	Universitas Negeri Surabaya Faculty of Engineering Civil Engineering Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
FLUID MECHANICS AND HYDRAULIC	2220103176	Compulsory Study Program Subjects	T=3	P=0	ECTS=4.77	2	January 26, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Project Based Learning**	
Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**	
	Program Objectives (PO)	
	PO - 1	Able to apply knowledge of fluid mechanics and hydraulics to gain a thorough understanding of the basic principles of water civil engineering.
	PO - 2	Able to carry out laboratory experiments and analyze data to compile a practical report.
	PO - 3	Able to analyze hydraulics in open and closed channels to solve civil engineering problems in the water sector.
	PO - 4	Able to apply modern methods, skills and technical tools required for hydraulic analysis.

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3
PO-4

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																
PO-4																

Short Course Description	Fluid Mechanics and Hydraulics are one of the basic sciences in civil engineering in the field of water. This course discusses the basics of fluids and their flow properties in open and closed channels. Apart from that, some of the topics that will be discussed are an introduction to fluid properties, definitions of hydraulics, hydrostatic forces, flow patterns and principles, channel geometry, and flow profiles in open and closed channels. Lectures are carried out theoretically (2 credits) and practicum (1 credit). For theory, it is done face to face, either directly or online. Assessments are carried out to determine the achievement of course learning outcomes through assignments, quizzes, mid-semester exams, final semester exams, and practical reports.
References	**Main :**

1. Anggraini. 1995. Hidrolika Saluran Terbuka . Jakarta: Erlangga.
2. ASCE. 2015. Jurnal of Hydraulic Engineering .
3. Djoni Irianto. 2001. Hidrolika . Surabaya: Unesa Press.
4. Frank M. White. 1994. Fluide Mechanic and Hidraulic. Mc GrawHill
5. ISH. 2015. Jurnal of Hydraulic Engineering.
6. Soedradjat. 1983. Mekanika Fluida dan Hidrolika . Bandung: Nova.
7. Soemitro Herman Widodo, Ronald V. Giles. 1990. Mekanika fluida & Hidrolika . Jakarta: Erlangga.
8. Subramanya. 1995. Hidrolika . Jakarta: Erlangga.
9. Triatmodjo, B. 1991. Hidraulika . Yogyakarta: Beta Offset.
10. Ven Te Chow. 1985. Hidrolika dan Saluran Terbuka . Jakarta: Erlangga.

Supporters:	
Supporting lecturer	Ir. Nurhayati Aritonang, M.T. Danayanti Azmi Dewi Nusantara, S.T., M.T. Siti Talitha Rachma, S.T., M.Sc.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Able to understand the definition and properties of fluids	1. Students can explain the definition and properties of fluids and their relationship to civil engineering so that students understand Newton's Law and its use, dimensions and units used. 2. Students can give examples of deriving equations as well as dimensions and units of each parameter in fluid properties.	**Form of Assessment** : Project Results Assessment / Product Assessment	Participatory Activities 3 X 50		**Material:** Definition and properties of fluids **Reference:** *ASCE. 2015. Journal of Hydraulic Engineering.*	3%

2	Able to explain the basic principles of hydrostatistics	1. Students are able to understand the concept of hydrostatics and can calculate the amount of fluid pressure using a manometer. 2. Students are able to understand fluid pressure on flat and curved surfaces and can calculate the pressure of several types of sluice gates. 3. Students can calculate the relative balance of fluids that are moved horizontally or rotated.	**Form of Assessment** : Project Results Assessment / Product Assessment	Participatory Activities 3 X 50		**Material:** Basic principles of hydrostatistics **Library:** *ISH. 2015. Journal of Hydraulic Engineering.*	3%
3	Able to understand the basic concepts of flow and their equations	Students are able to understand the laws of determining mass, determining energy and momentum	**Form of Assessment** : Project Results Assessment / Product Assessment	Participatory Activities 3 X 50		**Material:** Basic concepts of flow and their equations **Reference:** *Anggraini. 1995. Open Channel Hydraulics. Jakarta: Erlangga.*	3%
4	Able to understand the laws of hydrostatics	Students are able to understand the distribution of hydrostatic pressure	**Form of Assessment** : Participatory Activities	Participatory Activities 3 X 50		**Material:** Laws of hydrostatics **Reader:** *Frank M. White. 1994. Fluide Mechanics and Hydraulics. McGraw Hill*	3%
5	Able to understand the laws of hydrostatics	Students are able to calculate the pressure force in a submerged area	**Form of Assessment** : Participatory Activities	Participatory Activities 3 X 50		**Material:** Laws of hydrostatics, pressure forces in submerged areas. **Reference:** *Soedradjat. 1983. Fluid Mechanics and Hydraulics. Bandung: Nova.*	3%

6	Able to calculate the stability of floating objects	1. Students understand Archimedes' law 2. Students are able to calculate the stability of floating objects 3. Students differentiate between stable and unstable floating objects	**Form of Assessment** : Participatory Activities	Participatory Activities 3 X 50		**Material:** Floating objects **Reference:** *Soedradjat. 1983. Fluid Mechanics and Hydraulics. Bandung: Nova.*	3%
7	Able to understand relative balance	1. Students are able to calculate the pressure in a tank that is accelerating 2. Students are able to calculate the increase in surface elevation of a liquid in a cylinder	**Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Participatory Activities 3 X 50			3%
8	Mastering Fluid Mechanics material by taking the Mid-Semester Exam (UTS)	Students master Fluid Mechanics material by taking the Mid-Semester Exam (UTS)	**Form of Assessment** : Project Results Assessment / Product Assessment, Test	UTS 3 X 50		**Material:** Fluid Mechanics **Library:** *Soedradjat. 1983. Fluid Mechanics and Hydraulics. Bandung: Nova.* **Material:** Fluid Mechanics **Reader:** *Frank M. White. 1994. Fluide Mechanics and Hydraulics. McGraw Hill*	15%
9	Able to understand open channel flow and its classification	1. Students are able to understand flow types 2. Students are able to understand the nature of flow 3. Students are able to understand flow regimes	**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Participatory Activities 3 X 50		**Material:** Hydraulics **Reference:** *Ven Te Chow. 1985. Hydraulics and Open Channels. Jakarta: Erlangga.*	3%

10	Able to understand the shape and properties of open flow	1. Students are able to understand the cross-sectional geometry of open channels 2. Students are able to understand the distribution of speed in a channel cross-section	**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Participatory Activities 3 X 50		**Material:** Hydraulics **Reference:** *Subramanya. 1995. Hydraulics. Jakarta: Erlangga.*	3%
11	Able to understand the principles of energy and momentum	1. Students are able to calculate specific energy 2. Students are able to calculate specific forces	**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Participatory Activities 3 X 50		**Material:** Hydraulics **Library:** *ASCE. 2015. Journal of Hydraulic Engineering.*	4%
12	Able to calculate and apply critical flow principles	Students are able to calculate and apply critical flow principles	**Form of Assessment** : Participatory Activities	Participatory Activities 3 X 50		**Material:** Hydraulics **Library:** *Anggraini. 1995. Open Channel Hydraulics. Jakarta: Erlangga.*	4%
13	Able to calculate uniform flow in open channels	1. Students are able to calculate normal depth and flow velocity 2. Students are able to calculate the normal slope and critical slope	**Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	3 X 50		**Material:** Hydraulics **Reference:** *Ven Te Chow. 1985. Hydraulics and Open Channels. Jakarta: Erlangga.*	4%
14	Able to calculate flow surface profiles	1. Able to calculate the flow surface profile changing gradually 2. Able to calculate rapidly changing flow surface profiles		Participatory Activities 3 X 50		**Material:** Hydraulics **Literature:** *Soemitro Herman Widodo, Ronald V. Giles. 1990. Fluid mechanics & Hydraulics. Jakarta: Erlangga.*	3%
15	1. Able to calculate open channel planning for uniform flow 2. Able to calculate the discharge in the channel through the threshold	Students are able to calculate open channel planning for uniform flow	**Form of Assessment** : Project Results Assessment / Product Assessment	Practical 3 X 50		**Material:** Hydraulics **Library:** *Soedradjat. 1983. Fluid Mechanics and Hydraulics. Bandung: Nova.*	20%

16	Mastering Open Channel Hydraulics material by taking the Final Semester Examination (UAS)	Students master Open Channel Hydraulics material by taking the Final Semester Examination (UAS)	**Form of Assessment** : Project Results Assessment / Product Assessment, Test	UAS 3 x 50		**Material:** Hydraulics **Reference:** *Ven Te Chow. 1985. Hydraulics and Open Channels. Jakarta: Erlangga.* **Material:** Hydraulics **Library:** *Anggraini. 1995. Open Channel Hydraulics. Jakarta: Erlangga.*	29%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	19.83%
2.	Project Results Assessment / Product Assessment	57.83%
3.	Practice / Performance	3.33%
4.	Test	22%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.