	Universitas Negeri Surabaya Faculty of Engineering , Information Technology Education Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Computer Architecture and Organization	8320702006	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	2	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Drs. Bambang Sujatmiko, M.T.	.....	Drs. Bambang Sujatmiko, M.T.

Learning model	**Project Based Learning**	
Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**	
	PLO-8	Mastering the concepts and implementation in developing software engineering, games, intelligent multimedia, and network computer engineering.
	PLO-13	Able to develop innovative educational products or learning resources using scientific design-based strategies to support teaching activities that can be integrated with ICT.
	Program Objectives (PO)	
	PO - 1	Students are able to describe the history of the development of computer evolution.
	PO - 2	Students are able to describe the architecture and organization of the processor (CPU) on a computer.
	PO - 3	Students are able to describe the architecture and organization of memory on a computer.
	PO - 4	Students are able to describe the input-output (IO) interface and other peripherals that exist or are connected to a computer.
	PO - 5	Students are able to describe the components of a digital system for those on a computer.
	PO - 6	Students are able to explain the logical and arithmetic operations carried out by computers.
	PO - 7	Students are able to describe the Instruction Set Architecture (ISA) that exists and is used on computers.
	PO - 8	Students are able to describe the multicore architecture that exists on computers.
	PO - 9	Students are able to describe the architecture of distributed systems used on computers.
	PLO-PO Matrix	

P.O	PLO-8	PLO-13
PO-1		
PO-2		
PO-3		
PO-4		
PO-5		
PO-6		
PO-7		
PO-8		
PO-9		

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																
PO-5																
PO-6																
PO-7																
PO-8																
PO-9																

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. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice-Hall. 2. Carl Hamacher, Zvonko Vranesic dan Safwat Zaky. 2012. Computer Organization and Embedded Systems Sixth Edition. McGraw-Hill.
	Supporters:
	1. John L Hennessy dan David Patterson. 2012. Computer Architecture A Quantitative Approach. Morgan Kaufman 2. Tanenbaum, Andrew S. 2007. Structured Computer Organization. India: Prentice-Hall India.
Supporting lecturer	Aditya Prapanca, S.T., M.Kom. I Gusti Lanang Putra Eka Prismana, S.Kom., M.Kom. Harun Al Rosyid, S.T., M.T.

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	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x50	**Material:** 1. Explaining the terms in computer systems, 2. Detailing the functions of computer systems, 3. Describing the structure of computer systems, 4. Examining the evolution of computer systems **References:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%

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	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x 50	**Material:** Identifying the concept of Von Neumann computer components and examining the basic components of computer systems. **Library:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth 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:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x 50	**Material:** Performing calculations using arithmetic operations, adding multiplication in binary, calculating logical operations. **Reference:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%
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:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities, Portfolio Assessment	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x 50	**Material:** Explain 1. the differences in types of memory in a computer system, 2 working systems of internal memory technology, and diagram the memory addressing process. **Reference:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%

5	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:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities, Portfolio Assessment	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x 50	**Material:** Explain 1. the differences in types of memory in a computer system, 2 working systems of internal memory technology, and diagram the memory addressing process. **Reference:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%
6	Students are able to explain the CPU work process	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	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities, Portfolio Assessment	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x 50	**Material:** Details 1. characteristics of computer Instruction Sets, and 2. functions of computer instruction sets, and Explains the principles of machine instructions. **Reference:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%
7	Students are able to explain the CPU work process	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	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities, Portfolio Assessment	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x 50	**Material:** Details 1. characteristics of computer Instruction Sets, and 2. functions of computer instruction sets, and Explains the principles of machine instructions. **Reference:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%

8	Sub Summative Exam (UTS)	Cognitive Values, Character Values, and Psychomotor Values	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Portfolio Assessment, Test	Offline Quiz 2 X 50	Online Quiz 2 x 50	**Material:** All material that has been taught at meetings 1 to meeting 7 **References:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	14%
9	Students are able to understand how I/O and DMA work in computers	1. Identify I/O modules 2. Explain how Direct Memory Access works 3. Explain the concept of I/O Channels and Processors 4. Explain the Complex Instruction process	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practice / Performance	Scientific approach, presentation, question and answer, discussion and problem-based learning 4 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 4 x 50	**Material:** Identifying I/O modules, explaining 1. how Direct Memory Access works, 2. the concept of I/O Channels and Processors, and 3. the complex instruction process. **Library:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%
10	Students are able to understand how I/O and DMA work in computers	1. Identify I/O modules 2. Explain how Direct Memory Access works 3. Explain the concept of I/O Channels and Processors 4. Explain the Complex Instruction process	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practice / Performance	Scientific approach, presentation, question and answer, discussion and problem-based learning 4 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 4 x 50	**Material:** Identifying I/O modules, explaining 1. how Direct Memory Access works, 2. the concept of I/O Channels and Processors, and 3. the complex instruction process. **Library:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%

11	Students are able to understand the working principles of Computer Interconnection Structures	1. Explains how Structure Interconnection works 2. Describes the transfer process between memory, I/O, CPU 3. Explain the working concept of PCI Bus	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities, Portfolio Assessment	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x 50	**Material:** Explains 1. how Structural Interconnection works, 2. PCI Bus working concept; and Describe the transfer process between memory, I/O, CPU **Library:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%
12	Students understand the concept and function of Reduced Instruction Set Computer (RISC)	1. Describes the RISC process in computer architecture 2. Identify the uses of RISC in modern computer architecture	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentation, question and answer, discussion and online problem-based learning 2 x 50	**Material:** Describe the RISC process in architecture and identify the use of RISC in modern computer architecture. **Reference:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%
13	Students understand the concept and function of pipelines.	1. Explain the concept and function of pipelines 2. Distinguishing processor performance from pipelines	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities, Portfolio Assessment	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentations, questions and answers, discussions and online problem-based learning 2 x 50	**Material:** Explaining the concept and function of pipelines and differentiating processor performance with pipelines. **Reference:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%

14	Students are able to understand the concepts of multi-processor and parallel processing	1. 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:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentations, questions and answers, discussions and online problem-based learning 2 x 50	**Material:** Explain 1. multiprocessor concept, 2. parallel processing concept; Mention the advantages of multiprocessors; Mentioning the advantages of multiprocessors **Reference:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	5%
15	Students are able to analyze the application of computer architecture concepts with case studies of the Intel 8085 and Intel 8086 microprocessors.	Linking architectural concepts and implementation in organizations	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities	Scientific approach, presentation, question and answer, discussion, and problem-based learning 2 X 50	Scientific approach, presentations, questions and answers, discussions and online problem-based learning 2 x 50	**Material:** Linking architectural concepts and implementation in organizations **. References:** *Carl Hamacher, Zvonko Vranesic and Safwat Zaky. 2012. Computer Organization and Embedded Systems Sixth Edition. McGraw-Hill.*	5%
16	Final exams	Can master CPMK well	**Criteria:** Cognitive Values, Character Values, and Psychomotor Values **Form of Assessment** : Participatory Activities, Tests	Final Exam Semester 2 x 50	Online Final Semester Examination 2 x 50	**Material:** Can master CPMK well **References:** *Stalling, Williams. 2010. Computer Organization and Architecture: Designing for Performance Eighth Edition. United States: Pearson Prentice Hall.*	20%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	53.34%
2.	Portfolio Assessment	25.34%
3.	Practice / Performance	3.34%
4.	Test	17%
		99.02%

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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.