

Module Name	Fundamental of Hydrology
Module level, if applicable	
Code, if applicable	GEL 1301
Semester(s) in which the module	Second (2 <sup>nd</sup> ) Semester
Person responsible for the module	Prof. Dr. Sudarmadji, M.Eng.Sc
Lecturer	Dr. Tjahyo Nugroho Adji, S.Si.,M.Sc.Tech Dr. M Pramono Hadi, M.Sc Drs. Suyono, M.S
Language	Bahasa Indonesia
Relation to curriculum	For Geography and Enviromental Science students only, specialize basic hydrology, and one of elective class to be taken. This class available for third semester or higher.
Type of teaching, contact hours	STAR ( <i>Student Teacher Aesthetic Role-Sharing</i> ) is an optimal combination between SCL ( <i>Student Centered Learning</i> ) and TCL ( <i>Teacher Centered Learning</i> ). Lecture: 1400 minutes Mid Semester Examination: 100 minutes Final Semester Examination: 120 minutes
Workload	Lecturer, including homework and discussion = 14 meetings x 100 minutes each Mid Semester Examination: 100 minutes Final Semester Examination: 120 minutes Total workload = 1620 minutes
Credit points	2
Requirements according to the examination regulations	Must attend lecture for more than 70%
Recommended prerequisites	-
Module objectives/intended learning aoutcomes	<ol style="list-style-type: none"> <li>1. After following the lecture topic <b>Introduction</b>, students are able to: <ol style="list-style-type: none"> <li>a. Explain the hydrological branches</li> <li>b. Explain the scope of hydrological study</li> <li>c. Explain the use of hydrology to solve practical problems related to water</li> <li>d. Explain the hydrological cycle with some models</li> <li>e. Explain the amount of water components on earth</li> </ol> </li> <li>2. After following the lecture topic <b>Concept of Water Balance</b>, students are able to: <ol style="list-style-type: none"> <li>a. Explain the conept of water balance on earth</li> <li>b. Explain the concept of water balance in watershed</li> <li>c. Explain the concept of water balance in aquifer</li> <li>d. Explain the concept of water balance in soil columns</li> <li>e. Explain the concept of water balance in lake</li> </ol> </li> <li>3. After following the lecture topic <b>Precipitation</b>, students are able to: <ol style="list-style-type: none"> <li>a. Explain the types of precipitation based on genesis and precipitation forms</li> </ol> </li> </ol>

	<ul style="list-style-type: none"> <li>b. Explain the conditions of precipitation</li> <li>c. Explain the factors that affect precipitation that occurs in a region</li> <li>d. Identify precipitation measuring devices</li> <li>e. Explain the amount of rain, duration, intensity, and hietograph</li> <li>f. Identify the steps to calculate mean rainfall in a region</li> <li>g. Identify the use of double rain mass curve</li> <li>h. Identify of how to present rainfall data spatial</li> <li>i. Identify of how to analyze the rainfall tendency of a period</li> </ul> <p>4. After following the lecture topic <b>Evaporation and Transpiration</b>, students are able to:</p> <ul style="list-style-type: none"> <li>a. Explain the various forms of water and the process of change</li> <li>b. Explain the heat transfer process for the evaporation process</li> <li>c. Explain the factors that influence evaporation and transpiration</li> <li>d. Explain the measuring tools for measuring evaporation and transpiration</li> <li>e. Explain the basics of evaporation calculations</li> <li>f. Identify some empirical formulas for calculating evaporation and evapotranspiration</li> <li>g. Calculate potential and actual evapotranspiration</li> <li>h. Identify the water balance meteorologically</li> </ul> <p>5. After following the lecture topic <b>Potamology</b>, students are able to:</p> <ul style="list-style-type: none"> <li>a. Understand the definition of runoff, its components and types of runoff</li> <li>b. Identify the runoff unit and explain the definition of flow discharge</li> <li>c. Explain the definition with image of slope-hydrograph, stage hydrograph, flood hydrograph, and sediment hydrograph</li> <li>d. Explain the runoff process and hydrological phenomena that occur during the dry season, the beginning of the rainy season, the rainy season, and the dry season</li> <li>e. Explain the factors that affect runoff</li> <li>f. Explain with image the influences of rainfall distribution to the shape of hydrograph</li> <li>g. Explain the parameters of watershed morphometry</li> <li>h. Explain the parameters of watershed morphometry that relate with hydrograph</li> <li>i. Explain the parts of the flood hydrograph</li> <li>j. Explain the conditions of water station placement and its devices</li> <li>k. Illustrates the the steps of collecting flow discharge and sediment data through flowcharts</li> </ul>
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	<ul style="list-style-type: none"> <li>l. Identify the steps of measuring flow discharge</li> <li>m. Identify the principal of flow discharge measurement with velocity area method, slope are method</li> </ul> <p>6. After following the lecture topic <b>Geohydrology</b>, students are able to:</p> <ul style="list-style-type: none"> <li>a. Identify the terminology of groundwater and the problems</li> <li>b. Identify the factors that affect to the groundwater potantil in a region</li> <li>c. Identify the groundwater vertical zonation</li> <li>d. Identify the basic characteristics of rocks to groundwater</li> <li>e. Identify the concept of aquifer, aquitard, aquifuge, and aquiclude</li> <li>f. Explain the concept of groundwater basin</li> <li>g. Explain the concept of groundwater watertable and its fluctuations</li> <li>h. Making flownets</li> <li>i. Identify the concept of porosity and permeability of an aquifer</li> </ul> <p>7. After following the lecture topic <b>Water Quality</b>, students are able to:</p> <ul style="list-style-type: none"> <li>a. Explain the factors that affect to water quality</li> <li>b. Identify the chemical composition of water on earth</li> <li>c. Identify the parameters of pure water quality</li> <li>d. Identify the types of dissolved ions in water</li> <li>e. Identify the sources of mayor ions in water</li> <li>f. Explain the steps to represent water quality data</li> </ul> <p>8. After following the lecture topic <b>Limnology</b>, students are able to:</p> <ul style="list-style-type: none"> <li>a. Explain the terms of lake and its types</li> <li>b. Explain the types of lake formation</li> <li>c. Explain the classification and types of lake</li> <li>d. Explain the types of water movement in lake</li> <li>e. Define the ecosystem of lake</li> </ul>
Content	<p>Content 1- Introduction: contract teaching, scope, hydrological cycle</p> <p>Content 1- Introduction: hydrological cycle, water balance</p> <p>Content 2- Hydrometeorology: rain/precipitation, hietograph, rainfall in a region, meteorological water balance</p> <p>Content 2- Hydrometeorology: evaporation and transpiration</p> <p>Content 3- Potamology: watershed and runoff</p> <p>Content 3- Potamology: water station, discharge</p> <p>Content 3- Potamology: discharge measurement, hidrograph</p>

	<p>Content 4- Geohidrology: terminology, groundwater problems, vertical zonation</p> <p>Content 4- Geohidrology: flownets, aquifer</p> <p>Content 4- Geohidrology: Parameters of Geohidrology</p> <p>Content 5- Water Quality: terminology, factors, chemical composition of water on earth</p> <p>Content 5- Water Quality: paramters of water quality, representation of water quality data</p> <p>Content 6- Limnology: terminology, type of lake, process of lake formation</p> <p>Content 6- Limnology: the water movement in lake, stratigraphy of lake, problems of lake ecosystem</p>
<p>Study and examination requirements and forms of examination</p>	<p>Quiz (5 %), participation (5 %), assignment (20 %), discussion (10 %), mid-semester examination (30 %) dan final examination (30 %). Examination is formed in written test.</p>
<p>Media employed</p>	<ul style="list-style-type: none"> <li>- ELISA website</li> <li>- Internet</li> <li>- Computers</li> <li>- Interactive video</li> <li>- LCD projector</li> </ul>
<p>Reading list</p>	<p>Seyhan, E., 1977 <i>Fundamental Hydrology</i>. Geografisch Institute der Rijks Universitiet Utrecht. The Netherlands.</p> <p>Linsley, R.K., Kohler, M.A., Paulhus, J.L., 1975. <i>Hydrology for Engineers</i>. 2nd. Ed. Mc Graw Hill Kogakusha Ltd. Tokyo, Japan.</p> <p>Subagyo, S. 1990. <i>Dasar-dasar Hidrologi</i>. Gadjah Mada University Press Yogyakarta. Terjemahan dari <i>Fundamentals of Hydrology</i> by Ersin Seyhan</p> <p>Weisner, C.J., 1970. <i>Hydrometeorology</i>. Ist. Published. Chapman and Hall UD, London.</p> <p>Fetter, C.W., 1994, <i>Applied Hydrogeology</i>. 3rd Ed. Macmillan Publishing Company, New York.</p> <p>Todd, D. K. 2005. <i>Groundwater Hydrology</i>. John Willey &amp; Sons Inc.</p> <p>Appelo, C.A.J., Postma, D., 1994. <i>Geochemistry, groundwater and pollution</i>. A.A. Balkema, Rotterdam, 536p.</p>