Systems	4920203001	Compulsory Study Program Subjects	T=3	P=0	ECTS=4.77	1	June 26, 2022

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model: Case Studies

Program Learning Outcomes (PLO)

PLO study program which is charged to the course

Program Objectives (PO)

PO - 1	Able to master the theoretical concepts of the role and function of the units that make up a computer system
PO - 2	Able to master the theoretical concepts of computing processes in the CPU.
PO - 3	Able to identify the hardware needs of a computer organization.
PO - 4	Able to solve problems related to data science using appropriate technology

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3
PO-4

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																
PO-4																

Short Course Description: This course teaches about modern computer architecture and organization comprehensively by emphasizing the basic concepts of computer systems including Bus Systems, Internal and External Memory and Input/Output. Furthermore, this course studies the main role of each component that makes up computing such as Computer Arithmetic, Instruction Set, CPU Structure and Function, and Control Unit Operations.

References

Main :

1. Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice-Hall

Supporters:

1. Carl Hamacher, Zvonko Vranesic dan Safwat Zaky. 2012. Computer Organization and Embedded Systems Sixth Edition. McGraw-Hill
2. John L Hennessy dan David Patterson. 2012. Computer Architecture A Quantitative Approach. Morgan Kaufman

Supporting lecturer

Dr. Wiyli Yustanti, S.Si., M.Kom.
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Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Students are able to identify the functions of computer systems and the history of computer development	1. Explain the terms in computer systems 2. Details the functions of a computer system 3. Describe the structure of a computer system 4. Examines the evolution of computer systems	**Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 3 X 50		**Material:** Chapter 1 : Basic concepts and computer evolution; Chapter 2 : Performance Concepts; **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	3%
2	Students are able to formulate the components of a computer system	1. Identify the concept of Von Neumann computer components 2. Examining the basic components of a computer system	**Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 3 X 50		**Material:** Chapter 3 : A top-level view of computer function and interconnection **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	5%
3	Students are able to apply Arithmetic and Logic operations.	1. Performing calculations with arithmetic operations, 2. addition of multiplication in binary 3. Perform calculations of logical operations.	**Criteria:** Independent task **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion and problem-based learning 2 X 50		**Material:** Chapter 9: Number system; Chapter 10 : Computer Arithmatics; Chapter 11 : Digital logic; **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	7%
4	Students are able to identify the working principles of the memory system in a computer.	1. Explain the different types of memory in a computer system 2. Explain the working system of internal memory technology 3. Explain the working system of external memory technology 4. Diagram the memory addressing process	**Criteria:** Independent Assignment: Practice Questions **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 3 X 50		**Material:** Chapter 4: Cache memory; Chapter 5 : Internal memory; Chapter 6: External memory; **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	7%

5	Students are able to identify input/output in a computer work system	1. Be able to describe external devices as computer input 2. Able to explain the input/output module 3. Able to explain the types of input/output 4. Able to explain the operating system 5. Able to explain memory management in the input/output process	**Criteria:** Independent Assignment: Practice Questions **Form of Assessment** : Participatory Activities, Tests	Scientific approach, presentation, question and answer, discussion, and problem-based learning 3 X 50		**Material:** Chapter 7: Input/Output; Chapter 8 : Operating system support; **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	10%
6	Students are able to explain the characteristics and functions of the instruction set	1. Details the characteristics of a computer's Instruction Set 2. Details the function of a computer's instruction set 3. Explain the principles of machine instructions 4. Analyze the differences in characteristics and functions in x86 and ARM instruction sets	**Criteria:** Independent Assignment: Practice Questions **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 3 X 50		**Material:** Chapter 12 : Instruction Sets : characteristics and functions **References:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	7%
7	Students are able to explain the format and addressing mode in the instruction set	1. Explain the addressing modes 2. Analyze the differences in addressing modes on x86 and ARM 3. Analyze the differences in instruction formats on x86 and ARM	**Form of Assessment** : Practice / Performance	Scientific approach, presentation, question and answer, discussion, and problem-based learning 3 X 50		**Material:** Chapter 13 : Instruction Sets : Addressing modes and formats **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	10%
8	Midterm exam		**Form of Assessment** : Test	2 X 50		**Material:** Chapters 1-13 **Bibliography:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	0%
9	Students are able to understand the structure and function of the processor	1. Explain processor organization 2. Explain the organization of the register 3. Explain the instruction cycle and pipeline 4. Explains the x86 and ARM processor families	**Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion and problem-based learning 4 X 50		**Material:** Chapter 14: Processor Structure and Function **References:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	5%

10	Students are able to understand the concept of Reduced Instruction Set Computers (RISC)	1. Describes the characteristics of instruction execution 2. Explain the use of large register files 3. Explain RISC architecture 4. Explain pipelining in RISC 5. Explains MIPS R4000 and SPARC 6. Explain the pipeline in the processor organization 7. Explain the differences between CISC, RISC, and contemporary systems	**Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion and problem-based learning 4 X 50		**Material:** Chapter 15: Reduced Instruction Set Computer **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	5%
11	Students are able to understand instruction level parallelism and superscalar on computers	1. Explains issues related to instruction-level parallelism 2. Explaining the Intel Core monoarchitecture 3. Explaining ARM Cortex-A8 and ARM Cortex-M8	**Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion and problem-based learning 2 X 50		**Material:** Chapter 16: Instruction-Level Parallelism and Superscalar Processors **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	5%
12	Students understand the concept of control unit operation	1. Explain the concept of micro-operations 2. Explain how processor control works	**Criteria:** Independent task **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion and problem-based learning 2 X 50		**Material:** Chapter 19: Control unit operation and microprogrammed control **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	7%
13	Students understand microprogram control	1. Explain microprogram control 2. Explain the concept of microinstruction sequencing 3. Explain the concept of microinstruction execution	**Criteria:** Independent task **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion and problem-based learning 2 X 50		**Material:** Chapter 21: Microprogrammed Control **References:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	7%
14	Students are able to understand the concept of parallel processing	1. Can explain the concept of multiprocessing 2. Distinguish between single processor and multi processor processes 3. Mention the advantages of multiprocessors 4. Explain the concept of parallel processing	**Criteria:** Independent task **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion and problem-based learning 2 X 50		**Material:** Chapter 17 : Parallel processing **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	7%

15	Students are able to understand the concept of multicore computers	1. Explain hardware and software performance issues 2. Explain multicore and heterogeneous multicore organization 3. Describes the multicore architecture on the Intel Core i7-5960X, ARM Cortex-A15 MPcore, and IBM Z13 mainframes	**Criteria:** Independent task **Form of Assessment** : Participatory Activities, Practice/Performance	Scientific approach, presentation, question and answer, discussion and problem-based learning 2 X 50		**Material:** Chapter 18: Multicore Computer **Reference:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	15%
16	Final exams		**Form of Assessment** : Test			**Material:** Chapters 15-20 **Bibliography:** *Stalling, Williams. 2019. Computer Organization and Architecture: Designing for Performance Eleventh Edition. United States: Pearson Prentice Hall*	0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	77.5%
2.	Practice / Performance	17.5%
3.	Test	5%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.