



SEMESTER STUDY PLAN

Study program: Master of Environmental Science

Faculty: School Of Postgraduated Studies

Subject:	Hydroclimatology	Code: P-CIL-8-215	Credit:2 (4 ECTS)	Smt:2	
Supporting lecturer:	1. Prof. Dr. Ir. Sutrisno Anggoro, MS 2. Dr. Muhammad Helmi, SSi, MSi 3. Ferry Hermawan, ST., MT., PhD.				
Learning Outcomes Subject:	<ul style="list-style-type: none">• Be able to describe the underlying relationship between climate variability and water resources;• Able to describe and explain natural hydroclimatological variability at various spatial scales;• Be able to explain the methods used to reconstruct the record of past hydroclimatological changes;• Able to explain basic concepts and methods used in both climate science and hydrology;• Able to demonstrate knowledge of cutting-edge technology and instrumentation including weather radar and satellites for real-time measurement of meteorological and climate parameters;• Be able to demonstrate an understanding of the causes and effects of atmospheric and oceanic circulation;• Be able to discuss the interaction between ocean circulation/atmosphere and hydrological processes such as precipitation, evaporation, interception, soil moisture, snow, river flow, etc.;• Able to explain climate change and climate variability;• Able to demonstrate an understanding of climate indicators, hydroclimatic models and sources of global climate data;• Be able to discuss 'contemporary' challenges in hydroclimatology due to the increasing human impact on processes in the hydrological cycle				
Short Description of Courses:	This course provides students with a thorough background of the basic processes that govern the climate and hydrological systems, and the relationships between them. It first examines fundamental atmospheric and hydrological processes, and traces the flow of energy and water between the Earth's surface and the atmosphere. Then the physical processes that control the water cycle are examined, including evapotranspiration, precipitation, runoff and water storage in natural reservoirs (including soil and groundwater, lakes and wetlands). Finally, students will learn about the role of water in climate in Earth's major biomes.				

1	2	3	4	5	6	7	
Week	Final Ability of each learning stage	Study Materials/ Subjects	Learning methods	Workload	Student Learning Experience	Evaluation	
						Criteria & Indicators	Weight (%)
1	Able to understand local to global hydroclimatic challenges, from current conditions to future challenges	Introduction to hydroclimatology includes its boundaries: 1. Environmental Climatology 2. Environmental Climatology 3. Environmental phenomena related to global and local hydroclimatology	Lectures, questions and answers, and discussions	216minutes (0.25 ECTS) Consist of: · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 Minutes</i> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5
2	Able to understand the hydrological cycle, hydrolimnology, types, zones, character systems, vulnerability cases in each water body	Climatological and Hydrological Cycle Environment: 1. Fresh water 2. brackish water 3. Sea water	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 Minutes</i> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5

3	Able to understand the interrelationships of the hydrological cycle in ecosystems	1. The linkage of biohydroclimate with aquatic ecosystems, 2. The linkage of various development activities on aquatic ecosystems & hydro-oceanography, 3. Coastal boundaries, coastal hydroclimate land & waters, 4. Components of the hydro-oceanographic environment	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5
4	Able to describe problems and provide an evaluation of environmental impacts	Hydrosean environmental impact forecast case study and environmental impact evaluation	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5
5	Able to understand the use of coastlines in a case study	Utilization of shoreline data, estuaries (characteristics,	Lectures, questions and	216 minutes (0.25 ECTS) Consist of:	Students listen to the lecturer's	Presence and Activeness in	5

		ecosystem components, functions, type of formation, capacity, hydraulic system	answers, and discussions	<ul style="list-style-type: none"> · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	explanation and answer the lecturer's questions, as well as discuss	Understanding Discussion	
6	Able to understand climate change events	Climate change and its impact on the resilience of the terrestrial & coastal water environment: - Problem - Impact	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: <ul style="list-style-type: none"> · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5
7	Able to understand climate change events	Climate change and its impact on the resilience of the terrestrial & coastal water environment: Sustainable development based on the carrying capacity of marine resources	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: <ul style="list-style-type: none"> · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> 	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5

				<ul style="list-style-type: none"> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i> 			
8	Mid Term Examination	Meeting Material 1- 9	Written test	216 minutes of processing time or the equivalent of 0.25 ECTS	Students working on UTS questions	Completeness and correctness of explanation and accuracy of understanding	5
9	Able to understand climate change events	Climate change and its impact on the resilience of the terrestrial & coastal water environment: - Green economy (understanding, principles, indicators, legal basis, policies) - Blue economy (understanding, principles, indicators, legal basis, policies)	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: <ul style="list-style-type: none"> · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i> 	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5
10	Able to describe environmental management strategies	Environmental management strategy for disaster mitigation	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: <ul style="list-style-type: none"> · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20</i> 	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5

				<i>minutes</i> <i>· Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>			
11	Able to understand hydroclimatic phenomena	<p>The hydroclimatic phenomenon is Acid rain and its impact on the environment:</p> <ul style="list-style-type: none"> - Formation of acid in the atmosphere - Explanation of acid rain - Causes and effects of acid rain - Environmental variables that can have a synergistic effect with acid rain 	Lectures, questions and answers, and discussions	<p>216 minutes (0.25 ECTS)</p> <p>Consist of:</p> <ul style="list-style-type: none"> · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> · <i>Presentation = 1 x 20 minutes</i> <p><i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i></p>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5
12	Able to recognize spatial modeling related to hydroclimatology studies	Spatial modeling for studies related to hydroclimatology	Lectures, questions and answers, and discussions	<p>216 minutes (0.25 ECTS)</p> <p>Consist of:</p> <ul style="list-style-type: none"> · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> · <i>Presentation = 1 x 20 minutes</i> <p><i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i></p>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5

				<i>minutes/day (16 weeks)</i>			
13	Able to recognize spatial modeling related to hydroclimatology studies	Spatial modeling for studies related to hydroclimatology	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> · <i>Presentation = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5
14	Able to recognize spatial modeling related to hydroclimatology studies	Spatial modeling for studies related to hydroclimatology	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: · <i>Lecture = 1x 120 minutes</i> · <i>Q&A = 1 x 20 minutes</i> · <i>Discussion = 1 x 20 minutes</i> <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	Students listen to the lecturer's explanation and answer the lecturer's questions, as well as discuss	Presence and Activeness in Understanding Discussion	5
15	Able to understand urban hydrological planning	Urban hydrological planning	Lectures, questions and answers, and discussions	216 minutes (0.25 ECTS) Consist of: · <i>Lecture = 1x 120 minutes</i>	Students listen to the lecturer's explanation and answer	Presence and Activeness in Understanding Discussion	5

				<ul style="list-style-type: none"> · Q&A = 1 x 20 minutes · Discussion = 1 x 20 minutes · Presentation = 1 x 20 minutes <i>Individual Tasks (Self Work) = 1 x 36 minutes/day (16 weeks)</i>	the lecturer's questions, as well as discuss		
16	Final Examination	Meeting Materials 1-15 (resume material)	Written test	216 minutes of processing time or the equivalent of 0.25 ECTS	Students working on UAS questions	Completeness and correctness of explanation and accuracy of understanding	15
8. Reference List:		<ol style="list-style-type: none"> 1. Dahuri, R., Jacob Rais, Sapta Putra Ginting, and MJ Sitepu. 2001. Integrated Management of Coastal and Ocean Resources. PT Pradnya Paramita, Jakarta 2. Limantara Lily. 2018. Hydrological Engineering. ANDI Publisher. Yogyakarta 3. Syarifudin. 2017. Applied Hydrology. ANDI Publisher. Yogyakarta 4. Tjasyono Bayong. 2008. Applied Climatology. ITB Press. Bandung 					