TEACHING PLAN

BACHELOR OF EDUCATION IN BUILDING ENGINEERING (BE-BE) STUDY PROGRAM

DEPARTMENT OF CIVIL ENGINEERING, FACULTY OF ENGINEERING, UNIVERSITAS NEGERI PADANG

COURSE NAME	CODE	GRASS MK	SKS		SEM	VERSION
			Theory	Pract		
Building Utilities	**SIP. 61.5301**	**Study Program Compulsory Courses**	**2**	**-**		**1**
Lecturer in Charge	**Nidal Zuwida, S.Pd., M.Pd.T**		**Lecturer in Charge** **Nidal Zuwida, S.Pd., M.Pd.T** NIP. 199101172019032014			

Remarks	Dean of the Faculty of Engineering	Head of Civil Engineering Department	Coordinator of BEVE
	Dr. Fahmi Rizal, M.Pd., MT NIP. 195912041985031004	**Faisal Ashar, Ph.D.** NIP. 19750103 200312 1001	**Drs. Revian Body, MSA**. NIP. 19600103 198503 1003

Program Learning	Program Learning Outcomes (PLO)
	By considering input from all stake holders and the minimum requirements set by ASIIN, the PLOs that must be possessed by graduates from the Bachelor of Education in Building Engineering Study Program are determined as follows: 1. Master *basic knowledge of science* (mathematics, natural sciences) and other scientific disciplines that form the basis of building engineering vocational education field for carrying out professional work *(Knowledge and Understanding).*

	1.1. Able to implement basic concepts of mathematics and physics to master subjects matter in the field of building engineering vocational education. 1.2. Mastering Statics, Mechanics, Statistics, Technology Materials, and Engineering Drawings as the basic knowledge in the field of building engineering vocational education. 2. Able to identify, formulate, solve, and evaluate various technical problems of buildings as the basic ability for teaching in the field of building engineering vocational education *(Engineering analysis, investigation and assessment)* . 2.1. Able to identify, formulate, solve, and evaluate technical problems in the field of geotechnical and transportation as the basic ability for teaching in the field of building engineering vocational education. 2.2. Able to identify, formulate, solve, and evaluate technical problems in the field of structure and construction management as the basic ability for teaching in the field of building engineering vocational education. 2.3. Able to identify, formulate, solve, and evaluate technical problems in the field of hydrology as the basic ability for teaching in the field of building engineering vocational education. 3. Possess the ability to design building by taking into account environmental, social, health and work safety issues as the basis for teaching in the field of building engineering vocational education (Engineering design). 3.1. Able to make design programming by taking into account environmental, social, health and work safety issues, in cooperation with various party related. 3.2. Able to analyze the design by taking into account environmental, social, health and work safety aspects. 3.3. Able to produce design by taking into account environmental, social, health and work safety aspects. 4. Possess social, managerial, team work, and effective communication competencies, entrepreneurial character, environmental insight and life-long learning habits. *(Transferable and soft skills).* 4.1. Possess religious character implemented in personal and professional activities.

	4.2. Possess the spirit of nationalism, social sensitivity and environmental insight 4.3. Able to communicate effectively and work in a team. 4.4. Able to transfer science and technology to the community to improve the quality of life 4.5. Possess entrepreneurial character 5. Possess the ability to innovate and adapt to the development of science and technology, and implement it into the learning process of building engineering vocational education field by taking into account non-technical risks that may occur (ethical, ecological, commercial, and industrial impact) *(Engineering practice)*. 5.1. Able to innovate and use information technology (software) in the field of building engineering vocational education by taking into account the ethical, ecological, commercial and industrial impact. 5.2. Able to use information technology-based equipment (hardware) in field of building engineering vocational education. 6. Possess a good ability to design, implement and evaluate the learning process in the field of building engineering vocational education *(Educational design).* 6.1. Able to design curriculum and learning process of building engineering vocational education. 6.2. Able to implement, control, evaluate and improve the quality of learning process through research in the field of building engineering vocational education. 6.3. Able to develop an effective, efficient, and attractive learning media in the field of building engineering vocational education.
Course Learning	**Course Learning Outcomes (CLO)**

<table>
<tr><td>Outcomes</td><td>
<table>
<tr><th>CLO</th><th>CPL</th></tr>
<tr><td>1. Understanding in general about the utility system inside and outside the building according to standards</td><td>1.1,2.1,3.1</td></tr>
<tr><td>2. Able to understand, identify, and describe the vertical transportation system</td><td>1.3,3.1</td></tr>
<tr><td>3. Able to understand, identify, and describe the horizontal transportation system</td><td>1.3,3.1</td></tr>
<tr><td>4. Analyze simply the needs of air conditioners, lifts, and escalators</td><td>1.1,1.2,2.1,2.2</td></tr>
<tr><td>5. Understand, identify and describe lightning protection systems</td><td>1.2,1.3, 3.1,</td></tr>
<tr><td>6. Identify, design building access and environmental access for fire hazard prevention</td><td>1.3,2.1,3.1</td></tr>
<tr><td>7. Understand identifying, practically counting, and describing the water supply system</td><td>1.1,1.2,1.3,2.1</td></tr>
<tr><td>8. Understand, identify, practically calculate and describe the hot water supply system</td><td>1.1,1.2,1.3,2.1</td></tr>
<tr><td>9. Understand, identify, practically calculate, and describe the sewerage system of the building</td><td>1.1,1.2,1.3,2.1</td></tr>
<tr><td>10.Understand, identify, practically calculate, and describe the rainwater disposal system in buildings and sites</td><td>1.1,1.2,1.3,2.1</td></tr>
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<tr><td>Course Description</td><td>The Utilities course provides knowledge about the functions, benefits, and principles of choosing a building utility system; Basics of utility planning & technical requirements, as well as calculating in a simple way the need for utilities inside and outside the building, namely: Air conditioning system; Vertical and horizontal transportation; Lightning protection system; Protection of buildings against fire; Provision of clean and hot water, disposal of dirty water and rainwater.</td></tr>
<tr><td>Literature</td><td>Main (RU):
1. Dwi Tanggoro. 2009. Building Utilities. Jakarta: UI Press
2. Hartono Poerbo, 1995. Building Utilities
Supporting (RP)
1. Paulus Agus Susanto. 2005. Provision of Clean Water in Buildings. Univ. Parahyangan
2. Paulus Agus Susanto. 2005. Disposal of Dirty Water from Buildings. Univ. Parahyangan
3. Paulus Agus Susanto. 2005. Provision of Hot Water in Buildings. Univ. Parahyangan
4. Paulus Agus Susanto. 2005. Rainwater Drainage from Buildings and Sites. Univ. Parahyangan
5. Paulus Agus Susanto. 2005. Building Protection Against Fire. Univ. Parahyangan
6. SNI 03-7017.2-2004, Procedure for Lift Installation
7. SNI 03-6572-2001, Procedure for Designing Ventilation and Air Conditioning Systems</td></tr>
</table>

	8. SNI 03-3990-1995, Installation Procedure for Lightning Protection 9. SNI 03-1735-2000, Planning Procedures for Building Access and Environmental Access for Fire Hazard Prevention 10. SNI 03-1746-2000, Procedure for Planning and Installing Rescue Exit Means against Fire Hazards 11. SNI 03-3989-2000, Procedure for Planning and Installation of Automatic Sprinkler Systems 12. SNI 03-6573-2000. Procedures for Designing Vertical Transportation Systems in Buildings 13. SNI 03-6248-2000. General Conditions of Construction of an Electric Powered Escalator	
Teaching Media	**Software:**	**Hardware:**
	Office Word and Excel	Computers, LCD projectors and whiteboards and peripherals
Team Teaching	Yuwalitas Gusmareta, S.Pd, M.Pd.T, Nidal Zuwida, S.Pd, M.Pd.T	
Assessment	Mid-Term Exam, Final Exam, Independent & Group Assignments, Group Presentations	
Prerequisite	Nothing	

TEACHING MATERIALS

Week	Expected Competency	Study Materials	Teaching Methods and Strategies	Assignments	Assessment Criteria / Indicators	Reference
1-2	**CLO -1 (PLO - 1.1.2.1,3.1)** Students understand in general about the utility system inside and outside the building according to air standards	Air conditioning design 1. Functions and benefits 2. Types 3. Installation and workings of each type of air conditioner	Material explanation Question and answer Discussion	1. Make a summary and description of the material presented in the resume book	Able to understand in general about the utility system inside and outside the building according to air standards	RU-1, RU-2, RP-2, RP-7

Week	Expected Competency	Study Materials	Teaching Methods and Strategies	Assignments	Assessment Criteria / Indicators	Reference
3-4	**CLO -2 (PLO - 1.3,3.1)** Students understand, identify, and describe the vertical transportation system in buildings	1. Functions, benefits, 2. Specifications, type 3. Installation and working of the vertical transportation system	Paper presentation Have a discussion	1. Make a summary and present it in front of the class 2. Quiz	Able to understand, identify, and describe the vertical transportation system	RU-1, RU-2, RP-2, RP-6
5	**CLO -3 (PLO - 1.3,3.1)** Students understand, identify, and describe the horizontal transportation system in buildings	1. Functions, benefits, 2. Specifications, type 3. Installation and working of the horizontal transportation system	Paper presentation Have a discussion	1. Make a summary and present it in front of the class 2. Quiz	Able to understand, identify, and describe the vertical transportation system	RU-1, RU-2 RP-12, RP-13
6-7	**CLO -4 (PLO-1.1,1.2,2.1,2.2)** Students simply analyze the needs of air conditioners, lifts, and escalators	Simple calculation of the need for air conditioning, elevator, and escalator	Have a discussion Work on assignments	Work on assignments	Able to simply analyze the needs of air conditioners, lifts, and escalators	RU-1, RU-2. RP-12, RP-13
8	**Mid-Semester Evaluation through Mid-Semester Examination**					
9	**CLO -5 (PLO-**	Lightning rod installation	Paper presentation	Quiz	Be able to	RU-1,

Week	Expected Competency	Study Materials	Teaching Methods and Strategies	Assignments	Assessment Criteria / Indicators	Reference
	1.2,1.3,3.1,) Students understand, identify, and describe a lightning rod system	1. Definition 2. Element / material 3. Construction	Have a discussion		identify, and describe the lightning protection system	RU-2 RP-8
10	**CLO -6 (PLO-1.3,2.1,3.1)** Students understand, identify, and design building access and environmental access for fire hazard prevention	Prevention and control of fire hazards in buildings and housing environments 1. Terms and definitions 2. The concept of protection against fire hazards 3. Environmental arrangement for fire protection 4. The principle of prevention and overcoming fire in buildings and settlements 5. Terms, technical requirements and fire protection devices	Paper presentation Have a discussion	Quiz	Able to understand, identify, and design building access and environmental access for fire hazard prevention	RU-1, RU, RP-5, RP-9 RP-10, RP-11

Week	Expected Competency	Study Materials	Teaching Methods and Strategies	Assignments	Assessment Criteria / Indicators	Reference
11-12	**CLO -7 (PLO-1.1,1.2,1.3,2.1)** Students understand identifying, practically counting, and describing the clean water supply system	Provision of clean water in buildings 1. Clean water supply 2. Clean Water Design 3. Calculation of water requirements and tool capacity 4. Clean water installation	Paper presentation Have a discussion Work on assignments	1. Make a summary and present it in front of the class 2. Work on assignments	Capable of identifying, practically counting, and describing the water supply system	RU-1, RU-2 RP 1
13	**CLO -8 (PLO-1.1,1.2,1.3,2.1)** Students understand, identify, practically calculate, and describe the hot water supply system	Provision of hot water in buildings 1. Hot Water and Standard Temperature 2. Hot Water Supply System 3. Heating tank construction	Paper presentation Have a discussion Work on assignments	1. Make a summary and present it in front of the class 2. Work on assignments	Able to understand, identify, calculate practically, and describe the hot water supply system	RU-1, RU-2, RP 3
14	**CLO -9 (PLO-1.1,1.2,1.3,2.1)** Students understand, identify, calculate practically, and describe the sewerage	Sewage disposal of the building Discharge of dirty water from buildings 1. Exhaust System Classification	Paper presentation Have a discussion Work on assignments	1. Make a summary and present it in front of the class 2. Work on assignments	Able to understand, identify, calculate practically, and describe the sewerage system	RU-1, RU-2 RP-2

Week	Expected Competency	Study Materials	Teaching Methods and Strategies	Assignments	Assessment Criteria / Indicators	Reference
	system of the building	2. Effects of Siphons and Ven Pipes on Systems 3. Part2 Exhaust System 4. Installation			of the building	
15	**CLO -10 (PLO-1.1,1.2,1.3,2.1)** Students understand, identify, calculate practically, and describe the rainwater disposal system in the building and site	Drainage of rainwater from buildings & sites 1. Rainwater and Control in Buildings 2. Drainage site 3. Simple Calculations	Paper presentation Have a discussion Work on assignments	1. Make a summary and present it in front of the class 2. Work on assignments	Able to understand, identify, calculate practically, and describe the rainwater disposal system in the building and site	RU-1, RU-2 RP 4
16	**Final Semester Evaluation (Evaluation which is intended to determine the final achievement of student learning outcomes)**					

Note :

1. Off-line class lectures last for 14 meetings
2. Job descriptions consist of individual assignments and presentation of group papers (max 3 people)

Correlation between CLO and plo and Assessment Methods

	Assessment	Weig	CPL-1	CPL-2	CPL-3	CPL-4	CPL-5	CPL-6

		ht (%)	1	2	3	1	2	3	4	1	2	3	4	1	2	3	1	2	3	1	2	3
CLO 1	Presentation	2.5		x				x														
CLO 2	Presentation	2.5			x	x																
	Duty	5	x							x												
CLO 3	Presentation	2.5			x	x				x												
CLO 4	Mid Semester	5	x	x		x	x															
CLO 5	Presentation	2.5		x	x					x												
CLO 6	Final Exam	5	x	x		x				x												
	Presentation	2.5			x	x																
CLO 7	Final Exam	5	x	x		x																
	Presentation	2.5			x	x																
	Duty	5	x	x																		
CLO 8	Uas	5	x	x		x																
	Presentation	2.5		x		x																
CLO 9	Uas	5	x	x		x																
	Presentation	2.5		x		x																
	Duty	5	x		x	x																
CLO 10	Uas	5	x	x		x																
	Presentation	2.5		x		x																
TOTAL		100																				

Assessment Components

Midterm exam : 20%

Final exams : 20%

Task (QIUZ)	:	20%
Papers and Presentations	:	30%
Presence	:	10%
Total		**: 100%**

Rating Level Description

	Excellent	Good	Satisfy	Fail
Description	80-100	70-79	51-69	> 50
Formulations	-	-	-	-
Calculation	-	-	-	-
Analysis	90-100	70-89	51-69	> 50

Assessment System

Score	Grade Letter	Grade Point	Notes	Score	Grade Letter	Grade Point	Notes
85 - 100	A	4.0	Exceptional	55 - 59	C	2.0	Quite Satisfactory
80 - 84	A-	3.6	Excellent	50 - 54	C-	1.6	Poor
75 - 79	B +	3.3	Very Good	40 - 49	D	1.0	Very Poor
70 - 74	B	3.0	Good	≤ 39	E	0.0	Fail
65 - 69	B-	2.6	Fairly Good	-	T	-	Delayed
60 - 64	C +	2.3	Satisfactory				

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MID-SEMESTER EXAM

Course	:	Building Utilities
Code / Credits	:	
Type of Exam	:	*Close Book*
Lecturer	:	Yuwalitas Gusmareta, S.Pd., M.Pd.T
		Nidal Zuwida, S.Pd., M.Pd.T
Time Allocation	:	60 Minutes
Maximum grade	:	20%

1	With regard to operating and maintenance factors for air conditioning, the indicators that need to be considered are: a. Simple construction b. Durable c. Easy to repair in case of damage d. Easy to reach and maintain e. Can serve changing operating conditions f. High efficiency Explain each of the factors above!	
2	A person who has a room measuring 8 x 7 m and a ceiling height of 3 m, installs 2 pieces of AC with a capacity of 1 PK. Analyze whether the correct capacity of the AC installed by the person?	
3	Factors that influence the consideration of choosing a lift design system are: Number of floors served a. Floor to floor distance b. The number of occupants per floor c. Building location d. Special use of elevators in buildings e. Special floors f. Building function Explain each of the above factors related to the design of a building lift (the focus of the explanation is oriented to the design of a passenger elevator)!	
4	Calculate the round trip time of the lift (round trip time) from the approach of a 23-storey hotel building with floor height = 3.50 m and the selected lift capacity = 10 people / lift	
5	Explain how the escalator works / operates!	

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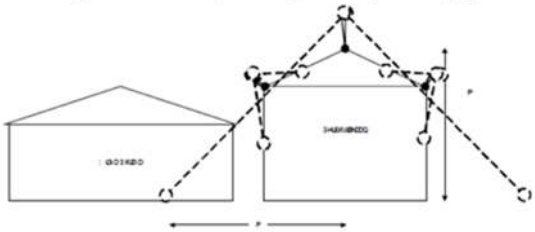
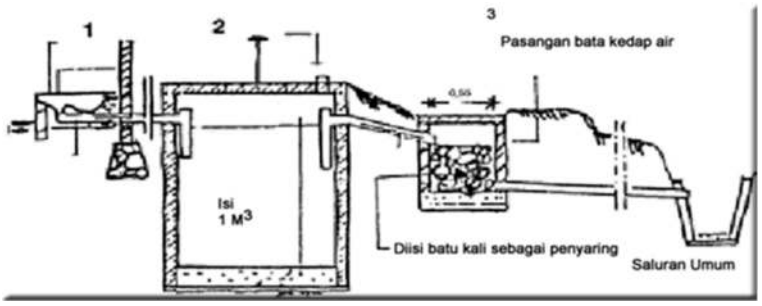
FINAL EXAM

Course	:	Building Utilities
Code / Credits	:	
Type of Exam	:	*Close Book*
Lecturer	:	Yuwalitas Gusmareta, S.Pd., M.Pd.T
		Nidal Zuwida, S.Pd., M.Pd.T
Time Allocation	:	60 Minutes
Maximum Grade	:	20%

No.	Question	Weight
1	Give an explanation from the image below regarding the lightning protection system! 	
2	Describe the building's hot water supply system using a central installation heating system	
3	Write down the formula needed to calculate the need for clean water in buildings	
4	Describe the process of removing dirty water from the image below: 	
5	Explain and describe the efforts to drain rainwater on the lawn both coming from the roof of the building and from inside the building!	

ASSIGNMENT 1

Courses	:	Building Utilities
Code / Credits	:	OK2,61,5301
Type of Exam	:	*Close Book*
Lecturer	:	Yuwalitas Gusmareta, S.Pd., M.Pd.T
		Nidal Zuwida, S.Pd., M.Pd.T
Time Allocation	:	60 Minutes
Maximum Grade	:	5%

Group	Questions	Max value
1	Factors that influence the consideration of choosing a lift design system are:	
2	Calculate the round trip time of the lift (round trip time) from the approach of a 23-storey hotel building with a floor height = 3.50 m and the lift capacity chosen = 10 people / lift	
3	A Rental Office building that serves as a shopping centers and office centers with the following data: - Number of floors (n) = 18 floors - Floors 1 - 4 as a shopping center - Floor 5 - 18 as an office center - Net floor area (a) = 1200 m2 / floor - Floor to floor height (h) = 4 meters - Net floor area per person (a ”) = 6 m2 / person - Average speed for buildings 15 to 20 floors (s) = 210 - 240 m / min = 4 m / s - P for public buildings = 5 - 13% Calculate the normal staircase requirements and the required space area as well as the lift capacity (m) and the number of lifts (N) required in the building.	
4	Draw a cross-sectional and longitudinal sketch of a set of lifts in the building and explain the names and functions of each component	

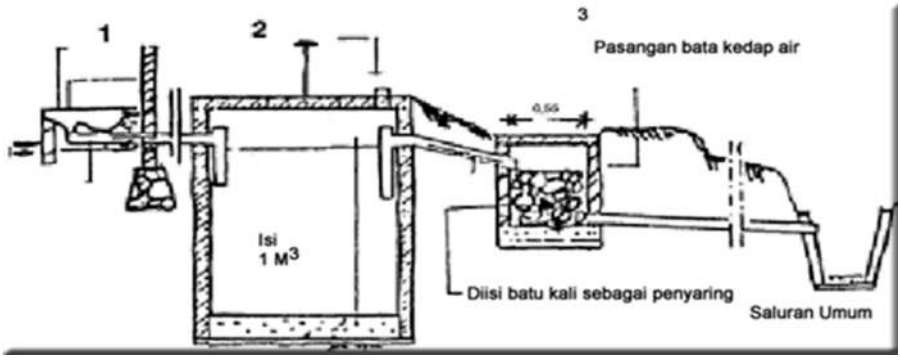
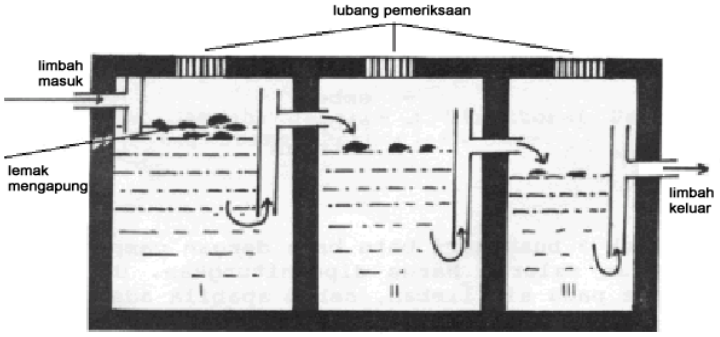
ASSIGNMENT 2

Courses	:	Building Utilities
Code / Credits	:	OK2,61,5301
Type of Exam	:	*Close Book*
Lecturer	:	Yuwalitas Gusmareta, S.Pd., M.Pd.T
		Nidal Zuwida, S.Pd., M.Pd.T
Time Allocation	:	30 minutes
Maximum Grade	:	5%

Group	Question	Max value
1	Describe the scope of safeguarding the clean water supply system in the following buildings: 1. System security 2. Prevention of pollution 3. Water blow prevention	
2	Calculate the need for clean water based on the number of residents / users of an apartment with a capacity of 40 blocks / family with room specifications: 25 blocks for a capacity of 2 bedrooms and 15 blocks for a capacity of 1 bedroom, and has 30 shops, clothing and 2 restaurants. downstairs	
3	Calculate the need for clean water based on the number of load units of a 5-storey office building with the type and number of plumbing equipment you design yourself, the top floor is designed for a restaurant	
4	The 18-storey rental office building which functions as a shopping center, offices and restaurants with the following data: ***Building Data:*** 1. Number of floors (n) = 18 floors 2. Typical floor area (a) = 800 - 1600 m² / floor 3. Floor to floor height (h) = 4 meters 4. Net Floor Area Per Person (a ”) = 4 - 8 m² / person A. Floor 1 - 3 = Shopping Center = (?) M² Assumption Density = 4 m² / person Clean Water Needs Ratio = 40 liters / person Hot Water Needs Ratio = 10 ltr / person B. Floors 4 - 16 = Offices = (?) M² Assumption Density = 6 m² / person Clean Water Needs Ratio = 110 liters / person Hot Water Needs Ratio = 20 liters / person C. Floor 17 & 18 = Restaurant / Canteen / Cafe = (?) M² Assumption Density = 4 m² / person Clean Water Needs Ratio = 200 liters / person Hot Water Needs Ratio = 30 liters / person ***Asked:*** Calculate The Need For Clean Water, In The Building.	

ASSIGNMENT 3

Courses	:	Building Utilities
Code / Credits	:	OK2,61,5301
Type of Exam	:	*Close Book*
Lecturer	:	Yuwalitas Gusmareta, S.Pd., M.Pd.T
		Nidal Zuwida, S.Pd., M.Pd.T
Time Allocation	:	30 minutes
Maximum Grade	:	5%

Group	Questions	Max value
1	Describe the process of removing dirty water from the image below 	
2	Calculate the size of each sump chamber from the image below 	
3	Design the size of a septic tank and infiltration well for a house that has 5 bedrooms, 10 0 people, sandy clay conditions and a groundwater level of 2.8 m below the ground level. Also design the fields and infiltration pipes needed for the dirty water from the septic tank treatment. Additional data: the time required for water to turrun its surface 2.5 cm is 10 minutes	

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COURSE ASSIGNMENT
(QUIZ)

Course	:	Building Utilities
Code / Credits	:	
Type of Assignment	:	Group discussion
Lecturer	:	Yuwalitas Gusmareta, S.Pd., M.Pd.T Nidal Zuwida, S.Pd., M.Pd.T
Time Allocation	:	30 minutes
Weighted Value	:	20%

Group	Questions	Max value
CLO-1	Make a paper with the subject "Air Conditioning Systems"	2.0%
CLO-2	Make a paper with the subject "Vertical Transportation Systems"	2.0%
CLO -3	Make a paper with the subject "Horizontal Transportation System (Escalator)"	2.0%
CLO -5	Make a paper with the subject "Lightning Protection System"	2.0%
CLO -6	Make a paper with the subject "Procedures for Preventing and Overcoming Fire Hazards in Buildings and Housing Environments"	2.0%
CLO -7	Make a paper with the subject "clean water supply systems in high-rise buildings"	2.5%
CLO -8	Make a paper with the subject "building hot water supply system"	2.5%
CLO -9	Make a paper with the subject "sewerage system building"	2.5%
CLO -10	Make a paper with the subject "rainwater disposal systems in buildings and sites"	2.5%