	INSTITUT TEKNOLOGI SEPULUH NOPEMBER **FACULTY OF CIVIL, PLANNING AND GEO ENGINEERING** **DEPARTMENT OF GEOMATICS ENGINEERING** **UNDERGRADUATE PROGRAM**	**Document Code**

SEMESTER LEARNING PLAN (SLP)

COURSE NAME	CODE	COURSE GROUP	CREDITS (SKS)		SEMESTER	Date of Preparation
Hydrodynamics Modelling	CM234984	Geomarine	T=2	P=0	Elective Course	-

AUTHORIZATION	SLP Developer	Course Group Coordinator	Head of Study Program
	Danar Guruh Pratomo, S.T., M.T., Ph.D.	Dr. Muhammad Aldila Syariz, S.T., M.S., Ph.D.	Putra Maulida, ST, MT, Ph.D

Learning Outcomes (LO)

Expected Learning Outcomes (ELO) that Imposed in the Course	
ELO-5	Able to design survey and mapping activities using the latest technology in the fields of geodesy, surveying, hydrographic, remote sensing, photogrammetry, and cadastral.
ELO-6	Able to identify, formulate, analyze and solve problems in the fields of geodesy, surveying, hydrographic, remote sensing, photogrammetry, and cadastral.

Course Learning Outcomes (CLO)	
CLO-1	Students able to explain concept in hydrodynamics
CLO-2	Students able to analyze elements in motions.
CLO-3	Students are able to demonstrate Reynold Transport Theorem
CLO-4	Students are able to explain the concept of momentum conversion.
CLO-5	Students are able to define parameters for hydrodynamic modelling
CLO-6	Students are able to demonstrate in building of hydrodynamic model.

Matrix ELO – CLO

CPMK	ELO-5	ELO-6
CLO-1	v	v
CLO-2	v	v
CLO-3	v	v
CLO-4	v	v
CLO-5	v	v
CLO-6	v	v

Course Description	The Hydrodynamic Modeling course aims to provide an in-depth understanding of the basic concepts of hydrodynamics and their applications in water flow analysis. Students will study the principles of hydrodynamics and the elements of fluid motion, such as velocity, pressure, and forces acting in the flow. Additionally, they will be introduced to the concept of Reynold's transport theorem to analyze changes in physical quantities within fluid systems, as well as to understand the momentum conversion mechanism that underlies fluid dynamics. By the end of the course, students will be guided in defining the parameters necessary for hydrodynamic modeling and performing hydrodynamic simulations directly. With the skills acquired, students will be able to design and analyze hydrodynamic models relevant to various applications in marine engineering, environmental, and industrial fields, enabling them to solve problems related to fluid dynamics in real-world work environments.
Course Materials	1. Introduction - Course Overview 2. Governing Equations in Fluid Motion 3. Elements of Motion 4. Reynold's Transport Theorem 5. Momentum Conversion 6. Geostrophic Acceleration 7. Newton's Second Law in Hydrodynamics 8. Navier-Stokes Equation 9. Applications of Hydrodynamic Modeling
References	**Main:**

	1.
	Additional :
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Lecturer	1. Danar Guruh Pratomo, S.T., M.T., Ph.D. 2. Candida Aulia De Silva Nusantara, S.T., M.T.
Prerequisite	Seabed Imaging and Mapping

Class/ Week	Lesson Learning Outcome (Sub-CLO)	Evaluation		Forms of Learning, Learning methods,Student Assignments/Task, [Estimated Time]		Learning Materials [References]	Weight (%)
		Indicators	Criteria and Form	Offline	Online		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Students are able to explain the basic concepts of hydrodynamics and the scope of the course.	1. Accuracy explains the concept of hydrodynamic 2. Understanding the scope of hydrodynamic modeling.	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [1 x 50'] 2. Discussion [1 x 50']		Overview of hydrodynamics, scope and modeling applications.	5
2-3	Students are able to explain the equations used in fluid movement and their application in hydrodynamic modeling.	1. Ketepatan menjelaskan persamaan gerakan fluida.	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion [1 x 50'] 3. Task [1 x 50']		Equations of fluid motion, principles and basic laws of fluid dynamics.	10

		2. Pemahaman penerapan persamaan dalam pemodelan.					
4	Students are able to analyze the elements of motion in a fluid, including velocity, pressure, and force.	1. Accuracy analyzes the moving elements of a fluid. 2. An understanding of forces and pressures in fluid flow.	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion [2 x 50']		The elements of motion in fluids, velocities, pressures, and forces.	10
5	Students were able to demonstrate the application of Reynold's Transport Theorem in fluid flow analysis.	1. Precision in applying Reynolds' Transport Theorem. 2. Understanding fluid flow in open systems.	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion, Task [1 x 50'] 3. Response/Exercise [1 x 50']		Reynold's Transport Theorem and its application in fluid flow.	5
6-7	Students are able to explain the concept of momentum conversion in	1. Accuracy explains the momentu				Conversion of momentum in fluid flow and its application.	10

	fluid systems and apply it in modeling.	m conversion. 2. Understanding the application of momentum conversion in fluid dynamics.					
8	**Midterm Evaluation / Midterm Exam**						**50**
9	Students are able to explain the concept of geostrophic acceleration and its influence in fluid flow.	1. Accuracy explains geostrophic acceleration. 2. Understanding the application of acceleration in fluid dynamics.	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion, Task [1 x 50'] 3. Response [1 x 50']		Geostrophic acceleration and its effects in fluid dynamics.	**10**
10-11	Students are able to analyze the application of Newton's Second Law in fluid dynamics.	1. Ketepatan menjelaskan penerapan Hukum Newton dalam fluida.	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion, Task [1 x 50'] 3. Response/exercise [1 x 50']		Newton's laws and their application in hydrodynamics.	**10**

		2. Pemahaman hukum gerak dalam pemodelan fluida.					
12 - 13	Students were able to demonstrate the use of the Navier-Stokes equation in hydrodynamic modeling.	1. Accuracy explains the Navier-Stokes equation. 2. Understanding the application of equations in fluid dynamics.	1. Completeness of the material 2. Depth of explanation and effectiveness of communication	1. Lecture [2 x 50'] 2. Discussion, Task [1 x 50'] 3. Response/exercise [1 x 50']		Navier-Stokes equation and its use in fluid modeling.	**10**
14 - 15	Students are able to apply the concept of hydrodynamics in real case studies and simulations.	1. The correctness of the application of the concept of hydrodynamics in real cases. 2. Understanding of hydrodynamic modeling				Applications of hydrodynamics in case studies and simulations.	**20**

		simulations.					
16	**Final Semester Evaluation / Final Semester Examination**						**100**