



SAM RATULANGI UNIVERSITY MANADO
FACULTY OF ENGINEERING, DEPARTMENT OF ARCHITECTURE
Architecture Undergraduate Program

Document Code
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SEMESTER LEARNING PLAN

COURSE (MK)	CODE	COURSE GROUP	CREDIT (SKS)		SEMESTER	UPDATE DATE
Building Utility Curriculum 2020 (K-2020)	ARS-2262	ALL	T = 3	P = 0	3 (Tiga)	11 May 2022
Authorization	Developed by:		Course Group Coordinator		Study Program Coordinator	
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Learning Outcomes (LOs)	Expected Learning Outcomes (ELOs) Charged on Course : A1, S1-S2-S4-S6,K3-K4					
	ATTITUDE & VALUES					
	A1	<i>Embodying a behavior setting that includes national patriotism; religious; humanistic; appreciative and tolerant to cultural and religious diversity; sensitive to social and natural environmental issues; obedience to the law; uphold academic ethics; responsible, independent, persevering, thriving and have entrepreneurial spirit.</i>				
	GENERAL SKILLS					
	S1	<i>Able to make decisions, apply or develop science, technology and art with logical, critical, systematic, innovative, creative, qualified and measurable thinking, independently or in group cooperation, based on valid data input and analysis, and well reported and documented.</i>				
	SPECIAL SKILLS					
	S2	<i>Able to perform various architectural communication techniques (mathematical & statistical expression; manual & computer aided drawings; oral & written verbal narratives) to support a design proposition.</i>				
	ADDITIONAL WORK ABILITIES					
	S4	Able to apply architectural knowledge and skills to carry out the physical construction process of an architectural object in relation to the efficiency of available resources and the applied legal aspects.				
	S6	Able to apply architectural knowledge and skills to carry out educational / teaching, research and community service activities in the field of Architecture				
	KNOWLEDGE MASTERY					
	K3	Understand the basic concepts of ecology, biodiversity, energy, water, life cycle of building materials, disaster risk, concepts of comfort in human-environment interaction, concepts and strategies of built environment system in a contextual design problems, especially in the context of vernacular architecture of the coastal and hilly environment.				
	K4	Understand the aspects of building statics and mechanics, building materials, structural systems, utility system, and the strategy for their integration in a contextual design problems, especially in the context of vernacular architecture of the coastal and hilly environment.				
	Course Learning Outcomes (CLO)					
	Able to design systems and utility details in buildings: <ul style="list-style-type: none"> • Conduct a study on the utility needs of a building in an effort to achieve basic needs such as comfort, safety, ease of communication, health, and mobility • Conduct a study of the required utility system capacity requirements • Conducting studies for utility installations 					
Final Ability of Each Learning Stage (Sub-CLO)						
Sub-CLO1	Perform analysis and calculation of passive and active air conditioning requirements and design air-conditioning systems					
Sub-CLO2	Perform analysis and calculation of lighting needs passively and actively and design lighting systems inside and outside the room					
Sub-CLO3	Conduct noise analysis and design room acoustic system.					
Sub-CLO4	Analyze plumbing needs and design plumbing systems and sewage treatment plants.					
Sub-CLO5	Analyze the needs of the transportation system within the building and design the placement/capacity of elevators, escalators, travelators					

	Sub-CLO6	Analyze fire hazard early warning systems and design the placement/capacity of sprinklers, hydrants, fire-extinguishers, etc. Analysis of lightning rods such as Franklin's wand, Faraday's cage, etc						
	Sub-CLO7	Performing communication and digital system analysis.						
		ELOs						
		A1	S1	S2	S4	S6	K3	K4
	CLO	√	√	√	√	√	√	√
	Sub-CLO 1	√	√	√	√	√	√	√
	Sub-CLO 2	√	√	√	√	√	√	√
	Sub-CLO 3	√	√	√	√	√	√	√
	Sub-CLO 4	√	√	√	√	√	√	√
	Sub-CLO 5	√	√	√	√	√	√	√
	Sub-CLO 6	√	√	√	√	√	√	√
	Sub-CLO 7	√	√	√	√	√	√	√
Short Description of Course	The course teaching program will provide students with an in-depth understanding of the theoretical conception of utility requirements for standard buildings and their various systems, as well as aspects of precedent in innovation and evolution.							
Learning Materials	<p>A) Sub-CLO 01 Learning Materials</p> <ol style="list-style-type: none"> 1) Climate, Weather, Building Envelope, Material Specification 2) Passive and Active Building Thermal Comfort 3) Air Conditioning System in building: Condenser, Compressor and Evaporator 4) Air Conditioning System in building: All Air System and Chilled Water System 5) Estimated Cooling Load 6) Refrigerant Cycle and Psychrometric Chart Functions 7) Technical Installation of Ducting, Diffuser, etc. <p>B) Sub-CLO 02 Learning Materials</p> <ol style="list-style-type: none"> 1) Room Illumination Standard 2) Passive and Active Room Lighting 3) Estimated Indoor Lighting Needs, Window Openings and Lamps 4) Electrical system in Building <p>C) Sub-CLO 03 Learning Materials</p> <ol style="list-style-type: none"> 1) Room Acoustic Standard 2) Acoustic Room Technical Requirements: Ray Diagram, Volume, Reverberation Time. 3) Estimated Reverberation Time Calculation 4) Acoustic Specifications of Building Materials 5) Sound System <p>D) Sub-CLO 04 Learning Materials</p> <ol style="list-style-type: none"> 1) Technical and Requirements of Plumbing and Plumbing Installation 2) IPAL / STP 3 stages: Physical Treatment, Biological Treatment, and Chemical Treatment <p>E) Sub-CLO 05 Learning Materials</p> <ol style="list-style-type: none"> 1) Elevator, Escalator and Travelator Technical Requirements 2) Estimation of Elevator, Escalator, and Travelator Needs 3) Elevator, Escalator and Travelator System <p>F) Sub-CLO 06 Learning Materials</p> <ol style="list-style-type: none"> 1) Sprinkler, Hydrant, Fire Extinguisher Technical Requirements 2) Flame Detector, Heat detector, Smoke Detector, Ion Detector 3) Early Warning System Technical Requirements: 4) Installation of Sprinkler, Hydrant, Fire Extinguisher and Early warning system <p>G) Sub-CLO 07 Learning Materials</p> <ol style="list-style-type: none"> 1) Technical Requirements for CCTV, Cable TV, Wifi Hot-Spot 2) CCTV Installation, Cable TV, Wifi Hot-Spot 							

References	Utama :
	<ol style="list-style-type: none"> 1) Vaughn Bradshaw PE, The Building Environment, Active and Passive Control System, John Willey and Sons Inc, 3rd Edition, 2010 2) Walter T. Grondzik and Alison G. Kwok, Mechanical and Electrical Equipment for Buildings, John Willey and Sons Inc, 13rd Edition, 2019 3) Benjamin Stein, Ben Stein dan John S Reynolds, Mechanical and Electrical Equipment for Buildings, John Willey and Sons Inc., 8th Edition, 1999 4) Sugeng Triyadi dan Andi Harapan, Sistem Utilitas Bangunan Untuk Arsitek, Deepublish, 2015 5) Leslie Doelle, Akustik Lingkungan, Erlangga, 1993 6) Steven V. Szokolay, Introduction to Architectural Science The Basis of Sustainable Design, 2014
	Pendukung :
	<ol style="list-style-type: none"> 1) Rada Sahisnu dan Gunanto, Sistem dan Instalasi Refrigerasi, Andi, 2016 2) Hartono Poerbo, Utilitas Bangunan: Buku Pintar untuk mahasiswa arsitektur dan sipil, Djambatan, 2006
Lecturers in Charge	Dr. Ir. Pierre H. Gosal, MEDS., IPU, dkk
Prerequisite Courses	

Week	Sub-CLOs	Evaluation		Forms of Learning, Methods, Student Assignment		Learning Materials	Weights of Evaluation (%)
		Indicators	Criteria / Forms	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1-3	Sub-CLO 01 Perform analysis and calculation of passive and active air conditioning requirements and design air-conditioning systems	Indikator : <ul style="list-style-type: none"> • Exactly explain the active ventilation system • Make plans and details of Air Conditioning System 	Task Evaluation	-	Tutorials Discussion Individual Tasks	<ol style="list-style-type: none"> 1) Climate, Weather, Building Envelope, Material Specification 2) Passive and Active Building Thermal Comfort 3) Air Conditioning System in building: Condenser, Compressor and Evaporator 4) Air Conditioning System in building: All Air System and Chilled Water System 5) Estimated Cooling Load 6) Refrigerant Cycle and Psychrometric Chart Functions 7) Technical Installation of Ducting, Diffuser, etc. 	25 %
4-5	Sub-CLO 02 Perform analysis and calculation of lighting needs passively and actively and design lighting systems inside and outside the room	Indicators : <ul style="list-style-type: none"> • Exactly explain the active lighting system • Making plans and details of Electrical and Lighting Installations 	Task Evaluation	--	Tutorials Discussion Individual Tasks	<ol style="list-style-type: none"> 1) Room Illumination Standard 2) Passive and Active Room Lighting 3) Estimated Indoor Lighting Needs, Window Openings and Lamps 4) Electrical system in Building 	15 %
6-7	Sub- CLO 03 Conduct noise analysis and design room acoustic system.	Indicators : <ul style="list-style-type: none"> • Can accurately explain the Acoustic System in the room. • Can explain Acoustic Room Requirements 	Task Evaluation	Visiting projects that are currently carrying out air conditioning system installations, electrical installations, and sound absorbent material installations	Tutorials Discussion Individual Tasks	<ol style="list-style-type: none"> 1) Room Acoustic Standard 2) Acoustic Room Technical Requirements: Ray Diagram, Volume, Reverberation Time. 3) Estimated Reverberation Time Calculation 4) Acoustic Specifications of Building Materials 5) Sound System 	10 %
8-9	Sub- CLO 04 Analyze plumbing needs and design plumbing systems and sewage treatment plants.	Indicators : <ul style="list-style-type: none"> • Can explain exactly how the 3-stage STP works • Can make plans and details about STP 	Task Evaluation	Visiting a project that is carrying out the construction of a Sewage Treatment Plan	Tutorials Discussion Individual Tasks	<ol style="list-style-type: none"> 1) Technical and Requirements of Plumbing and Plumbing Installation 2) IPAL / STP 3 stages: Physical Treatment, Biological Treatment, and Chemical Treatment 	15 %

10-11	Sub- CLO 05 Analyze the needs of the transportation system within the building and design the placement/capacity of elevators, escalators, travelators	Indicators : <ul style="list-style-type: none"> • Can explain precisely the working mechanism of elevators, escalators, travelators. • Can make plans and detailed drawings of elevators, escalators, travelators. 	Task Evaluation	-	Tutorials Discussion Individual Tasks	<ol style="list-style-type: none"> 1) Elevator, Escalator and Travelator Technical Requirements 2) Estimation of Elevator, Escalator, and Travelator Needs 3) Elevator, Escalator and Travelator System 	15 %
12-13	Sub- CLO 06 Analyze fire hazard early warning systems and design the placement/capacity of sprinklers, hydrants, fire-extinguishers, etc. Analysis of lightning rods such as Franklin's wand, Faraday's cage, etc	Indicators : <ul style="list-style-type: none"> • Can explain exactly how sprinklers and hydrants work • Can make plans and detailed drawings of sprinklers, hydrants, fire-extinguishers, etc • Can draw lightning protection system 	Task Evaluation	Visiting projects that are installing elevators, escalators, and travelators as well as projects that are installing sprinklers and hydrants as well as fire-extinguishers and lightning protection system	Tutorials Discussion Individual Tasks	<ol style="list-style-type: none"> 1) Sprinkler, Hydrant, Fire Extinguisher Technical Requirements 2) Flame Detector, Heat detector, Smoke Detector, Ion Detector 3) Early Warning System Technical Requirements: 4) Installation of Sprinkler, Hydrant, Fire Extinguisher and Early warning system 5) Instalation of lightning protection system 	10 %
14-15	Sub- CLO 07 Performing communication and digital system analysis.	Indicators : <ul style="list-style-type: none"> • Can explain precisely how communication and digital systems work • Can make plans and detailed drawings of communication and digital systems 	Task Evaluation	-	Tutorials Discussion Individual Tasks	<ol style="list-style-type: none"> 1) Technical Requirements for CCTV, Cable TV, Wifi Hot-Spot 2) CCTV Installation, Cable TV, Wifi Hot-Spot 	10 %
16	UAS (Term Exam.)	Validate the final assessment and determine the student's passing grade and then input on the academic portal					100 %

Notes:

- (1) TM: Class Lecture, BT: Structured learning, BM: Self-study
- (2) {TM 1(3x50")} : class lecture 1 time (week) x 3 credits x 50'=150 minutes (2,30 hours)
- (3) {BT+BM (1+1) x(3x60")} : Structured learning 1 time (week) and self-study 1 time (week) 2 x 3 credits x 60 minutes = 360 menit (6 hours)
- (4) RPS: Semester Learning Plan, RMK: Course Group, PRODI: Study Program