Module/Course Description

FOREST HYDROLOGY (MNH 341)

A. Module Identity		
1.	Name	Forest Hydrology
2.	Code	MNH 341
3.	Credit	3 (2-3)
4.	Semester	5
5.	Coordinator	Dr. Ir Hendrayanto, M.Agr.
6.	Lecturers	Dr. Ir. Nana Mulyana Arifjaya, M.Si.
7.	Language	Indonesian
8.	Program(s) in which the course is offered	Internal department: Forest Management Study Program Other departments: ……..
9.	Type of teaching	a. Traditional classroom: 100 % b. Blended system: Traditional classroom….%, Online….% c. e-Learning system: ……..% d. Others: …….%

B. Workload of course components (total contact hours and credits per semester)

Credit		Contact Hours				Self-Study	Other	Total
SKS *)	ECTS	Lecture	Class Exercise	Laboratory	Field Practice			
3		**28**	**15**		**24**	**56**		**123**

**) Semester credit unit according to the Indonesian higher educational system*
1 credit unit lecture = 2 hours/ week for lecture and 2 hours/ week for self-study within 14 weeks/ semester
1 credit unit class exercise or laboratory or field practice = 3 hours/week within 12-14 weeks/semester
***) 1 hour for lecture= 50 minutes; 1 hour for class exercise or laboratory or field practice = 60 minutes*

C. Module Objective (Learning Outcomes)
Students having the ability to explain the effects of forest management on the water yield of a Watershed (DAS) qualitatively and quantitatively.

D. Detailed Course Learning Outcomes (LO) in Relation to Learning Domains, Teaching Strategies, and Assignment Methods			
No.	**LO in Learning Domains**	**Teaching Strategies**	**Assessment Methods**
a.	**Knowledge**		
1.	Students are able **to comprehend** the development of the science of hydrology, forest hydrology, and the problem of global water conditions and regional water issues	Presentation of teaching materials. FAQ Provision of Duty	Verbal and Writing (Midterm Exam) 5%
2.	Students are able **to explain** the water balance and the effects of forests on water balance	Discussion of the results of the completion of the task. Presentation of advanced teaching materials. Provision of Duty.	Verbal and Writing (Midterm Exam) 10%
3.	Students are able **to comprehend** the importance of watershed hydrology analysis, watershed characteristics, and ways of identifying the characteristics of the watershed	Discussion of the results of the completion of the task Presentation Materials Provision of Duty. Practicum	Verbal and Writing (Midterm Exam) 10%
4.	Students are able **to describe** the quality standards and levels of pollution, as well as the influence of forest management and other land use on water quality	Discussion of the results of the completion of the task Presentation of advanced teaching materials. Provision of Duty.	Verbal and Writing and Calculation (Final Exam) 10%
5.	Students are able **to outline** the principles of watershed management and flood phenomena that occur in a watershed.	Discussion of the results of the completion of the task Presentation of advanced teaching materials. Provision of Duty.	Verbal and Writing and Calculation (Final Exam) 20%

b.	**Skills**		
1.	Students are able **to operate** how to measure, suspect, rainfall data handling, and able to explain the problem of determining the rain area, as well as the role of forests against precipitation	Discussion of the results of the completion of the task Presentation of advanced teaching materials. Provision of Duty. Practicum	Verbal and Writing and Calculation (Midterm Exam) 5%
2.	Students are able **to explain** the sense of potential and actual evapotranspiration, differences in evaporation and transpiration, interception understanding, and able **to demonstrate** ways to measure and predict the magnitude of potential and actual evapotranspiration, transpiration, interception, as well as effects of forests on water loss.	Discussion of the results of the completion of the task Presentation of advanced teaching materials. Provision of Duty. Practicum	Verbal and Writing and Calculation (Midterm Exam) 10%
3.	Students are able **to explain** the infiltration process, the factors that influence it, and able **to demonstrate** how to measure and predict the amount of infiltration of the soil, as well as the effects of forests on infiltration	Discussion of the results of the completion of the task Presentation of advanced teaching materials. Provision of Duty. Practicum	Verbal and Writing and Calculation (Midterm Exam) 10%
4.	Students are able **to comprehend** the phenomenon of flow in saturated and unsaturated soil, and able **to operate** how to measure and predict the amount of flow in the soil as well as their role in controlling	Discussion of the results of the completion of the task Presentation of advanced teaching materials. Provision of Duty. Practicum	Verbal and Writing (Midterm Exam) 5%

	the flow in the soil		
5.	Students are able **to explain** the principles of measurement of surface flow, velocity, discharge and sediment flow, and able **to demonstrate** how to measure runoff and streamflow	Discussion of the results of the completion of the task Presentation of advanced teaching materials. Provision of Duty. Practicum	Verbal and Writing and Calculation (Final Exam) 5%
6.	Students are able **to analyse** the hydrograph river, rain-flow models and forest relationship with water results	Discussion of the results of the completion of the task Presentation of advanced teaching materials. Provision of Duty. Practicum	Verbal and Writing and Calculation (Final Exam) 10%

E. Module Content		
List of Topic	**Number of Weeks**	**Contact Hours**
Introduction	**1**	**2**
Water Balance	**1**	**2**
Observation unit hydrological processes	**1**	**2**
Precipitation	**1**	**2**
Evapotranspiration	**1**	**2**
Infiltration (If)	**1**	**2**
Underground stream	**1**	**2**
Hydrometric	**1**	**2**
Hydrograph	**2**	**4**
Water quality	**2**	**4**
Special topics and the use of hydrological models	**2**	**4**

F. Course Assessments			
No.	**Assessment Type *)**	**Schedule (Week Due)**	**Proportion of the Final Mark**
1.	**Mid-term examination**	**8th week**	**40**
2.	**Final examination**	**16th week**	**40**
3.	**Homework**	**Each week**	**20**

**) Example: mid-term examination, final examination, quiz, homework, project, etc.*

G. Media Employed

- Classroom
- Laptop
- LCD
- Microphone (loudspeaker)
- Practical tools

H. Learning Resources

1. Bruijnzeel LA. 1990. *Hydrology of Moist Tropical Forest and Effects of Conversion: a State of Knowledge Review*. The Netherlands: Free University of Amsterdam.
2. Bruijnzeel LA. 2004. Hydrological functions of tropical forests: not seeingthe soil for the trees?.*Agriculture, Ecosystems and Environment* 104 (2004) 185–228. Elsevirr B.V.
3. Chang M. 2003. *Forest Hydrology. An Introduction to Water and Forest. 1st ed*. CRC Press.
4. Chang M. 2013. *Forest Hydrology. An Introduction to Water and Forest. 3rded*. CRC Press.
5. Hand Out Mata Kuliah Hidrologi Hutan. 2014
6. Hamilton LS, King PN. 1993. *Tropical Forested Watersheds, Hydrological and Soils Response to Major Uses of Conversions*. Westview Press Inc., Boulder, Colorado. Edisi Bahasa Indonesia. Penterjemah: Suryanata, K. (Ed): Tjitrosoepomo, G., 1997. Daerah Aliran Sungai HutanTropika, Tanggapan.
7. Harto SBr. 2009. Analisis Hidrologi.
8. Raghunath HM. 2006. *Hydrology: Principle, Analysis, Design. Revised 2nd ed*. New Age International (P) Limited.