IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**INSTITUT PERTANIAN BOGOR PROGRAM STUDI S1 MANAJEMEN SUMBERDAYA PERAIRN (MSP)**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

RENCANA PEMBELAJARAN SEMESTER-*SEMESTER LEARNING PLAN*

MATA KULIAH (MK) ***Course***	**KODE** ***Code***	**RUMPUN MK** ***Course Cluster***	**BOBOT (sks)** ***Credits***	**SEMESTER**	**TANGGAL PENYUSUNAN** ***Preparation Date***
Kuliah Kerja Nyata Tematik - Thematic Community Outreach Course	IPB1400	Tugas Tahun Terkhir-Wajib ***Final Year's Project-Mandatory***	4 *5.76 ESCT*	7	

Pengasuh **(*Lecturer*)**	**Koordinator MK**	**Tim Pengajar**
		Tim ***Team***

Capaian Pembelajaran (CP) ***Learning Outcome* (LO)**		
	CPL-PRODI yang dibebankan pada MK	
	LO5	Menerapkan ilmu pengelolaan sumberdaya perairan, sumberdaya perikanan, konservasi, lingkungan, dan kawasan berdasarkan prinsip daya dukung untuk keberlanjutan pemanfaatan sumberdaya. ***Apply the science of management of aquatic resources, fisheries resources, conservation, environment, and areas based on the principle of carrying capacity for sustainable use of resources***
	Capaian Pembelajaran Mata Kuliah (CPMK)	
	CPMK	LO mengacu pada Peraturan Rektor Institut Pertanian Bogor Nomor 9/IT3/ PM/2020 Tentang Penyelenggaraan Kegiatan Kuliah Kerja Nyata Tematik Bagi Mahasiswa Program Sarjana Institut Pertanian Bogor Setelah mengikuti kegiatan KKNT (IPB401), mahasiswa mampu:

		a) Meningkatkan rasa peduli dan empati terhadap permasalahan yang dihadapi di masyarakat, serta pemahaman terhadap adat istiadat dan budaya masyarakat serta wawasan kebangsaan b) Mampu mengidentifikasi, merencanakan, melaksanakan, dan mengevaluasi program pemberdayaan masyarakat dalam bidang pertanian dalam arti luas, industri berbasis pertanian, dan lingkungan secara terintegrasi baik multidisiplin maupun interdisiplin antar bidang ilmu di IPB; c) Peduli dan berkomitmen yang tinggi, terampil berkomunikasi, dan bekerjasama antar bidang ilmu untuk berkontribusi dalam mengatasi permasalahan yang ada di masyarakat; dan d) Mampu menginisiasi dan mengembangkan jejaring kerjasama pemangku kepentingan dalam upaya pemecahan masalah untuk memenuhi kebutuhan dalam dinamika kehidupan aktual di masyarakat. *LO refers to the Rector's Regulation of Bogor Agricultural University Number 9 / IT3 / PM / 2020 concerning the Implementation of Thematic Real Work Lecture Activities for Students of the Bogor Agricultural University Undergraduate Program.* *After participating in KKNT activities (IPB401), students are able to:* *a. Increase a sense of care and empathy for the problems faced in the community, as well as understanding of the customs and culture of the community as well as national insight;* *b. Able to identify, plan, implement, and evaluate community empowerment programs in agriculture in a broad sense, agriculture-based industries, and the environment in an integrated manner both multidisciplinary and interdisciplinary between fields of science at IPB;* *c. High care and commitment, communication skills, and cooperation between fields of science to contribute to overcoming problems that exist in society; and* *d. Able to initiate and develop stakeholder cooperation networks in problem-solving efforts to meet the needs in the dynamics of actual life in society.*
Deskripsi MK ***Course Description***		Kuliah Kerja Nyata Tematik Institut Pertanian Bogor (KKNT IPB) merupakan suatu bentuk pendidikan dengan cara memberikan pengalaman belajar kepada mahasiswa untuk hidup di tengah masyarakat di luar kampus, yang secara langsung bersama-sama masyarakat mengidentifikasi dan menangani masalah-masalah pertanian dalam arti luas dan lingkungan serta masalah pembangunan lain yang dihadapi di daerah. Kegiatan KKNT IPB diharapkan dapat: a) Mengasah softskill mahasiswa untuk berfikir kritis dan analitis, kreatif, komunikatif dan kolaboratif lintas disiplin/keilmuan; b) Meningkatkan keterampilan dalam menerapkan ilmu pengetahuan dan teknologi; c) Mampu mengembangkan inisiasi dalam pemecahan masalah pembangunan, berempati terhadap masalah sosial, budaya dan lingkungan, d) Mengasah kepemimpinan adaptif berbasis ilmu pengetahuan teknologi dan seni yang inovatif. e) Menjadi wahana bagi dosen untuk membimbing mahasiswa membantu memberikan solusi terhadap permasalahan masyarakat.

<table>
<tr><td></td><td colspan="5">Thematic Community Outreach Course of IPB is a form of education by providing learning experiences to students to live in the community outside the campus, which directly together with the community identifies and handles agricultural problems in a broad sense and the environment and other development problems faced in the region, that is expected to be:
a. Honing students' soft skills to think critically and analytically, creatively, communicatively and collaboratively across disciplines / sciences;
b. Improve skills in applying science and technology;
c. Able to develop initiation in solving development problems, empathizing with social, cultural and environmental problems,
d. Honing adaptive leadership based on science, technology and innovative arts.
Become a vehicle for lecturers to guide students to help provide solutions to community problems.</td></tr>
<tr><td>Pustaka
References</td><td colspan="5">-</td></tr>
<tr><td rowspan="3">Evaluasi Pembelajaran (Rubrik)
(Rubric)</td><td colspan="3">Penilaian Hasil Belajar (Learning Outcomes Assessment)</td><td colspan="2">Penilaian Akhir (Final Assessment)</td></tr>
<tr><td>Basis Evaluasi (Evaluation Base)</td><td>Bobot (%) (Proportion)</td><td>Deskripsi (Description)</td><td>Nilai Mutu (Grade)</td><td>Rentang Nilai (Range of Values)</td></tr>
<tr><td>Nilai akhir setiap mahasiswa akan ditentukan berdasarkan performa hasil evaluasi pembekalan, aktivitas di lokasi, laporan, dan saat akhir, serta sesuai dengan kinerja dalam penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para Pembimbing) yang diperhitungkan bersama dalam satu formulir penilaian final - The final grade of</td><td>15</td><td>Dimulai dari setelah mahasiswa menyelesaikan proposal KKNT dengan durasi yang disesuaikan dengan kegiatan yang direncanakan - Starting from after students complete the KKNT proposal with a duration adjusted to the planned activities</td><td>A
AB
B
BC
C
D
E</td><td>Nilai ≥ 80
75 ≤ Nilai < 80
70 ≤ Nilai < 75
65 ≤ Nilai < 70
60 ≤ Nilai < 65
55 ≤ Nilai < 60
< 55</td></tr>
</table>

	each student will be determined based on the performance of the results of the debriefing evaluation, activities at the location, reports, and at the end, as well as in accordance with the performance in the preparation, implementation, and reporting of the thesis (for Supervisors) which is calculated together in one final assessment form				
	Hasil Projek (***Project Outcomes***) a. Ujian Pembekalan	Pretest	Mahasiswa mendapatkan materi pembekalan KKNT dari IPB, Program Studi, dan mitra lokasi KKNT (***Students get KKNT briefing materials from IPB, Study Programs, and KKNT location partners***)		
	b. Proposal	10	Mahasiswa mendapat tugas merancang proposal KKNT secara berkelompok, dan		

			penyajian makalah (***Students get the task of designing KKNT proposals in groups, and presenting papers***)		
	c. Pelaksanaan KKNT	50	Mahasiswa melakukan kegiatan KKNT dengan durasi yang disesuaikan dengan yang direncanakan - ***Students carry out KKNT activities with a duration adjusted to what is planned***		
	d. Laporan	30	Mahasiswa melaporkan kegiatan KKNT dengan durasi yang disesuaikan dengan yang direncanakan dalam bentuk makalah - ***Students report KKNT activities with a duration adjusted to what is planned in the form of papers***		
	e. Ujian dengan Dosen Pembimbing Lapang	10	Mahasiswa secara individu mengerjakan soal untuk mengevaluasi		

			pengetahuan dan pemahaman mahasiswa terhadap kegiatan KKNT yang telah dilapporkan - (***Students individually do questions to evaluate students' knowledge and understanding of KKNT activities that have been reported***)		

RENCANA PELAKSANAAN KULIAH (*LECTURE IMPLEMENTATION PLAN*)

No.	Kemampuan akhir yang diharapkan (*Expected final capability*)	Topik & Sub Topik (*Topics & Sub Topics*)	Metode Methods
(1)	**(2)**	**(3)**	**(4)**
1	Setelah mengikuti kegiatan KKNT (IPB401), mahasiswa mampu: a) Meningkatkan rasa peduli dan empati terhadap permasalahan yang dihadapi di masyarakat, serta pemahaman terhadap adat istiadat dan budaya masyarakat serta wawasan kebangsaan b) Mampu mengidentifikasi, merencanakan, melaksanakan, dan mengevaluasi program pemberdayaan masyarakat dalam bidang pertanian dalam arti luas, industri berbasis pertanian, dan lingkungan secara terintegrasi baik multidisiplin maupun interdisiplin antar bidang ilmu di IPB;	Mahasiswa hidup di tengah masyarakat di luar kampus, secara langsung bersama-sama masyarakat mengidentifikasi dan menangani masalah-masalah pertanian dalam arti luas dan lingkungan serta masalah pembangunan lain yang dihadapi di daerah - *Students live in communities outside the campus,*	Kegiatan di lapang ***Onsite activities***

No.	Kemampuan akhir yang diharapkan (*Expected final capability*)	Topik & Sub Topik (*Topics & Sub Topics*)	Metode Methods
(1)	(2)	(3)	(4)
	c) Peduli dan berkomitmen yang tinggi, terampil berkomunikasi, dan bekerjasama antar bidang ilmu untuk berkontribusi dalam mengatasi permasalahan yang ada di masyarakat; dan d) Mampu menginisiasi dan mengembangkan jejaring kerjasama pemangku kepentingan dalam upaya pemecahan masalah untuk memenuhi kebutuhan dalam dinamika kehidupan aktual di masyarakat. *After participating in KKNT activities (IPB401), students are able to:* *a. Increase a sense of care and empathy for the problems faced in the community, as well as understanding of the customs and culture of the community as well as national insight;* *b. Able to identify, plan, implement, and evaluate community empowerment programs in agriculture in a broad sense, agriculture-based industries, and the environment in an integrated manner both multidisciplinary and interdisciplinary between fields of science at IPB;* c. *High care and commitment, communication skills, and cooperation between fields of science to contribute to overcoming problems that exist in society; and* d. *Able to initiate and develop stakeholder cooperation networks in problem-solving efforts to meet the needs in the dynamics of actual life in society*	*directly together with the community identifying and addressing agricultural problems in a broad sense and environmental as well as other development problems faced in the area*	

Bogor 2022

BOGOR AGRICULTURAL UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
DEPARTMENT OF RESOURCE MANAGEMENT (MSP)
BACHELOR PROGRAM

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
Introduction to Aquatic and Fishery Resources Management	MSP1101	Academic Core Courses (ACC)	2	3	07-12- 2022

Teaching Team	Coordinator of Course	Member of Teaching Team
	Prof. Dr. Ir. Luky Adrianto, M.Sc. (LAO)	1. Prof. Dr. Ir. Fredinan Yulianda, M.Sc. (FRY) 2. Dr. Zulhamsyah Imran, S.Pi., M.Si. (ZIM)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO2	Identify problems and complexities of ecosystems and aquatic and fisheries resources as the basis for approaches and models of sustainable management.
	LO of Course	
	LO of Course	After attending this course students are able to: 1. ***Softskill*:** Able to think systemically in identifying and mapping the problems and complexities of ecosystems and aquatic and fisheries resources as the basis for approaches and models of sustainable management. 2. ***Hardskill***: Have the technical ability to map the complexity of ecosystems and aquatic and fishery resources
Description of Course	This course contains knowledge about the complexity of ecosystems and aquatic and fishery resources, opportunities and threats to the sustainability of aquatic and fishery ecosystems and resources, simple models of the complexity of ecological systems and social systems that depend on aquatic ecosystems and fishery resources, an introduction to ecosystem and aquatic resource management approaches and fisheries including ecotourism, management of aquatic biodiversity.	
Reference	1. French, P.W. 1997. Coastal and Estuarine Management. Routledge. London and New York. 2. Kochrane, K.L. 2002. Fishery Manager's Guide Book. FAO Technical Paper 424	

	3. Dahuri, R. 1996. Keanekaragaman Hayati Laut Indonesia. Gramedia, Jakarta 4. Orams, M. 1999. Marine Tourism. Routledge. London and New York. 5. UNDP. 2006. A Guide to Strategic Environmental Assessment. Georgia.				
Learning Evaluation (Rubric)	**Assessment of Learning Outcomes**			**Final Assessment**	
	Basis of Evaluation	**Percentage (%)**	**Description**	**Quality Value**	**Range of Value**
	Participatory Activities (Attendance and activeness in class)	10	Percentage of attendance and activeness in class	A AB B BC C D E	Value ≥ 80 75 ≤ Value < 80 70 ≤ Value < 75 65 ≤ Value < 70 60 ≤ Value < 65 55 ≤ Value < 60 < 55
	Result of Project	20	Practicum assessment		
	Task	-			
	Quiz	-			
	Midterm exam	35	Covers lecture material 1-7		
	Final exams	35	Covers lecture material 8-14		

LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1-2	Students are able to understand the typology and characteristics of ecosystems and aquatic resources	1. Typology of aquatic ecosystems 2. Characteristics of aquatic ecosystem problems 3. Ecological and social aspects in the management of aquatic ecosystems	• Lectures • Active Knowledge Sharing	1	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		4. The balance of ecological systems and social systems in the management of aquatic ecosystems			
3-4	Students are able to understand the principles, definitions and approaches to management of aquatic resources	1. Principles of aquatic ecosystem management 2. Definition and approach to management of aquatic ecosystems	• Lectures • Active Knowledge Sharing	1	LAO
5	Students are able to understand the principles, definitions and approaches to fisheries resource management	1. The principles of fisheries resource management 2. Definition and approach to fisheries resource management	• Lectures • Active Knowledge Sharing	2	LAO
6-7	Students are able to understand the principles and approaches to managing aquatic biodiversity	1. Characteristics and typology of aquatic biodiversity 2. Principles of management of aquatic biodiversity 3. Approach to management of aquatic biodiversity	• Lectures • Active Knowledge Sharing	3	FRY
MIDTERM EXAM (UTS)					

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8-9	Students are able to understand the framework, principles and approaches to managing aquatic resource ecotourism	1. The concept of aquatic ecotourism 2. Typology and spectrum of aquatic ecosystems (fresh water, coastal and marine) 3. Definition and management approach of coastal and marine ecotourism	• Lectures • Active Knowledge Sharing	4	FRY
10	Students are able to understand the management of water pollution management	1. The threat of pollution to the sustainability of aquatic ecosystems 2. Typology of water pollution (point sources and non-point sources)	• Lectures • Active Knowledge Sharing	1	FRY
11-12	Students are able to understand the management of aquatic resources from the perspective of strategic environmental studies (SEA; Strategic Environmental Assessment)	1. The Importance of Strategic Environmental Assessment (KLHS) in the management of the aquatic environment	• Lectures • Active Knowledge Sharing	5	ZIM

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		2. Structure, definition, and scope of the Waters KLHS 3. Step by step of the Waters KLHS 4. An example of a waters KLHS case study			
13-14	Students are able to understand the management of cross-sectoral aquatic resources (multi-sectoral approach for aquatic resources management)	1. The complexity of aquatic ecosystems 2. Multi-dimensional management of sustainable aquatic ecosystems 3. Multi-sectoral approach in aquatic resources management	• Lectures • Active Knowledge Sharing	1	ZIM
FINAL EXAMS (UAS)					

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**INSTITUT PERTANIAN BOGOR** **FAKULTAS PERIKANAN DAN ILMU KELAUTAN** **MANAJEMEN SUMBERDAYA PERAIRAN (MSP)** **PROGRAM SARJANA**	MSP | Departemen Manajeme Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPI

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Basic Limno-Oceanology	MSP1211	*Foundational Literacy* (FL)	2(2-0)	Ganjil	December 2020

	Course Coordinator	Team Lecturer
Lecturer	Dr. Majariana Krisanti, S.Pi., M.Si. (MYK)	1. Prof. Dr. Ir. Agus Saleh Atmadipoera (ASA) 2. Dwi Yuni Wulandari, S.Pi., M.Si. (DYW)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO 2	Identify the types and characteristics of ecosystems and aquatic areas by complying with applicable scientific principles
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: *Soft skills*: 1. Critical thinking in recognizing inland, estuary and coastal waters based on their typology and characteristics. 2. Creative in collecting various information related to inland waters, estuaries and beaches.

		3. Have technological literacy in studying, understanding and conveying knowledge related to inland, estuary and coastal waters. *Hardskill*: 1. Describes the distribution of fresh waters, typologies, characteristics, and origins of different types of freshwater ecosystems . 2. Describe and explain the role of physical, chemical and biological environmental factors for freshwater ecosystems. 3. Explain the definition of coastal areas and estuaries; types of estuaries; the role of estuaries in coastal ecosystems. 4. Describe the physical and dynamic processes that occur in Coastal Areas / Estuaries and Coastal Ecosystems.
Course Description	Basic knowledge and theory of the origin of waters, properties and characteristics of physical, chemical, biological freshwater (lakes, rivers, peat, karst) and seas related to freshwater and marine living systems and environments; Basic knowledge and theory of lake morphometry.	
References	1. Allan JD, Castillo MM. 2007. Stream Ecology: Structure and function of running waters. 2nd Ed. Springer. Dordrecht 436 pp 2. Cole, GA. 1991. Textbook of Limnology. 2nd Edition. Saint Louis. The C.V. MOSBY Company. 283 pp 3. Davidson-Arnott R. 2010. Introduction to Coastal Processes and Geomorphology. Cambridge University Press. 4. Dodds WK. 2002. *Freshwater Ecology Concepts and Environmental Applications.* Academic Press. California. 569 pp. 5. Lampert W, Sommer U. 2007. Limnoecology. 2nd Ed. Oxford University Press. Oxford. 324 pp. 6. Pratiwi NTM, Krisanti M, Hariyadi S, Wardiatno Y, Effendi H, Ayu IP, Iswantari A. 2018. Buku ajar Limnologi pengantar. IPB Press 94 hlm 7. Wetzel RG. 2001. Ljmnology: Lake and Rjver Ecosystems. 3rd Ed. Academic Press. San Diego. 1006 pp. 8. Yanagi T. 2000. Coastal Oceanography. Springer.	

Learning Evaluation (Assessment Rubric)	Learning Outcomes Assessment			Final Assessment	
	Grade	Description	Grade	Grade	Score
	Participatory Activities (Class attendance and activity)	10	Attitude assessment, including compliance, discipline, responsibility and student skills in communicating and working in teams in collaborative learning, assessment is carried out during discussions and from facilitators.	A AB B BC C D E	Score ≥ 80 75 ≤ Score < 80 70 ≤ Score < 75 65 ≤ Score < 70 60 ≤ Score < 65 55 ≤ Score < 60 < 55
	Project Outcomes	40	In the meeting, 2-12 students were tasked with concocting material based on triggers prepared through the results of discussions looking for learning issues according to the topic or subject matter designed by the facilitator. Each topic or subject matter requires 3-4 meetings		
	Assignment	5			
	Quiz	5			
	Mid Test	20	Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 1-7		

	Final Test	20	Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 8-14 and various overall insights about the course		

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students explain the usefulness of knowledge related to aquatic ecosystems, both fresh and marine, the position and relationship of limnology with the management of aquatic resources.	1. **Introduction:** usefulness and scope of the course. Explanation of Problem Base Learning and group formation. 2. **Typology and origin of freshwater formation.** The process of formation of inland waters, the main characteristics of each type of water, the difference between each type, the factors of the external aquatic environment that influence.	Lecture. Discussion.	6, 7	MYK
2	Students are able to describe the distribution of fresh waters, typology, characteristics, and origins of various types of freshwater ecosystems .	**Distribution, typology and origin of the formation of fresh waters.** Freshwater distribution. Stagnant and flowing waters: the main characteristics of each type of water, the differences of each type, the factors of the external aquatic environment that influence. The process of formation of inland waters.	Problem Based Learning	1, 2, 5, 6, 7	MYK
3	Students are able to describe the distribution of fresh waters, typology, characteristics, and origins of various types of freshwater ecosystems .		Problem Based Learning	1, 2, 5, 6, 7	MYK
4	Students are able to describe the distribution of fresh waters, typology, characteristics, and origins of various types of freshwater ecosystems .		Problem Based Learning	1, 2, 5, 6, 7	MYK
5	Students are able to describe and explain the role of physical, chemical	1. Light and heat: their roles related to Life in Water, Water Stratification, Turnover, and	Problem Based Learning	1, 2, 5, 6, 7	DYW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
	and biological environmental factors for freshwater ecosystems.	Stabilization of Water Masses in terms of Water Temperature Distribution and Specific Gravity. 2. Oxygen 3. Organic matter. 4. Nutrients. 5. Components of aquatic biology: the role of plankton, benthos, periphytons, aquatic plants, and decomposers in aquatic ecosystems			
6	Students are able to describe and explain the role of physical, chemical and biological environmental factors for freshwater ecosystems.		Problem Based Learning	1, 2, 5, 6, 7	DYW
7	Students are able to describe and explain the role of physical, chemical and biological environmental factors for freshwater ecosystems.		Problem Based Learning	1, 2, 5, 6, 7	DYW
MIDTERM EXAM					
8	Students are able to explain the definition of coastal areas and estuaries; types of estuaries; the role of estuaries in coastal ecosystems	1. Definition of coastal and estuary areas. 2. Coastal zoning and estuaries. 3. Types of estuaries. 4. Time scales of change in coastal and estuary areas. 5. The role of estuaries on coastal ecosystems.	Problem Based Learning.	3, 8	ASA
9	Students are able to explain the definition of coastal areas and estuaries; types of estuaries; the role of estuaries in coastal ecosystems		Problem Based Learning.	3, 8	ASA
10	Students are able to explain the definition of coastal areas and estuaries; types of estuaries; the role of estuaries in coastal ecosystems		Problem Based Learning	3, 8	ASA

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	Students are able to explain the physical and dynamic processes that occur in Coastal / Estuary Areas and Coastal Ecosystems	1. Physical processes in coastal waters and estuaries. 2. Coastal ecosystems. 3. Dynamics of waters: wind, waves, currents, tides. 4. Physical and Chemical Factors of Seawater. 5. Bathymetry/Seabed topography	Lectures, presentations. Discussion.	3, 8	ASA
12	Students are able to explain the physical and dynamic processes that occur in Coastal / Estuary Areas and Coastal Ecosystems		Lectures, presentations. Discussion.	3, 8	ASA
13	Students are able to explain the basic principles of aquatic morphometry; Measuring the Upper and Lower Dimensions of the Water	1. Basic principles of water measurement and mapmaking 2. Definition and measurement of Upper Water Dimensions	Lectures, presentations. Discussion.	1, 6, 7	MYK
14	Students are able to explain the basic principles of aquatic morphometry; Measuring the Upper and Lower Dimensions of the Water	1. Definition and measurement of Upper Water Dimensions 2. Lake Morphometry measurement practices	Lectures, presentations. Discussion.	1, 6, 7	MYK
FINAL EXAM					

Bogor, December 2022

Dr. Majariana Krisanti, S.Pi., M.Si./Koordinator m.k.

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	ARM — Department of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences, IPB University — Bogor Indonesia

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Basic Planktonology and Benthology	MSP1212	*Academic Core Courses* (ACC)	3(2-1)	3	7 Desember 2022

	Course Coordinator	Team Lecturer
Lecturer	Prof. Dr. Ir. Niken TM Pratiwi, M.Si (NTP)	1. Dr. Majariana Krisanti, S.Pi, M.Si (MYK) 2. Inna Puspa Ayu, S.Pi, M.Si (IPA) 3. Dwi Yuni Wulandari, S.Pi, M.Si (DYW) 4. Aliati Iswantari,S.Pi, M.Si (AAY)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	CPL2	LO 1 Identify resources (individuals, populations, and communities), ecosystems, environments, and water areas
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: 1. Soft skills: After completing this course, students will be able to describe the potential of plankton and primary producers in aquatic ecosystems and their benefits for humans 2. Hardskill: After completing this course, students will be able to identify and analyze plankton organisms and describe ecology.

<table>
<tr><td>Course Description</td><td colspan="5">Concepts and practices are concerned with the characterization of the biology and habitat of microalgae, zooplankton, and basic biota (benthos); Life Requirements and Ecological Functions as Primary and Secondary Producers and Bioindicators.</td></tr>
<tr><td>References</td><td colspan="5">1. Belcher, H dan E. Swale. 1979. An ilustrated Guide of River Phytoplankton. Crown Copy Right. London. 64 p.
2. Davis, C.C. 1955. The Marine and Freshwater Plankton. Michigan State University Press.
3. Edmonson, W.T. 1963. Freshwater Biology. John Wiley and Sons, Inc. Seattle.
4. Fritsch, F.E. 1959. The Structure and Reproduction of the algae. Cambridge University Press.
5. Goldman, C.R. 1985. Primary Productivity in Aquatic Environments.
6. Harris, G.P. 1986. Phytoplankton Ecology: Structure, Function, and Fluctuation. Chapman and Hall. New York.
7. Legendre, L. dan P. Legendre. 1983. Numerical Ecology. Elsevier Scientific Publ. Co. Amsterdam, Oxford. 428 p.
8. Mizuno, T. 1979. Illustration of The Freshwater Plankton of Japan. Hokusha Publishing Co. Ltd. Japan. 313 p.
9. Odum, E.P. 1971. Fundamentals of Ecology. W.B Saunders Company. Philadelphia.
10. Prescott, G.W. 1970. How to Know the Freshwater Algae. WMC Brown Company Publishers. Dubuque, Iowa.
11. Ravera, O. 1979. Biological Aspect of Freshwater Pollution. Pergamon Press. London.
12. Weitzel, R.L. 1979. Periphyton Measurement and Aplication: In Methods and Measurement of periphyton Communities. American Society for Testing and Animal. Philadelphia. 725 p.
13. Shubert, L.E. 1984. Algae as ecological indicators. Academic Press. London. 434 p.
14. Borowitzka, M.A. & Borowitzka L.J. 1988. Micro-algal Biotechnology. Cambridge University Press. Melbourne. 477 p.</td></tr>
<tr><td rowspan="3">Learning Evaluation (Assessment Rubric)</td><td colspan="3">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
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</table>

			and from facilitators (at least 2 facilitators).		
	Project Outcomes	65	In the meeting, 6-10 students were tasked with concocting material based on triggers prepared through the results of discussions looking for learning issues according to the topic or subject matter designed by the facilitator. Each topic or subject matter requires 3-4 meetings. As well as practicing skills in the Laboratory and Field	AB	75 ≤ Score < 80
	Assignment			B	70 ≤ Score < 75
	Quiz			BC	65 ≤ Score < 70
	Mid Test	15	Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 1, 2, and 7	C	60 ≤ Score < 65
	Final Test	10	Students individually do questions to evaluate students' knowledge and understanding of the	D	55 ≤ Score < 60

			material / study materials at meetings 8-14 and various overall insights about the course		
				E	< 55

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Basic knowledge and theory of the characteristics of microalgae, zooplankton and benthos	1.a. Terminology plankton, periphytons, and benthos b. Classification and constituent organisms of plankton, periphytons, and benthos 2. Bioecological factors affecting the growth and development of plankton and benthos community structures 1. Distribution and physiological and anatomical adaptations of plankton and benthos.	PBL	1,2,3,4,5	NTP
2					
3					

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
4	Basic knowledge and theory on the identification of microalgae, zooplankton, and benthos	1.Identification of microalgae, 2.zooplankton, and Bentos	PBL	1,2,3,4.7.8	MYK
5					
6					
7	Basic knowledge and theory of sampling, as well as qualitative and quantitative analysis of examples	1.a. Sampling technique b. Tools and references used in plankton and periphyton analysis c. How to prepare samples for the purposes of determination and identification of plankton & periphyton	PBL	1,2,3,5,7,8,9	DYW
MIDTERM EXAM					
8	Basic knowledge and theory of sampling, as well as qualitative and quantitative analysis of examples	1.a. Plankton & periphyton enumeration methods b. Abundance and biomass	PBL	1,2,3,5,7,8,9	IPA
9					
10	Mastering basic knowledge and theory about the benefits of microalgae, zooplankton, and basic biota, as well as the	1. Blooming and Red tide	PBL		MYK

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	ecological functions of microalgae, zooplankton, and basic biota in general and as bioindicators	2. Succession and paradoxes in plankton and basic biota 1. The role of plankton and primary producers of waters as carbon traps (*deep ocean and waters iron sulfate fertilization*) 1. The role of plankton as an alternative energy of the future 2. Analyze data and interpret the results of data analysis to evaluate potential and water quality problems based on the presence of plankton: a. Diversity index b. Similarity index c. Plankton, periphytons, and basic biota as biological indicators d. Biological water quality index (fertility index)		1,2,3,9,10,11,12,13,14	
12					
13					
14					
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1 2 3	Basic knowledge and theory of the characteristics of microalgae, zooplankton and benthos	1. Basic characteristics and classification of microalgae, zooplankton, and benthos 2. Basic characteristics and classification of zooplankton 3. Basic characteristics and classification of benthos	CL (6); CI (8)	1,2,3,4,5,6	DYW
4 5 6	Basic knowledge and theory on the identification of microalgae, zooplankton, and benthos	1. Identification of microalgae, 2. Identify zooplankton, and Benthos identification	CL (6); CI (8)	1,2,3,4,5,6,8,9	AAY
7	Basic knowledge and theory of sampling, as well as qualitative and quantitative analysis of examples	1. Sampling technique 2. Tools and references used in	CL (6); CI (8)	1,2,3,8,9,10	IPA

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		plankton and periphyton analysis 3. How to do sample preparation for the purposes of determination and identification of plankton & periphyton			
MIDTERM EXAM					
8	Basic knowledge and theory of sampling, as well as qualitative and quantitative analysis of examples	Plankton & periphyton enumeration methods Abundance and biomass	CL (6); CI (8)	1,2,3,8,9,10	AAY
9 10 11	Basic knowledge and theory about the benefits of microalgae, zooplankton, and benthos, as well as the ecological functions of microalgae, zooplankton, and benthos in general and as bioindicators	Evaluate community potential based on: 1. Diversity index 2. Similarity index 3. Succession analysis Existence: 1. mikroalgae 2. plankton 3. bentos	CL (6); CI (8)	1,2,3,8,9,10,11 ,12,13,14	DYW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
12		as a bioindicator to evaluate potential and quality problems qualitatively			
13					
14					
FINAL EXAM					

Form of learning with a '*student center learning' approach*:

1. Small group discussion → SGD
2. Role-play & simulation → RPS
3. Case study → CS
4. Discovery learning → DL
5. Self-directed learning → SDL
6. Cooperative learning → CL
7. Collaborative learning → CbL
8. Contextual Instruction → CI
9. Project based learning →PjBL
10. Problem based learning & inquiry → PBL

Bogor, 7 Desember 2022

IPB UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
AQUATIC RESOUCES MANAGEMENT
BACHELOR DEGREE PROGRAM

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Plants and Macroalgae	MSP1213	*In-depth Prodi Courses*	2(1-2)	4	7 Desember 2022

	Course Coordinator	Team Lecturer
Lecturer	Prof. Dr. Ir. Niken T.M. Pratiwi, M.Si. (NTP)	1. Inna Puspa Ayu, S.Pi., M.Si. (IPA) 2. Dwi Yuni Wulandari, S.Pi., M.Si (DYW) 3. Aliati Iswantari, S.Pi., M.Si. (AAY) 4. Dr. Fery Kurniawan, S.Pi., M.Si. (FRK)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO 2 Sub LO 2.1	2. Identify resources (individuals, populations, and communities), ecosystems, environments, and water areas 2.1. Identify the characteristics of aquatic biota by complying with applicable scientific principles
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: 1. Soft skills: Mastering basic knowledge and theories about morphology, identification, biology, habitat of aquatic plants, seaweed, seagrass, as well as ecological and economic functions. 2. Hardskill: 1. Characterizing types of aquatic plants 2. Identifying aquatic plant species

<table>
<tr><td></td><td></td><td colspan="4">3. Organize, maintain, and evaluate the acuascus system</td></tr>
<tr><td>Course Description</td><td colspan="5">This course provides the students with knowledge of morphology, identification, biology, habitat of aquatic plants, seagrass, seaweed, as well as ecological and economic functions.</td></tr>
<tr><td>References</td><td colspan="5">1. Fasset NC. 1990. A Manual of Aquatic Plants. Madison. University of Winconsin Press.
2. Pancho JV, Soerjani M. 1978. Aquatic weeds of Southeast Asia- A systematic account of common Southeast Asian aquatic weeds. Filipina. National Publishing Cooperative Inc.
3. Sainty GR, Jacobs SWL. 2010. Waterplants in Australia. Australia. Merritt Madden Printing Pty. Ltd
4. Sastrapadja S, Bimantoro R. 1981. Tumbuhan Air LIPI. Bogor. Lembaga Biologi Nasional-LIPI.
5. Schweingruber FH, Kucerová A, Adamec L, Doležal J. 2020. Anatomic Atlas of Aquatic and Wetland Plant Stems. Switzerland. Springer
6. Soerjani M, Kostermans AJGH, Tjitrosoepomo G. 1987. Weed of Rice In Indonesia. Jakarta (ID) : Balai Pustaka.
7. Bold,H.C, dan Wynne,M.J. (1978), Introduction To The Algae, Second Edition, Pretice-Hall Mc. Engelwood Cliffs, New York
8. Fery Kurniawan, Zulhamsyah Imran, Robba Fahrisy Darus, Fitriyah Anggraeni, Ario Damar, Adriani Sunuddin, Mohammad Mukhlis Kamal, Niken Tunjung Murti Pratiwi, Inna Puspa Ayu, Aliati Iswantari. 2020. Rediscovering Halophila major (Zollinger) Miquel (1855) in Indonesia. Aquatic Botany.
9. Howard, J., Hoyt, S., Isensee, K., Pidgeon, E., Telszewski, M. (eds.) (2014). Coastal Blue Carbon: Methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrass meadows. Conservation International, Intergovernmental Oceanographic Commission of UNESCO, International Union for Conservation of Nature. Arlington, Virginia, USA.</td></tr>
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</table>

			from facilitators (at least 2 facilitators).		
	Project Outcomes	65	In the meeting, 6-10 students were tasked with concocting material based on triggers prepared through the results of discussions looking for learning issues according to the topic or subject matter designed by the facilitator. Each topic or subject matter requires 3-4 meetings.	AB	75 ≤ Score < 80
	Assignment	0		B	70 ≤ Score < 75
	Quiz	0		BC	65 ≤ Score < 70
	Mid Test	10	Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 1 - 7	C	60 ≤ Score < 65
	Final Test	10	Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 8-14 and various overall insights about the course and its	D	55 ≤ Score < 60

			application in the community		
				E	< 55

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Mastering basic knowledge and theory about the biology of aquatic plants	Terminology and classification of aquatic plants and macroalgae	CL (6)	1	NTP
2	Mastering basic knowledge and theory about the biology of aquatic plants	Distribution, zoning, and growing habitat	CL (6)	1-6	NTP
3	Mastering basic knowledge and theories about plasticity, invasive species, as well as aquatic weeds and their resulting losses	Distinctive properties of aquatic plants	CL (6)	1-6	NTP
4	Mastering basic knowledge and theories about plasticity, invasive species, as well as aquatic weeds and their resulting losses	Invasive macrophyte species	CL (6)	1-6	IPA
5	Mastering basic knowledge and theories about plasticity, invasive species, as well as aquatic weeds and their resulting losses	Types of water weeds and the resulting losses	CL (6)	1-6	AAY
6	Mastering basic knowledge and theory about the bioecology of freshwater plants	Terms of life and boecology of aquatic plants	CL (6)	1-6	NTP

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
7	Mastering basic knowledge and theory about the bioecology of freshwater plants	Functions and ecological roles of freshwater plants in closed and open systems	CL (6)	1-6	NTP
MIDTERM EXAM					
8	Mastering basic knowledge and theory about seagrass and seaweed bioecology	The function and role of seagrass and seaweed community ecology as a source of oxygen	CL (6)	7,8	NTP
9	Mastering basic knowledge and theory about seagrass and seaweed bioecology	The function and ecological role of seagrass and seaweed ecosystems as nursery ground and feeding ground, as well as breakwater and erosion prevention	CL (6)	7,8	NTP
10	Mastering basic knowledge and theory about seagrass and seaweed bioecology	The function and role of seagrass and seaweed ecosystem ecology as an indicator of coral ecosystem health	CL (6)	7,8	DYW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	Mastering basic knowledge and theory about the role of aquatic plants in the process of adaptation and mitigation related to global warming	The role of aquatic plants in the adaptation process is related to the issue of climate change due to global warming	CL (6)	9	AAY
12	Mastering basic knowledge and theory about the role of aquatic plants in the process of adaptation and mitigation related to global warming	The role of aquatic plants in the process of ecological mitigation of aquatic plant beds is related to the issue of climate change due to global warming	CL (6)	9	FRK
13	Mastering basic knowledge and theory about the benefits of aquatic plants and macroalgae	Utilization of aquatic plants and macroalgae as agents to improve the quality of the aquatic environment	CS (3); CL (6)	1-6	IPA
14	Mastering basic knowledge and theory about the benefits of aquatic plants and macroalgae	Utilization of aquatic plants and macroalgae as raw materials for various industrial activities	CS (3); CL (6)	1-6	AAY
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Apply basic knowledge and theory about the characteristics and identify the type of each type of aquatic plant	Characteristics and identification of submerged-type plants	CL (6); CI (8)	1-6	NTP
2	Apply basic knowledge and theory about the characteristics and identify the type of each type of aquatic plant	Characteristics and identification of floating-type plants	CL (6); CI (8)	1-6	NTP
3	Apply basic knowledge and theory about the characteristics and identify the type of each type of aquatic plant	Characteristics and identification of sticking type plants	CL (6); CI (8)	1-6	IPA
4	Apply basic knowledge and theory about plasticity, invasive species, aquatic weeds and their resulting losses	Apply basic knowledge and theory on the preparation of a herbarium catalog of potentially weeding aquatic plants: Herbarium	CL (6); CI (8)	1-6	IPA
5	Apply basic knowledge and theory about plasticity, invasive species, aquatic weeds and their resulting losses	Apply basic knowledge and theory on the preparation of a	CL (6); CI (8)	1-6	AAY

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		herbarium catalog of potentially weeding aquatic plants: Catalogue of aquatic plants			
6	Apply basic knowledge and theory about the ecological function and role of aquatic plants to natural and artificial open systems	Ecological functions and roles of aquatic plants in open systems: Natural sticking out and floating	CL (6); CI (8)	1-6	AAY
7	Apply basic knowledge and theory about the ecological function and role of aquatic plants to natural and artificial open systems	Ecological functions and roles of aquatic plants in open systems: Natural drowning	CL (6); CI (8)	1-6	DYW
MIDTERM EXAM					
8	Apply basic knowledge and theory about the ecological function and role of aquatic plants to natural and artificial open systems	Functions and ecological roles of aquatic plants in open systems: Artificial sticking out and floating	CL (6); CI (8)	1-6	DYW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
9	Solidify basic knowledge and theory on seagrass and seaweed bioecology	Bioecology of seagrass and seaweed	CL (6); CI (8)	7,8	FRK
10	Solidify basic knowledge and theories about the role of aquatic plants in adaptation and mitigation processes related to global warming	The role of aquatic plants in the process of adaptation and mitigation related to global warming	CL (6); CI (8)	9	FRK
11	Apply basic knowledge and theory about the function and ecological role of aquatic plants in closed systems through the preparation of the design and application of *indoor or* outdoor *aquascapes*	Functions and ecological roles of aquatic plants in closed systems: Preparation of systems, living media, and types of aquatic plants	CL (6); CI (8)	1-6	DYW
12	Apply basic knowledge and theory about the function and ecological role of aquatic plants in closed systems through the preparation of the design and application of *indoor or* outdoor *aquascapes*	Functions and ecological role of aquatic plants in closed systems: Aquascape arrangement and observation	CL (6); CI (8)	1-6	

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
13	Apply basic knowledge and theory about the function and ecological role of aquatic plants in closed systems through the preparation of the design and application of *indoor or* outdoor *aquascapes*	Functions and ecological roles of aquatic plants in closed systems: Aquascape system maintenance and observation	CL (6); CI (8)	1-6	AAY
14	Apply basic knowledge and theory about the function and ecological role of aquatic plants in closed systems through the preparation of the design and application of *indoor or* outdoor *aquascapes*	Functions and ecological roles of aquatic plants in closed systems: Evaluation of aquascape siatem	CL (6); CI (8)	1-6	FRK
FINAL EXAM					

Bogor, 7 Desember 2022

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	ARM Department of Aquatic Resources Management Faculty of Fisheries and Marine Sciences IPB University — Bogor Indonesia —

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Water Quality and Microbiology	MSP1214	ACC	3 (2-3)	3	7 Desember 2022

	Course Coordinator	Team Lecturer
Lecturer	Dr. Ir. Sigid Hariyadi, M.Sc. (SGH)	1. Inna Puspa Ayu, S.Pi., M.Si (IPA) 2. Dwi Yuni Wulandari, S.Pi., M.Si (DWY) 3. Aliati Iswantari, S.Pi., M.Si. (AAY) 4. Dr. Fery Kurniawan, S.Ik., M.Si. (FRK)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO 2 Sub LO 2.3	2. Identify resources (individuals, populations, and communities), ecosystems, environments, and water areas. 2.3 Explain and measure the physical, chemical, and biological parameters of water quality, and report the measurement results
	COURSE LEARNING OUTCOME	

<table>
<tr><td></td><td>LO</td><td colspan="4">After attending this lecture, students are able to:
1. Soft skills:
a. Understand the concepts and principles of water sampling and handling and the importance to the results of water quality analysis.
b. Understand the concepts and principles of measuring water quality parameters (physico-chemical-biological), both direct measurements with tools and analysis in the laboratory, so that they can interpret data correctly and can present data well.
c. Identify and understand the characteristics or status of water quality.
2. Hardskill:
a. Measuring water quality parameters (physics, chemistry) directly in the field.
b. Perform proper collection and handling of water samples.
c. Measuring water quality parameters in the laboratory.
d. Interpret water quality measurement data correctly and present data well.
e. Perform microbiological measurements/analyses, interpret data and present microbiological data related to water quality, decomposition processes, and nutrient cycles in waters</td></tr>
<tr><td>Course Description</td><td colspan="5">Method of taking and handling water samples, measuring, presenting, and interpreting water quality parameter data (physico-chemical); Methods of measuring, presenting, and interpreting aquatic microbiological data related to water quality, decomposition processes, and nutrient cycling in waters.</td></tr>
<tr><td>References</td><td colspan="5">1. APHA (American Public Health Association). 2005/2012/2017. Standard Methods for the Examination of Water and Wastewater. 21st/22nd/23rd ed. APHA, AWWA (American Water Works Association), and WPCF (Water Pollution Control Federation). Washington, D.C.
2. Boyd, CE. CS Tucker. 1992. Water Quality and Pond Soil Analyses for Aquaculture. Alabama Agricultural Experiment Station, Auburn University, Alabama.
3. Hadi, A. 2005. Prinsip Pengelolaan Pengambilan Sampel Lingkungan. PT Gramedia Pustaka Utama. Jakarta.
4. Okafor, N. Environmental Microbiology of Aquatic and Waste Systems. 2011. London, New York: Springer (Science+Business Media B.V.). 307 p.
5. Syauqi, A. 2017. Mikrobiologi Lingkungan: Peranan mikroorganisme dalam kehidupan. Ed. 1. Yogyakarta: ANDI. 208 p.
6. Weiner ER. 2008. Applications of Environmental Aquatic Chemistry: A practical guide. 2nd ed. Boca Raton-London-New York: CRC Press.
7. Cole, GA. 1988. Textbook of Limnology. 3rd ed. Wavelang Press, Inc. Prospect Heights, Illinois.</td></tr>
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	Participatory Activities (Class attendance and activity)	10	Attitude assessment, including compliance, discipline, responsibility and student skills in communicating and working in teams in collaborative learning, assessment is carried out during discussions and from facilitators (at least 2 facilitators).	A	Score ≥ 80
	Project Outcomes	35	The main assessment is the level of participation in carrying out practicum and skills in measurement (which will also be seen from the quiz scores and practicum reports and practical exams)	AB	75 ≤ Score < 80
	Project Outcomes			B	70 ≤ Score < 75
	Assignment			BC	65 ≤ Score < 70
	Midterm Exam	25	Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 1 - 7	C	60 ≤ Score < 65
	Final Exam	30	Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 8-14 and various overall insights about the course	D	55 ≤ Score < 60
				E	< 55

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Explain about water quality, water quality parameters, aquatic microbiology parameters.	Background. Understanding water quality. The role of microbiology. Scope of discussion: physical-chemical-biological parameters of water quality, key parameters.	CL(6), CL(8)	1-3,6,7	SGH
2	Explain how to conduct water sampling and water sampling; explain the principles and how to measure water quality parameters *in situ* according to procedures (using tools)	Water sampling and handling. In *situ measuring* (temperature, conductivity, salinity, brightness, turbidity, color of waters). Quality standards and influential factors.	CL(6), CL(8)	1-3,6,7	SGH
3	Explain the principles and how to measure physical parameters of water quality by gravimetric method (solids content in water) according to procedures, explain quality standards and factors that affect its concentration.	Suspended solids, dissolved solids, total solids, organic solids. Quality standards and influential factors. Gravimetric method.	CL(6), CL(8)	1-3,6,7	SGH
4	Explain the principles and how to measure water quality parameters by the titrimetric method (dissolved oxygen content) according to the procedure, and the factors that affect its concentration, the role of oxygen in waters.	Dissolved oxygen, source and use of oxygen, altitude factor, temperature, salinity to solubility, reaeration, vertical distribution, productivity index, measurement method.	CL(6), CL(8)	1-3,6,7	SGH
5	Explain the principles and how to measure water quality parameters (BOD, COD, and other organic matter	Titrimetric method. BOD, COD, organic matter.	CL(6), CL(8)	1-3,6,7	SGH

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
	parameters) according to procedures, and the meaning of these parameters.				
6	Explain the principles and how to measure water quality parameters (alkalinity, pH, CO2, carbonate) according to procedures, the relationship between parameters and their role in waters.	Alkalinity, pH, CO2 (dissolved gas), carbonate content, buffer capacity: Analysis methods and interrelation to each other.	CL(6), CL(8)	1-3,6,7	SGH
7	Explain the principles and how to measure water quality parameters (hardness, Ca, Mg) according to procedures, interconnectedness with each other, and their role in waters.	hardness, Ca, Mg. Methods of analysis and interrelation with each other.	CL(6), CL(8)	1-3,6,7	SGH
MIDTERM EXAM					
8	Explain the principles and how to measure water quality parameters by spectrophotometric methods for Nitrogen nutrient parameters according to procedures, the role of nutrients and ammonia in waters, relationships with other parameters, and nitrification and denitrification processes (nutrient cycle).	Nitrogen (N), ammonia, nitrate, nitrite, total N. N cycle, ammonification, nitrif, denitrification, assimilation. N as a nutrient and as a toxic substance. Spectrophotometric methods	CL(6), CL(8)	1-3,6,7	AAY
9	Explain the principles and how to measure water quality parameters by spectrophotometric methods for phosphor (P) nutrient parameters according to procedures, the role of P nutrients in waters, relationships with other parameters, and processes in the nutrient cycle.	Phosphor (P), Dissolved P, Total P, P cycle. Nutrients and eutrophication. Spectrophotometric methods	CL(6), CL(8)	1-3,6,7	DYW
10	Explain the principles of how to measure water quality parameters by spectrophotometric (AAS) methods for heavy	Metals and heavy metals (Hg, Pb, Cd, Cu, Cr, Zn, Fe). Sample handling, extraction,	CL(6), CL(8)	1-3,6,7	DYW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
	metal parameters according to procedures, the role of heavy metals in waters, and relationships with other parameters.	characteristics, quality standards.			
11	Explain the principles of how to measure water quality parameters (detergents, oils & fats, H2S, Cn, pesticides, PAHs, PCBs) according to procedures, their role in waters, and relationships with other parameters.	Detergents, oils & fats, H2S, CN, pesticides, PAHs, PCBs, principle of analysis, quality standards.	CL(6), CL(8)	1-3,6,7	IPA
12	Explain the principles of how to conduct aquatic microbiological measurement methods (total coliform, fecal coliform, nitrifying bacteria, denitrification, decomposers), including sampling and sample handling, and their role in water quality and waters in general.	Total coliform, fecal coliform, *Escheresia coli* and pathogens. Nitrifying and denitrifying bacteria, decomposers. Sampling, sample handling, analytical methods, quality standards.	CL(6), CL(8)	4,5	IPA
13	Present data well, and explain / interpret water microbiology data and water quality correctly.	Examples and ways of presenting data, interpretation of water quality data and aquatic microbiology	CL(6), CL(8)	4,5	IPA
14	Explain the process of the role of microbiology in the process of decomposition and nutrient cycling in waters	The role of microbiology in the process of decomposition and nutrient cycling in waters	CL(6), CL(8)	4,5	AAY
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Applying Good Laboratory Practice (GLP), introduction to tools, sampling techniques and handling	1. Good Laboratory Practice (GLP) 2. Tool introduction 3. The importance of measuring instrument calibration 4. Sampling technique 5. Sample handling	CL(6), CL(7), CL(9)	1,3	SGH
2	Using tools and measuring in *situ* parameters of waters	Practice in situ *measurement tools and methods*: conductivity (DHL), salinity, pH, temperature, brightness, color, odor, taste.	CL(6), CL(7), CL(9)	1-3,6,7	SGH
3	Using tools and measuring solids (TS, TSS, TDS, TVS) by gravimetric means in the laboratory.	Practice of using turbidity measurement tools and methods, analysis of solids content in water (TDS, TSS, TVS) gravimetrically	CL(6), CL(7), CL(9)	1-3,6,7	SGH
4	Using tools and measuring oxygen (DO) and BOD waters by means of titrimetry in the laboratory and the use of DO meters.	Practice of using tools (DO meters) and performing titrimetric	CL(6), CL(7), CL(9)	1-3,6,7	IPA

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		DO and BOD measurements in the laboratory			
5	Using tools and performing COD and TOM (permanganate) measurements/analyses	Practice using tools and performing COD and TOM measurements titrimetrically and spectrophotometrically	CL(6), CL(7), CL(9)	1-3,6,7	IPA
6	Using tools and measuring free CO2, alkalinity, hardness, Ca, Mg	Practice of using tools and methods of analysis of free CO2, alkalinity, hardness, Ca, Mg (titrimetry)	CL(6), CL(7), CL(9)	1-3,6,7	IPA
7	Using tools and measuring NO2-N, NO3-N, NH3-N, Total N	Practice of using NO2-N, NO3-N, NH3-N, Total N (spectrophotometry) analysis tools and methods	CL(6), CL(7), CL(9)	1-3,6,7	AAY
MIDTERM EXAM					
8	Explain the work procedures and principles of heavy metal measurement and AAS analysis work procedures	Introduction to AAS spectrophotometric analysis methods (demo) for heavy metal measurement, extraction	CL(6), CL(7), CL(9)	1-3,6,7	AAY

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
9	Explain the working procedure for measuring oil & fat, detergent, phenol, chlorine, cyanide, Fe	Introduction to oil & fat analysis methods, detergents, phenols, chlorine, cyanide, Fe	CL(6), CL(7), CL(9)	1-3,6,7	DYW
10	Using tools and conducting methods of analyzing the content of coliform bacteria	Practice of microbiological measurement procedures (coliform bacteria)	CL(6), CL(7), CL(9)	4,5	AAY
11	Using tools and conducting methods of analyzing total bacterial content	Practice the procedure of measuring the total content of bacteria.	CL(6), CL(7), CL(9)	4,5	IPA
12	Conduct sampling, sample handling, measurement of in situ parameters *in the* field (lake/river)	Sampling, sample handling, in situ measurement of parameters, and measurement of multiple parameters in the laboratory	CL(6), CL(7), CL(9)	1-3,6,7	DYW
13	Quite skilled in the measurement of water quality parameters.	Practical examination of the use of analytical tools and methods	CL(6), CL(7), CL(9)	1-3,6,7	FRK
14	Skilled in using tools in measuring in *situ* parameters of waters	Practice in situ *measurement tools and methods*: conductivity (DHL), salinity, pH,	CL(6), CL(7), CL(9)	1-3,6,7	DYW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		temperature, brightness, color, odor, taste.			
FINAL EXAM					

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	ARM Department of Aquatic Resources Management Faculty of Fisheries and Marine Sciences IPB University — Bogor Indonesia —

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Coastal Hydrology and Oceanography	MSP1215	*Academic Core Course* (ACC)	3 (2-1)	4	Desember 2022

	Lecturer Coordinator	Team Lecturer
Lecturer	Dr. Ir. Sigid Hariyadi, M,Sc. (SGH)	1. Dr. Yuli Naulita, M.Si. (YUN) 2. Dr. Majariana Krisanti (MYK) 3. Dr. Agus Soleh Atmadipura (ASA) 4. Dwi Yuni Wulandari, S.Pi, M.Si. (DYW)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO2	2. Identify resources (individuals, populations, and communities), ecosystems, environments, and water areas.
	LO2.3	2.3. Explain and measure physical, chemical, and biological parameters of water quality, and report measurement results.
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: 1. Soft skills: 1. Critical thinking, curiosity, mastery of technology, systems thinking. 2. Understand the hydrological cycle, the characteristics of the amount and flow of water in rivers, the movement of water in reservoirs and lakes.

		3. Understand current and wave patterns in the ocean and their dynamics, especially in coastal and estuary waters, related to seasons, the influence of ocean currents, and climate change. 4. Understand the role of water movement (hydrodynamics) in the distribution of pollution, the distribution of nutrients, and the living systems of aquatic biota. 2. Hardskill: 1. Ability to measure hydrological parameters such as current speed and direction, flow discharge, 2. Density. 3. Ability to make hydrooceanographic measurements, such as the speed and direction of ocean currents, tides, 4. salinity. 5. Ability to interpret and present hydrological and hydrooceanographic data in relation to the distribution of pollution, distribution of nutrients and distribution of aquatic biota.
Course Description	This course provides the students with knowledge of the hydrological cycle, the characteristics of the amount and flow of water in rivers, reservoirs and lakes, as well as the dynamics of current and wave patterns in the ocean, especially coastal and estuary, related to seasons, the influence of ocean currents, and climate change. The role of hydrodynamics in the distribution of pollution, the distribution of nutrients, and aquatic biota living systems. This understanding is needed as basic knowledge for management Aquatic Resources.	
References	1. Ji, ZG. 2008. HYDRODYNAMICS AND WATER QUALITY, Modelling Rivers, Lakes, and Estuaries. Wiley-Interscience, John Wiley & Sons, Inc. New Jersey. 2. Gordon, ND., TA McMahon, BL Finlayson. 1992. STREAM HYDROLOGY, An introduction for ecologist. John Wiley & Sons. Chicester. 3. Wetzel, RG. 2001. LIMNOLOGY, Lake and River Ecosystems. 3rd ed. Academic Press, San Diego. 4. Stewart, RH. 2008. INTRODUCTION TO PHYSICAL OCEANOGRAPHY. September 2008 Ed. Department of Oceanography, Texas A & M University. (pdf) http://oceanworld.tamu.edu/resources/ocng_textbook/PDF_files/book.pdf 5. The River Continuum Concept, Canadian Journal of Fisheries and Aquatic Sciences Vol. 37(1), 1980, 130-137 (epa.gov).	

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<tr><td></td><td colspan="5">
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<tr><td rowspan="3">Learning Evaluation (Assessment Rubric)</td><td colspan="3">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Grade</td><td>Description</td><td>Grade</td><td>Description</td><td>Grade</td></tr>
<tr><td>Participatory Activities (Class attendance and activity)</td><td>10</td><td>Attitude assessment, including compliance, discipline, responsibility and Student skills in communicating and teamworking in collaborative learning. Participation rate and skills in practicum.</td><td>A
AB
B
BC
C
D
E</td><td>Score≥ 80
75 ≤ Score < 80
70 ≤ Score < 75
65 ≤ Score < 70
60 ≤ Score < 65
55 ≤ Score < 60
< 55</td></tr>
<tr><td>Assignment</td><td>20</td><td>Assessment on the implementation of practicum and skills in</td><td></td><td></td></tr>
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			measurement (which will also be seen from the scores of practicum reports and practical exams)		
	Quiz	10	Assessment on related quiz results understanding of implementation and practicum material, as well as understanding of course material.		
	Midterm Exam	30	Students individually work on questions to evaluate knowledge and Student understanding of Study materials on Meeting 1 – 7.		
	Final Semester Exam	35	Students individually work on questions to evaluate knowledge and Student understanding of Study materials on 8-14 meetings and various Overall insight into Courses.		

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Able to explain about the movement of water, hydrological parameters, oceanographic parameters Coastal, hydrological cycle and its role.	INTRODUCTION: Background, scope of discussion, lecture overview, definition of hydrology, coastal oceanography, hydrological cycle.	Lectures, presentations and discussion.	3	SGH
2	Able to explain water density and its role in hydrology (movement of water), circulation, stagnation, explaining the forces atmosphere that plays a role in the movement of water; Understanding advection, dispersion.	The role of water density, atmospheric forces (wind, temperature, solar radiation, precipitation), Coriolis force and geostrophic flow in hydrodynamic processes. Understanding advection and dispersion.	Lectures, presentations and discussion.	1	SGH
3	Able to explain the characteristics of rivers, hydraulic movement within rivers, regions catchment water (DTA) and its role in Waters.	Characteristics of rivers and catchment areas (DTA). Hydraulic movement in rivers: current speed, flow in canals, flow in sediment, discharge, hydrographic river flow.	Lectures, presentations and discussion.	3	MYK
4	Able to explain river hydrology and principles of Manning's equation, advection, dispersion, in relation to modeling and the influence of water flow on water quality and biota.	River flow and Manning's equation (principle &; importance of Manning's equation). Advection and	Lectures, presentations and discussion.	2, 3	MYK

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		dispersion in rivers. The impact of river flow on water quality and biota.			
5	Able to explain the concept of River Contiuum in relation to environmental dynamics The waters flow from a biological point of view.	River Continuum Concept: The dynamics of the flowing aquatic environment from a biological point of view.	Lectures, presentations and discussion.	5	MYK
6	Able to explain the characteristics of lakes and reservoirs and hydrodynamic processes in them.	Characteristics of lakes and reservoirs. Hydrodynamic processes in lakes/reservoirs: inflow, outflow, influence of wind and vertical circulation, seasonal variations, gyre, seiche. Surface water movement vs internal, geostrophic effects.	Lectures, presentations and discussion.	2, 3	SGH
7	Able to explain the relationship of factors hydrology with water quality and using it for prediction.	Introduction to the Water Quality Model: The Streeter-Phelps Equation.	Lectures, presentations and discussion.	6	SGH
MIDTERM EXAM					
8	Able to explain the movement of water that occurs in estuaries and coastal waters and explain The role of these processes in Distribution of pollutants.	Water movement in estuaries and coastal waters: tides, tidal currents, estuary circulation, estuary stratification, flushing	Lectures, presentations and discussion.	8,9	YNG

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		time (B). Introduction to coastal pollutant distribution modeling			
9	Able to explain the characteristics of tides, Tidal currents, how they are measured How to predict tides.	Tidal generation: tidal generating force, tidal theory, tidal measurement and prediction, tidal type, tidal current.	Lectures, presentations and discussion.	4,9,10	YNG
10	Able to explain processes in waters coastal caused by various conditions hydrooceanography that occurs.	Processes in coastal waters: processes in coastal waters caused by waves, processes in coastal waters caused by currents, mixing processes, dispersion processes.	Lectures, presentations and discussion.	4,9,10	YNG
11	Able to explain oceanographic conditions that occurs in Indonesian waters such as current patterns, the influence of seasons on currents, tidal maps, El Niño phenomenon, La Nina.	Oceanographic conditions in Indonesian waters, wind conditions in Indonesia, current patterns in Indonesian waters, the influence of seasons on currents, tidal maps in Indonesia. El Nino, La Nina, etc.	Lectures, presentations and discussion.	11,12	YNG
12	Able to explain climate change and its influence on oceanographic conditions in Indonesian waters.	CLIMATE CHANGE and its effects on conditions hydrodynamics of waters in Indonesia	Lectures, presentations and discussion.	12	YNG
13	Able to explain climate change and Influence on hydrology and environment waters (rivers, lakes, reservoirs).	The effect of climate change on hydrodynamics Waters.	Lectures, presentations and discussion.		SGH/YNG
14	Able to explain the main factors in hydrology and oceanography play a role in	Introduction to transport modeling	Lectures, presentations and		ASA

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
	distribution of sediments (contaminants) and Using it for modeling Sediment Distribution/Transport.	sediment/contaminants. (A,B)	discussion.		
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Understand and recognize activities that will be carried out in practicum courses .ini.	Introduction to the scope of coastal hydrology and oceanography practicum.	Lectures, discussions.		SGH
2	Can use tools and perform measurement of current and flow discharge speed parameters.	Practice of using tools and methods measurement of current velocity and flow discharge.	Lectures, discussions, use of tools and measurements, calculations		DYW
3	Can use tools and measure water density in various strata depth.	Practice of using tools and methods of measuring water density, DHL, TDS, temperature. Water movement due to density differences (Transparent jars filled with warm water, flow colored cold water or tea water. Report what happened).	Lectures, discussions, use of tools and measurements, calculations		DYW
4	Can process data, present data in the form of graphs and interpret data / graphs.	Processing river hydrology data and making hydrographic river flows	Lectures, discussions, calculations, graphing. Data interpretation.		DYW
5	Can process data, present data in the form of graphs and interpret data / graphs	Processing lake/reservoir hydrological data and making reservoir/lake hypsographic curves.	Lectures, discussions, calculations, graphing. Data interpretation.		SGH/DYW
6	Can explain the process of water movement in Rivers and lakes with observations	Field observation of water movement in rivers and lakes: turbulent flows, laminar flows,	Field observation and discussion.		DYW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
	immediately.	waves in lakes, wind influences			
7	Can communicate, present, and discuss learning outcomes and observations.	Presentations and discussions on the topic of water movement and aquatic biota.	Literature review, presentation and discussion		DYW
8	Skillfully explain how equipment works and oceanographic data sources	Oceanographic data tools and sources Types of oceanographic equipment The working principle of oceanographic tools Benefits of data obtained from oceanographic tools a. Oceanographic data sources	Lectures, discussions, quizzes, Data processing exercises, poster tasks	4,13	YNG
9	Skilled enough to measure and make maps bathymetry for applications in marine and fisheries as well as being able to calculate volume Waters and coastal slope	Measurement and Use of Bathymetric Maps Differences in Land and Sea Topography Utilization of bathymetric maps Depth Measurement Method Methods of measuring beach slope and classification of beach slope a. Water Volume Calculation	Lectures, discussions and quizzes, data processing tasks and reports	14,15	YNG

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
10-11	Skilled enough to measure and perform Tidal data processing	Measurement and analysis of tidal data Tidal Measurement Methods Tidal data analysis methods Calculating the important elevation of tides Tidal data prediction a. Calculates flushing time from tidal data	Lectures, discussions and quizzes, data processing tasks and reports	12,16	YNG
12	Skilled enough to measure and perform ocean current data processing	Measurement and analysis of current data Current measurement methods Current data analysis methods Frequency distribution, speed and current direction a. Calculates flushing time from current data	Lectures, discussions and quizzes, data processing tasks and reports	17,18	YNG
13	Skilled enough to measure and analyze data wave	Wave data measurement and analysis Wave data measurement methods Wave data analysis methods	Lectures, discussions and quizzes, data processing tasks and reports	19	YNG

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		a. Classify wave data with the Beaufort Scale			
14	Skilled enough to measure and analyze data temperature, salinity and density based vertical and transverse profile	Measurement and analysis of temperature, salinity and density data Methods of measuring temperature, salinity and density Methods of analyzing temperature, salinity and density data Vertical and transverse profiles of temperature, salinity a. and density	Lectures, discussions and quizzes, data processing tasks and reports	20	YNG
FINAL EXAM					

Bogor, Desember 2022

Dr.Ir. Sigid Hariyadi, MSc. / Kordinator m.k.

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Ecology	MSP1221	Foundational Literacies (FL)	3(2-1)	3	07 December 2022

	Course Coordinator	Lecturer Team
Lecturer	Charles P. H. Simanjuntak, Ph.D (CPH)	1. Prof. Dr. Ir. Ario Damar, M.Si (ARD) 2. Prof. Dr. Ir. Etty Riani, MS (ETR) 3. Prof. Dr. Ir. Fredinan Yulianda, M.Sc (FRY) 4. Ir. Agustinus M. Samosir, M.Phil (AMS) 5. Dr. Ayu Ervinia, S.Pi, M.Sc (AYE) 6. Dudi Muhammad Wildan, S.Pi, M.Si (DMW)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO-2 Sub-LO 2.2	To identify aquatic resources (individuals, populations, and communities), ecosystem, environment, and water areas
	COURSE LEARNING OUTCOME	
	LO	After attending this course, students are able to: 1. Softskill: a. Explain the basic concepts of aquatic ecology which include populations, communities, ecosystems and ecological processes as well as their interrelationships and uses in the field of fisheries and marine science; b. Classify the organizational structure of aquatic organisms; c. Explain aquatic succession, the impact of pollution and climate change on the aquatic environment d. Explain the concept of aquatic biodiversity as a basis for aquatic conservation

		2. Hardskill: a. Conduct sampling techniques of physical-chemical parameters of waters both in fresh (lotic and lentic), brackish and marine waters b. Conduct aquatic biota sampling techniques including phytoplankton, zooplankton, perifiton, benthos and nekton c. Identify plankton (phytoplankton, zooplankton), perifiton, benthos and nekton d. Analyze the community structure of aquatic biota
Course Description	The Aquatic Ecology course discusses ecological processes in the aquatic environment (energy flow, material cycle, water limiting factors); organizational structure of aquatic organisms (species, populations and communities); terrestrial public aquatic ecosystems (brego, swamps, lakes), estuary, coastal and marine waters (seagrasses, mangroves, coral reefs), ecosystem development, pollution, global climate change, biodiversity and conservation).	
References	1. Barnes RSK & Mann KH. 1991. Fundamental of Aquatic Ecology, 2nd Edition. Blackwell Science Ltd. 2. Begon M. Townsend CR. Harper JL. 2006. Ecology: From Individuals to Ecosystems. Fourth edition. Blackwell Publishing Ltd. Oxford. 3. Boaden PJS and Seed R. 1985. An Introduction to Coastal Ecology. Chapman & Hall. 4. Brower JE. Zar JH. von Ende CN.1990. Field and Laboratory Methods for General Ecology. 3rd Edition. Wm. C. Brown Publishers, Dubuque 5. Castro P and Huber ME. 2016. Marine Biology, Tenth Edition. McGraw-Hill Education. 6. Dodds WK and Whiles MR. 2010. Freshwater Ecology: Concepts and Environmental Applications of Limnology. Academic Press. 7. Dudgeon D (eds.). 2008. Tropical Stream Ecology. First edition. Academic Press. 8. Giller PS. 1984. Community Structure and the Niche. Chapman and Hall, London 9. Krebs, C.J. 1999. Ecological Methodology, 2nd ed. Benjamin Cummings, Menlo Park. 10. Mitra A and Zaman S. 2016. Basics of Marine and Estuarine Ecology. Springer India. 11. Nybaken JW. Bertness MD. 2005 Marine biology: an ecological approach.Sixth edition. Pearson Education, Inc., San Francisco 12. Rahardjo MF. Simanjuntak CPH. 2021. Ekologi Akuatik. Departemen MSP FPIK IPB. 13. Rahardjo MF. Simanjuntak CPH, Asriansyah A. 2020. Panduan Praktikum Ekologi Perairan. Edisi Ketiga. IPB Press. 14. Southwood TRE. Henderson PA. 2000. Ecological Methodology, 3rd edition, Blackwell Science Ltd. London. 15. Keith Hiscock. 2014. Marine Biodiversity Conservation: A Practical Approach. Routledge. 16. Gaston KJ and Spicer JI. 2004. Biodiversity: an Introduction. 2nd edition. Blackwell Science Ltd. UK 17. Marten A. Hemminga. 2009. Seagrass Ecology. Cambridge University Press 18. Zvy Dubinsky. Noga Stambler (Editors). 2011. Coral Reefs: An Ecosystem in Transition. Springer Dordrecht. 19. Rahardjo MF. Simanjuntak CPH and Yulianda F. 2020. Konservasi Sumberdaya Perairan. Bunga Rampai Ilmu Perikanan dan Kelautan. IPB Press.	

	Learning Outcomes Assessment			Final Assessment	
	Component	Proportion (%)	Description	Grade	Score
Learning Evaluation (Assessment Rubric)	Participatory Activities (class attendance and activeness)	5	Assessment of attendance, compliance, discipline, responsibility, and activeness of students during the learning process both in class, lab, and field	A AB B BC C D E	Score ≥ 80 75 ≤ Score < 80 70 ≤ Score < 75 65 ≤ Score < 70 60 ≤ Score < 65 55 ≤ Score < 60 Score < 55
	Project outcomes	20	Projects are carried out by students in groups to analyze and provide critical answers to current issues and problems according to the topic of the aquatic ecology course.		
	Assignment	10	Structured assignments are carried out by students both individually and or in groups to sharpen students' analytical power and increase students' understanding of aquatic ecology learning materials.		
	Quiz	5	Quizzes are given at each meeting to evaluate the extent of students' understanding of the learning material		
	Midterm Exam	30	Midterm exam is given to students to evaluate the extent of students' knowledge and understanding of the learning material from week 1 to week 7		
	Final Exam	30	Final exam is given to students to evaluate the extent of students' knowledge and understanding of learning material from week 8 to week 14.		

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain the scope of ecology and its relation to other sciences	**Introduction**: The scope of ecology, the benefits of ecology, the link of aquatic ecology with other sciences. Especially with aquatic and fisheries science.	Lectures and discussions	1, 2,5, 6, 7, 10, 12	CPH
2	Students are able to explain the concept of ecosystem	**Ecosystem**: Components in ecosystems, aquatic productivity, ecological classification of aquatic organisms, food chains and webs, trophic levels and structures, laws of thermodynamics, ecosystem stability.	Lectures and discussions	1, 2, 10, 11, 12	CPH
3	Students are able to explain about biogeochemical cycles and limiting factors	**Biogeochemical cycle and limiting factors**: Nitrogen, phosphorus, sulfur, carbon, and water cycle. Law of minimum and tolerance, physical and chemical limiting factors, ecological indicators	Lectures and discussions	1, 2, 12	CPH
4	Students are able to explain species, populations, communities	**Species, populations, communities**; Understanding species, niche concepts (spatial, trophic), population characteristics (density, natality, mortality), survival curves, population growth, population movement, types of interspecies interactions, community structure and organisms, species richness, diversity, uniformity, dominance, organism control	Lectures and discussions	1, 2, 8, 9, 12, 13, 14	CPH
5	Students are able to explain about rivers and swamps	**Rivers and swamps:** Characteristics of rivers and swamps, spatial distribution of several physical and	Lectures and discussions	1, 6, 7, 12, 13, 14	CPH

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		chemical factors, community characteristics, river continuum concept, function of rivers and swamps			
6	Students are able to explain about lakes and reservoirs	**Lakes and reservoirs:** Characteristics of lakes and reservoirs, spatial distribution of some physical-chemical factors, characteristics of communities, formation and function of reservoirs,	Lectures and discussions	1, 6, 12, 13	CPH
7	Students are able to explain about estuaries	**Estuary**: Estuary characteristics, spatial distribution of some physical, chemical factors, community characteristics	Lectures and discussions	1, 3, 5, 10, 11, 12	CPH
MIDTERM EXAM					
8	Students are able to explain about the sea, beach, seagrass	**Sea, beach, seagrass:** Marine zoning, open sea, small islands.characteristics of the sea, spatial distribution of some chemical physical factors, seagrass (determining factors, threats), coastal fauna.	Lectures and discussions	1, 2, 3, 5, 10, 11, 12, 17	CPH
9	Students are able to explain about mangroves	**Mangrove:** Characteristics of mangroves, spatial distribution of some physical-chemical factors, characteristics of communities.	Lectures and discussions	1, 2, 3, 4, 10, 11, 12	CPH
10	Students are able to explain about coral reefs	**Coral reefs:** Coral reef formation, physico-chemical factors, community characteristics	Lectures and discussions	1, 2, 3, 4, 10, 11, 12, 18	CPH

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	Students are able to explain the development and evolution of ecosystems	**Development and evolution of ecosystems** Ecological succession (common types and characters), factors affecting it, adaptation strategies, habitat change and fragmentation due to humans	Lectures and discussions	1, 2, 8, 12	CPH
12	Students are able to explain about pollution	**Pollution:** Limitations, types, and sources of pollution, bio-accumulation and biomagnification, bio-indicators of pollution	Lectures and discussions	1, 2, 10, 12	CPH
13	Students are able to explain about climate change and its impact on fisheries	**Climate Change:** Greenhouse gases, global warming, and climate change, the impact of climate change on aquatic ecosystems.	Lectures and discussions	2, 10, 12	CPH
14	Students are able to explain about biodiversity and conservation	**Biodiversity and conservation** Understanding and level of biodiversity (genetics, species, and communities/ ecosystems), Value of biodiversity (usefulness, choice, existence). Threats to biodiversity. Conservation efforts (protection, preservation, utilization). Environmental ethics	Lectures and discussions	2, 3, 5, 11, 12, 15, 16, 17, 18, 19	CPH
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students understand all rules and materials of practical work; and students understand practicum procedures both in the lab and in the field	**Introduction**: Explanation of practicum rules, ethics and work procedures in the laboratory and in the field; Explanation of practicum materials, preparation of practicum tools and materials, rights and obligations of practitioners and assistants.	Lectures, discussions, demonstrations of techniques and work procedures	1, 4, 9, 12, 13, 14	CPH
2	Students recognize and understand the characteristics of the constituent components of flowing aquatic ecosystems and sampling techniques for physical, chemical and biological parameters of flowing aquatic ecosystems; and able to explain the interactions that occur between the constituent components of the ecosystem (abiotic and biotic)	**Flowing Aquatic Ecosystems**: Introduction to Flowing Aquatic Ecosystem Practicum and Sampling in Flowing Aquatic Ecosystems (Rivers)	Lectures, discussions and field practice on the River	4, 6, 7, 9, 12, 13, 14	CPH
3	Students are able to identify samples of aquatic biota (plankton, benthos, nekton, aquatic plants) from the sampling results in flowing aquatic ecosystems and are able to make brief scientific reports on the characteristics of the constituent components of river aquatic ecosystems	Laboratory analysis, data analysis and making practicum reports on flowing aquatic ecosystems (rivers)	Practicum and Discussion	4, 6, 7, 9, 12, 13, 14	CPH
4	Students know and understand the characteristics of the constituent components of stagnant aquatic ecosystems and sampling techniques for physical, chemical and biological parameters of stagnant aquatic ecosystems; and able to explain the	**Lentic Aquatic Ecosystems**: Introduction to Flooded Aquatic Ecosystem Practicum and Sampling in Stagnant Aquatic Ecosystems (Lake)	Lectures and Practicum/ Sampling	4, 6, 9,12, 13, 14	CPH

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
	interactions that occur between the constituent components of the lake ecosystem (abiotic and biotic)				
5	Students are able to identify samples of aquatic biota (plankton, benthos, nekton, aquatic plants) from the sampling results in stagnant aquatic ecosystems; and able to make brief scientific reports on the characteristics of the constituent components of the lake aquatic ecosystem	Laboratory analysis, data analysis and making practicum reports on stagnant aquatic ecosystems (Lake)	Practicum and Discussion	4, 6, 9,12, 13, 14	CPH
6	Students understand the characteristics of the constituent components of swamp and reservoir aquatic ecosystems; know sampling techniques of physical, chemical and biological parameters of flooded swamp and reservoir ecosystems; and able to explain the interactions that occur between the constituent components of the ecosystem (abiotic and biotic) flood swamps / lakes	**Flooded Swamp or Reservoir Water Ecosystems**: Introduction to Floodplain Aquatic Ecosystem Practicum and Creative content creation Flooded swamp and reservoir ecosystems	Lectures, discussions and practicum on infographic making	4, 6, 7	CPH
7	Students understand the characteristics of the constituent components of mangrove aquatic ecosystems and sampling techniques for physical, chemical and biological parameters of mangrove aquatic ecosystems; and able to explain the interactions that occur between the constituent components of the mangrove ecosystem (abiotic and biotic)	**Mangrove Aquatic Ecosystems**: Introduction to Mangrove Aquatic Ecosystem Practicum and Sampling in Mangrove Aquatic Ecosystems	Lectures and Practicum/ Sampling	2, 3, 4, 5, 9, 10, 11, 12, 13,14	CPH
MIDTERM EXAM					

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Students are able to identify samples of aquatic biota (plankton, benthos, nekton, mangrove vegetation) from the sampling results in mangrove aquatic ecosystems; and able to make brief scientific reports on the characteristics of the constituent components of mangrove aquatic ecosystems	Laboratory analysis, data analysis and making practicum reports on Mangrove Aquatic Ecosystems	Practicum and Discussion	2, 3, 4, 5, 9, 10, 11, 12, 13,14	CPH
9	Students know and understand the characteristics of the constituent components of intertidal aquatic ecosystems (tides) and are able to explain the interactions that occur between the constituent components of ecosystems (abiotic and biotic) of intertidal aquatic ecosystems	**Coastal Aquatic Ecosystems**: Introduction to Intertidal Aquatic Ecosystem Practicum (tidal areas), sandy beaches and rocky beaches; Creative content creation Intertidal Aquatic Ecosystem	Lectures, discussions and practicums on creative video making	2, 3, 4, 5, 10, 11, 12, 14	CPH
10	Students know and understand the characteristics of the constituent components of seagrass aquatic ecosystems and are able to explain the interactions that occur between the constituent components of ecosystems (abiotic and biotic) of seagrass aquatic ecosystems.	**Seagrass Aquatic Ecosystems:** Introduction to Seagrass Aquatic Ecosystem Practicum and Creative content creation of Seagrass Aquatic Ecosystem.	Lectures, discussions and practicums on making creative short videos	3, 5, 12, 14, 15, 17	CPH
11	Students know and understand the characteristics of the constituent components of coral reef aquatic ecosystems and are able to explain the interactions that occur between the constituent components of ecosystems (abiotic and biotic) of coral reef aquatic ecosystems	**Coral Reef Aquatic Ecosystems:** Introduction to Coral Reef Aquatic Ecosystem Practicum and Creative content creation of coral reef Aquatic Ecosystem	Lectures, discussions and practicums on creative infographic creation	3, 5, 11, 12, 14, 18	CPH
12	Students know and understand aquatic pollution, pollutants, and various types of pollutants commonly found in waters such as organic materials, heavy metals, macro and microplastics.	**Aquatic Pollution**: Introduction to Practicum Aquatic pollution in the form of pollution of organic matter, heavy metals,	Lectures, discussions and practicums on creative	1, 3, 5, 10, 11, 12	CPH

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		microplastics; and creative content creation of aquatic pollution	infographic creation		
13	Students understand the process of global climate change and its impact on aquatic ecosystems	**Global climate change**: Introduction to Practicum and creative content creation on the impact of global climate change on the constituent components of aquatic ecosystems	Lectures, discussions and practicums on making creative short videos	3, 5, 7, 10, 11, 12, 15	CPH
14	Students know and get to know aquatic biodiversity in tropical waters, especially Indonesia and understand aquatic ecology as a foundation for conservation of aquatic resources.	**Biodiversity and Conservation**: Introduction to Practicum and creative content creation Aquatic biodiversity and Conservation	Lectures, discussions and practicums on making creative short videos	12, 15, 16, 17, 18, 19	CPH
FINAL EXAM					

Bogor, 7 December 2022
Course Coordinator of MSP1221 Aquatic Ecology

Charles P. H. Simanjuntak, Ph.D

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Invertebrates	MSP1222	In Depth Prodi Courses (IPC)	3(2-1)	3	07 December 2022

	Course Coordinator	Lecturer Team
Lecturer	Prof. Dr. Ir. Djamar Tumpal F. Lumban Batu, M.Agr (DLB)	1. Prof. Dr. Ir. Sulistiono, M.Sc. (SLS) 2. Ir. Agustinus M. Samosir, M.Phill. (AMS) 3. Dudi Muhammad Wildan, S.Pi., M.Si. (DMW) 4. Dwi Yuni Wulandari, S.Pi, M.Si (DYW)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO-2	Identify aquatic resources (individuals, populations, and communities), ecosystems, environments, and water areas **Sub-LO 2.1** Identify the characteristics of aquatic biota by complying with applicable scientific rules
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: 1. Softskill 1. Students are able to understand and explain about general classification, biology (which includes descriptions of morphology, anatomy, digestive system, reproduction, life cycle, integration, blood circulation, respiration, etc.), the relationship between existence and habitat, and the economic meaning of several types of aquatic invertebrate animals. 2. Hardskill a. Students are able to identify aquatic invertebrate animals

<table>
<tr><td>Course Description</td><td colspan="5">This course discusses evolution, classification, biology, structure and role of aquatic invertebrate animals in fisheries resources. The function of organs in the reproduction and growth of aquatic invertebrates.</td></tr>
<tr><td>References</td><td colspan="5">1. Barnes RD. 1974. Invertebrate Zoology. 3rd ed. W. B. Saunders Company. Philadelphia.
2. Barnes SKP Callow and PJW Olive. 1998 & 1993. The Invertebrate a New Synthesis. Blackwell Scientific Publications. London
3. Hyman LH. 1940, 1951 & 1952. The Invertebrates: Protozoa Through Ctenopora. Vol. I,II & III. McGraw-Hill Book Company. New York.
4. Kaestner A. 1967, 1968 & 1970. The Invertebrates. Vol. 1-6. McGraw-Hill Book Company. New York.
5. Pennak RW. 1964, 1978 & 1989. Collegiate Dictionary of Zoology. The Royal Press Company. New York.</td></tr>
<tr><td rowspan="9">Learning Evaluation (Assessment Rubric)</td><td colspan="3">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Component</td><td>Weight (%)</td><td>Description</td><td>Grade</td><td>Score</td></tr>
<tr><td>Participatory Activities (Class attendance and activiteness)</td><td>5</td><td>Students actively ask and answer during lecture discussion sessions</td><td>A</td><td>Score ≥ 80</td></tr>
<tr><td>Project Results (Practicum Exam)</td><td>20</td><td>Practicum proficiency test</td><td>AB</td><td>75 ≤ Score < 80</td></tr>
<tr><td>Assignment</td><td>10</td><td>Tasks are structured according to course topics</td><td>B</td><td>70 ≤ Score < 75</td></tr>
<tr><td>Quiz</td><td>5</td><td>Questions during practicum</td><td>BC</td><td>65 ≤ Score < 70</td></tr>
<tr><td>Midterm Exam</td><td>15</td><td>Test learning outcomes week 1-7</td><td>C</td><td>60 ≤ Score < 65</td></tr>
<tr><td rowspan="2">Final Exam</td><td rowspan="2">20</td><td rowspan="2">Test learning outcomes week 8-14</td><td>D</td><td>55 ≤ Score < 60</td></tr>
<tr><td>E</td><td>Score < 55</td></tr>
</table>

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students can explain in general about invertebrates as one of the fishery commodities and the relationship between aquatic invertebrates and their environment	Introduction	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	DLB
2	Students can explain about body shape, anatomy, reproduction and life cycle of Protozoa.	Phylum Protozoa	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	DLB
3	Students can explain about body shape, anatomy, reproduction and life cycle of Protozoa.	1. Phylum Porifera 2. Phylum Coelenterata (Class Hydrozoa)	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	DLB
4	Students can explain the morphology, anatomy, habitat and reproduction of cnidarians in general and Hydrozoa	1. Phylum Coelenterata (class Scyphozoa, class Anthozoa) 2. Phylum Ctenophora	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	SLS
5	Students can explain the morphology, anatomy, habitat and reproduction of Scyphozoa, Anthozoa and Ctenophora	Phylum Platyhelminthes	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	SLS
6	Students can explain the morphology, anatomy, habitat and reproduction of Platyheliminthes	Phylum Rotifera	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	SLS
7	Students can explain the morphology, anatomy, habitat and reproduction of rotifers	Phylum Nematoda Lolophore animals: 1. Phylum Kinorhyncha 1. Phylum Entropocta 2. Phylum Bryozoa 3. Phylum Euchiura 4. Phylum Sipuncula	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	AMS
MIDTERM EXAM					

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Students can explain the morphology, anatomy, habitat and reproduction of annelids	Phylum Annelida	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	AMS
9	Students can explain the morphology, anatomy, habitat and reproduction of Molluscs (Chaetodermomorpha, Neomeniomoirpha, Monoplocophora, Polyplachophora and Gastropoda)	Phylum Mollusc: • Kelas Chaetodermomorpha, Neomeniomorpha, Monoplocophora, Polyplachophora dan Gastropoda	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	AMS
10	Students can explain the morphology, anatomy, habitat and reproduction of mollusks (Class Pelecypoda, Class Schapoda, Class Cephalopoda)	Body shape, reproductive anatomy and life cycle of Mollusks (Class Pelecypoda, Class Schapoda, Class Cephalopoda)	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	DMW
11	Students can explain the morphology, anatomy, habitat and reproduction of common crustaceans and Entomostraca	Body shape, reproductive anatomy and life cycle of common crustaceans and entomostraca	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	DMW
12	Students can explain the morphology, anatomy, habitat and reproduction of crustaceans (Class Malacostraca)	Body shape, reproductive anatomy and life cycle of crustaceans (class malacostraca)	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	DMW
13	Students can explain the morphology, anatomy, habitat and reproduction of Anthropopods (Chelicerata and Uniramia)	Body shape, reproductive anatomy and life cycle Anthropopods (Chelicerata and uniramia)	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	DYW
14	Students can explain the morphology, anatomy, habitat and reproduction of echinoderms and chordates	Body shape, reproductive anatomy and life cycle of Echinoderms and Chordata	Presentation of material, interactive discussion, structured tasks	1,2,3,4,5	DYW
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain matters related to practical work in the laboratory (tools and materials) and commonly used methods.	Introduction	Presentation, discussion	1,2,3,4,5	DLB
2	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of the Protozoan Phylum	Phylum Protozoa	Observation, image creation, discussion	1,2,3,4,5	DLB
3	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of Phylum Porifera	Phylum Porifera	Observation, image creation, discussion	1,2,3,4,5	DLB
4	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of Phylum Coelentrata	Phylum Coelentrata	Observation, image creation, discussion	1,2,3,4,5	SLS
5	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of Phylum Platyhelminthes	Phylum Platyhelminthes	Observation, image creation, discussion	1,2,3,4,5	SLS
6	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of the Phylum Rotifera	Phylum Rotifera	Observation, image creation, discussion	1,2,3,4,5	SLS
7	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of the Bryozoan Phylum	Phylum Bryozoa	Observation, image creation, discussion	1,2,3,4,5	AMS
MIDTERM EXAM					
8	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of the Phylum Nematode	Phylum Nematoda	Observation, image creation, discussion	1,2,3,4,5	AMS
9	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of Phylum Annelida	Phylum Annelida	Observation, image creation, discussion	1,2,3,4,5	AMS
10	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of Phylum Mollusc 1 (Gastropoda)	Phylum Molusc 1 (Gastropoda)	Observation, image creation, discussion	1,2,3,4,5	DMW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	Students are able to explain the definition, organ structure, and ecological value as well as the economic value of Phylum Mollusc 2 (Pelecypods, cephalopods)	Phylum Molusc 2 (Pelecypoda, Cephalopoda)	Observation, image creation, discussion	1,2,3,4,5	DMW
12	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of the Phylum Crustacea (Entomostraca)	Phylum Crustacea (Entomostraca)	Observation, image creation, discussion	1,2,3,4,5	DMW
13	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of the Phylum Crustacea (Malacostraca)	Phylum Crustacea (Malacostraca)	Observation, image creation, discussion	1,2,3,4,5	DYW
14	Students are able to explain the definition, structure of organs, and ecological values as well as the economic value of the Phylum Echinoderms	Phylum Echinodermata	Observation, image creation, discussion	1,2,3,4,5	DYW
FINAL EXAM					

Bogor, 7 December 2022
Course Coordinator of MSP1222 Aquatic Invertebrates

Prof. Dr. Ir. Djamar Tumpal F. Lumban Batu, M.Agr

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Ichthyologist	MSP1223	*In Depth Prodi Courses* (IPC)	3(2-1)	Odd	December 12, 2022

	Course Coordinator	Teaching Team
Lecturer	Sulistiono (SLS)	1. Ridwan Afandi (RAF) 2. MM Kamal (MMK) 3. Charles P Simanjuntak (CPH) 4. Dudi M Wildan (DMW) 5. Ayu Ervinia (AER)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO-2 Sub-LO 2.1	Identify resources (individuals, populations, and communities), ecosystems, environment, and water areas Identify the characteristics of aquatic biota by complying with applicable scientific principles
	Course Learning Outcomes (CPMK)	

	CPMK	After attending this course student are able to: 1. Soft skill: Mastering basic knowledge and theory about fish species, various forms of fish morphology, internal organs, and their functions, nomenclature and classification systems, distribution and migration, introduction to various types of caught fish, cultivation, endemic, resources and their application in fisheries 2. Hard skills Able to identify the types of fish, through observation of fish morphology and internal organs Able to perform dissection of fish biota and describe the type and position of fish organs
Course Description	This course discusses the definition of ichthyology, external morphology, 10 organ systems, nomenclature, classification, distribution, migration, species recognition, fish resource profiles, and applications in fisheries.	
References	1. Bond CE. 1979. Biology of Fishes. W. B. Saunders Company: Philadephia 2. Helfman GS, Collette BB, Facey DE, Bowen BW. 2009. The Diversity of Fishes: Biology, Evolution, and Ecology. Willey Blackwell, Chichester. 720 p. 3. Lagler KF, Bardach JE, Miller RR, Passino DRM. 1977. Ichthyology. John Wiley and Sons, New York. 506 p. 4. Nelson JS, Grand TC, Wilson MVH. 2016. Fishes of the World. 5th ed. John Wiley & Sons, Inc. Hoboken, New Jersey. 707 p.	

Evaluation Learning (heading)

Learning Outcomes Assessment			Final Assessment	
Component	Percentage (%)	Description	Grade	Score
Participatory Activities (Attendance and activeness in class)	5	Students actively ask and answer during lecture discussion sessions	A	Value ≥ 80
Project Results (Test Practicum and Practicum Report)	25	Practical ability test	AB	75 ≤ Score < 80
Task	5	Structured tasks according to the topic of MK	B	70 ≤ Score < 75

	Quiz	5	Question at the moment practice	BC	65 ≤ Score < 70
	Midterm exam	30	Learning achievement test 7 times the initial meeting	C	60 ≤ Value < 65
	Final exams	30	Learning achievement test 7 times the final meeting by considering the overall material	D	55 ≤ Value < 60
				AND	< 55

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students can explain in general about the history of ichthyology both globally and nationally, the definition of fish and their aquatic habitat types, as well as the position and benefits of ichthyology courses for each department in FPIK	Introduction	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
2	Students can explain meristically and morphotherically about the body shape of fish, and the skin as a body dressing with its derivatives	Fish Morphology	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW,

					AER
3-5	Students are able to describe correctly through the introduction of 10 organ systems and functions (skeleton, tendons, respiration and circulation, excretion and osmoregulation, digestion of food, reproduction, nerves and hormones)	-Integuments, skeleton and muscles -Respiration, Circulation, Digestion of Food, -Excretion, Osmoregulation -Reproduction and integration	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
6	Students are able to describe the classification system and nomenclature of fish through the application of morphological analysis (meristic morphometrics) and other methods, ways and mechanisms of identification, and naming fish	System of classification, nomenclature and identification of fish	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
7	Students are able to describe the theory of fish distribution, and analyze the current distribution and its relation to adaptation patterns and fish behavior	Fish distribution	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
MIDDLE SEMESTER EXAMINATION					

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Students are able to describe the theory of fish migration, and analyze the factors that influence migration, and observation techniques	Fish migration	• Presentation of material• Discussion • Interakti • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
9-10	Students are able to recognize and describe morphological characteristics, species identification, and biological information of economically important fish caught in Indonesia	Catch fish	• Presentation of material• Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
11	Students are able to recognize and describe morphological characteristics, species identification, and biological information on economically important fish for cultivation in Indonesia	Farmed fish	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4,	SLS, RAF, MMK, CPH, DMW, AER

12	Students can describe the types of endemic fish, their benefits, and the management efforts undertaken	Endemic and endangered fish	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
13	After completing this subject, students will be able to understand and explain the profile of fish resources in Indonesia	Fish resource profile	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
14	After completing this subject students can explain the application of ichthyology in the field of fisheries (and marine)	Internal ichthyology applications fisheries and marine	• Presentation of material • Discussion • Interactive • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
END OF SEMESTER EXAM (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer

(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand in general about ichthyology as a basis for knowledge in the field of fish life biology.	Introduction	Face to face • Presentation of material	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
2		Introduction to the Order fish*Cypriniformes & Siluriformes*	• Presentation of material• Discussion • Fish identification*Cyprinif ormes* & *Siluriformes* • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
3	Students are able to explain and understand the types, characteristics, shapes and anatomical characteristics of the Fish Order Perciformes & Cluepeiformes	Introduction of Seawater Fish:*Perciformes & Clupeiformes*	• Presentation of material • Introduction of fish species with orders *Perciformes* & *Siluriformes* • Structured Tasks	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
4	Students are able to explain and understand the types of fish, characteristics, and living habitat of Elasmobranchi fish	4. Introduction of Types of Fish *Elasmobranchii*	• Presentation of material • Identification of types of fish*elasmobranchi* • Structured Tasks	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER

5	Students are able to explain and Recognize parts of the nervous, skeletal, digestive, respiratory and circulatory systems.	Introduction to Morphology and Internal Organs of Herbivorous Fish	• Presentation of material • Introduction to herbivorous fish species • Structured Tasks	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
6	Students are able to recognize the characteristics and differences of carnivorous fish.	Introduction to Morphology and Internal Organs of Carnivorous Fish	• Presentation of material • Introduction to carnivorous fish species • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
7	Students are able to understand the morphometric & meristic anatomical structure of fish.	Meristics & Morphometrics	• Presentation of material • Identification of types of fish • Structured assignments	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
MIDDLE SEMESTER EXAMINATION (UTS)					
8	Students are able to understand and explain matters relating to the identification of seawater fish	Identify seawater fish	• Presentation of material • Introduction of types of seawater fish • Structured Tasks	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
9	Students are able to understand and explain matters relating to the identification of freshwater fish	Freshwater fish identification	• Presentation of material • Introduction to types of freshwater fish • Structured Tasks	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER

10	Students are able to apply laboratory knowledge in the field with Fieldtrip activities	Field trip	• Field Practice To the nearest TPI	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
11	Students are able to explain the definition of sampling techniques and the correct sampling procedure.	Fish sampling technique	• Presentation of material • Introduction to sampling techniques • Structured Tasks	1,2,3,4	ON THE, RAF, MMK, CPH, DMW, AER
12	Students are able to perform reservation techniques on fieldtrip fish.	Fish Reservation Techniques	• Presentation of material• • Introduction of fish reservation techniques • Structured Tasks	1,2,3,4	SLS, RAF, MMK, CPH, DMW, AER
13	Students are able to understand and explain the technique of fish collection.	Fish collection techniques	• Presentation of material• • Introduction to fish sampling techniques • Structured Tasks		SLS, RAF, MMK, CPH, DMW, AER
14	Students are able to convey and explain the results of field practice.	Fieldtrip Results Presentation.	• Submission of results of field practice • Discussion • Structured Tasks		SLS, RAF, MMK, CPH, DMW, AER

END OF SEMESTER EXAM (UAS)

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY FACULTY OF FISHERIES AND MARINE SCIENCES AQUATIC RESOUCES MANAGEMENT BACHELOR DEGREE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	VACATION IS	DATE
Aquatic Conservation Biology	MSP1224	*In Depth Prodi Courses* (IPC)	2(1-3)	Even	14 January 2023

Lecturer	Course Coordinator	Lecturer Team
	Dr. rar. nat. Ir. Mohammad Mukhlis Kamal, M.Sc. (MMK)	1.Dr. Ayu Ervinia, S.Pi., M.Sc. (AYE) 2.Dr. Charles PH Simanjuntak, S.Pi., M.Si. (CPH) 3. Dudi Muhammad Wildan, SPi., M.Sc. (DMW)

LEARNING	STUDY PROGRAM LEARNING OUTCOME

OUTCOME (LO)	LO-5 Sub IT 2	Apply the science of resource management, ecosystems, environment, and aquatic areas based on the principles of carrying capacity, conservation, and sustainability **LO-5 Sub-LO 2** Decide on management models of resources, ecosystems, environment, and marine areas based on the principles of carrying capacity, conservation, and sustainability
	COURSE LEARNING OUTCOME	
	IT	After attending this lecture, students are able to: 1. Soft skills: 1) Students can explain the scope in aquatic conservation biology, various problems that occur at the level of species (Pisces, mammals, and aquatic herpetofauna) and aquatic ecosystems (overfishing, pollution,

		habitat degradation, invasive species, and flow modification), related to human activities and climate change, as well as various alternative solutions to these problems. 2. Hard Skills: 1) Students can identify problems that occur in aquatic species and ecosystems 2) Students are able to apply biomolecular, spatial, and drone approaches in working on conservation biology analysis 3) Students are able to recommend efforts to save species and the aquatic environment to maintain its sustainability.
Course Description	This course discusses the ecological basics of environmental problems both naturally and due to the impact of human activities faced by aquatic species and ecosystems and various practices that are currently developed as ecological solutions to these problems.	

<table>
<tr><td>References</td><td colspan="5">

1. Hendrik S & K Martens. 2005. Aquatic Biodiversity: v. 2: The Diversity of Aquatic Ecosystems (Developments in Hydrobiology). Springer Publi.
2. Irawan M, RB Primack & J Supriatna. 2012. Conservation Biology (Revised Edition). Indonesian Torch Library Foundation. Jakarta
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4. Teixeira et al. 2019. Linking biodiversity to ecosystem services. Science of the Total Environment, Vol. 20 March Pages 517-534
5. Wahyudewantoro G, Haryono, IV Utama, Rusdianto, S OKtaviyani, SR Suharti, SH Nasution, Dharmadi, MM Kamal & Sulistiono. 2020. Aquatic biota threatened with extinction in Indonesia: Priorities for the protection of fish taxa. ITB Press. Bandung. 440 p.
6. Retnoningsih, Totong, Haryono & MM Kamal. 2021. Atlas of invasive foreign fish in Indonesia. IPB Press. 221 p.
7. Frankham R, JD Ballopu & DA Briscoe. 2002. Introduction to Conservation Genetics. Cambridge UniversityPress. 615 p.m.
8. Dudgeon D et al. 2014. Freshwater Biodiversity: Importance, Threats, Status, and conservation challenges. Biol. Rev. (2006), 81, pp. 163–182.
9. Kumar, U, MJ Asija. 2009. Biodiversity: Principle and Conservation. Agrobios (India)
10. Ormond, Rupert F. G., John D. Gage, and Martin V. A. (Editors), 1997. Marine Biodiversity: Patterns and Processes, Cambridge University Press, New York
11. Padhi BK & RK Mandal. 2000. Applied Fish Genetics. Fishing Chimes Publi.

</td></tr>
<tr><td rowspan="4">Learning Evaluation (Assessment Rubric)</td><td colspan="3">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Component</td><td>Percentage (%)</td><td>Description</td><td>Grade</td><td>Score</td></tr>
<tr><td>Participatory Activities (Class attendance and activity)</td><td>5</td><td>Students actively ask and answer during lecture discussion sessions</td><td rowspan="2">A
AB
B
BC
C
D
E</td><td rowspan="2">Score ≥ 80
75 ≤ Score < 80
70 ≤ Score < 75
65 ≤ Score < 70
60 ≤ Score < 65
55 ≤ Score < 60
Score < 55</td></tr>
<tr><td>Project Outcomes</td><td>25</td><td>Results of a comprehensive study of cases of aquatic conservation biology problems</td></tr>
</table>

	Assignment	5	Small study of each course topic		
	Quiz	5	Small questions from the lecture material at the meeting		
	Midterm Exam	30	Test learning outcomes 7 times initial meeting		
	Final Semester Exam	30	Test learning outcomes 7 times the final meeting by considering the overall material		

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	After completing this subject students will be able to explain the scope of the course, describe the definition and level of biodiversity, biodiversity and environmental services, biodiversity and conservation	Get to know biodiversity, environmental services, and aquatic conservation	Presentation of material and interactive discussions	1,2,3,4 (plus publication latest relevant)	MMK
2	After completing this subject students will be able to explain the five threats to aquatic species and environment: overfishing, water pollution, habitat degradation, stream modification, and invasive species	Threats to aquatic biodiversity	Presentation of material, interactive discussions, assignments structured, and quizzes	1,2,3,4 ,7 (plus publication latest Which relevant)	MMK
3	After completing this subject, students will be able to explain the association between the climate change phenomenon and the five aspects presented in week 3	The impact of climate change within the scope of conservation biology	Presentation of material, interactive discussions, assignments structured, and quizzes	1,2,3,4 (plus publication latest Which relevant)	MMK

4	After completing this subject, students will be able to explain the conservation status of aquatic flora and fauna and their assessment methods	Status determination method conservation of aquatic flora and fauna, implications for management	Presentation of material, interactive discussions, assignments structured, and quizzes	1,2,3,4, 7, 8, 9, 10 (plus publication latest relevant)	MMK
5-7	After completing this subject students will be able to explain and apply molecular biology, bioinformatics techniques and mapping in aquatic conservation biology	1. Application of molecular biology in aquatic conservation biology 2. Application of geospatial technology for area mapping (example: ArcGIS, remote sensing, MARXAN, and Drone). 3. Characteristics of deep sea waters and robotic applications for underwater observation and exploration (ROVs)	Presentation of material, interactive discussions, assignments structured, and quizzes	7, 12, 13, 14,15 (plus publication latest relevant)	CHANCE
MIDDLE SEMESTER EXAMINATION (UTS)					
9-10	After completing this subject, students will be able to explain the biology, ecology, uses, threats, and conservation efforts of fish	Capita Selecta 1: Biology, Utilization, and fish conservation	Presentation of material, interactive discussions, quizzes, and structured assignments	1,2,11,12 (plus publications latest relevant)	CPH

11-13	After completing this subject, students will be able to explain the biology, ecology, use, threats and conservation efforts of mammals and animals aquatic herpetofauna	Capita Selecta 2: Biology, Utilization, and non-fish conservation (mammals and aquatic herpetofauna)	Presentation of material, discussion, interactive, assignments structured, and quizzes	1,2,3,4,19,2 0 (plus publications latest Which relevant)	MMK
14	After completing this subject, students will be able to explain regulations and policies that are relevant to aquatic conservation biology	Regulations and policies in aquatic conservation biology	Presentation of material, discussion, interactive, assignments structured, and quizzes	1,2,3,4,21 (plus regulation Which relevant Which relevant)	MMK
END OF SEMESTER EXAM (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	After completing this subject, students will be able to describe the scope and relevance of each practicum material to lecture activities	Preliminary practicum	Introduction, introduction, division of groups, contract agreements and practicum rules	Suitable for materials activity library college, and case study examples	DMW, MMK
2	After completing this subject, students will be able to map biodiversity and conservation for aquatic species and environments	Threats to species and the aquatic environment and their impact on sustainability, as well as alternative solutions to reduce threat	**Problem-based learning**: Introduction to "Biodiversity and conservation concept map", topic selection for groups biodiversity and conservation groups, presentations and discussions, and formulating	Suitable for materials activity library college, and case study examples	DMW, MMK

3	After completing this subject students will be able to explain five threats to species and the aquatic environment	• How to install R program • Open command, read data, print data • Mathematical operations	**Problem-based learning:** Introduction about 5 causal aspects reduction of aquatic biodiversity, group discussions by dividing the 5 topics, presentations and discussions, formulating	Suitable for materials activity library college, and case study examples	DMW, MMK
4	After completing this subject students will be able to explain the phenomenon of climate change and its impact on species and the environment; relevance to the previous week's practical material	scientific Background, mechanisms, and impacts of climate change on species and the environment waters	**Problem-based learning**: Introduction about climate change phenomena, impacts on species and the environment, group discussions with the division of 3 aspects (temperature, hydrological cycle, acidity increase), presentation and discussion, formulating	Suitable for materials activity library college, and case study examples	DMW, MMK

5-7	After completing this subject, students will be able to apply simple genetic, mapping, and modeling approaches in aquatic conservation biology work.	Bioinformatics and spatial technology applications for mapping in aquatic conservation biology (Utilizing genetic data, operating*Drone*, applying ArcGIS and Marxan software, as well as simple modeling in aquatic conservation biology)	Introduction, practice operate spatial technology, searching for data and information, discussion and presentation, formulate	Suitable for materials activity library college, and case study examples	DMW, CPH
MIDDLE SEMESTER EXAMINATION (UTS)					
8-10	After completing this subject students will be able to explain briefly and clearly about the biology, use, threats, and fish conservation programs	Capita Selecta 1: Biology water conservation (Fish)	Introduction, work groups, discussions and presentations, formulate	Suitable for materials activity library college, and case study	DMW, CPH
11-13	After completing this subject students will be able to explain briefly and clearly about the biology, uses, threats, and conservation programs of aquatic mammals and herpetofauna	Capita Selecta 2: Biology water conservation (Mammals and aquatic Herpetofauna)	Introduction, work groups, discussions and presentations, formulate	Suitable for materials activity library college, and case study examples	DMW, MMK

14	After completing this subject, students will be able to explain conservation biology regulations and policies	Regulations and policies in marine conservation biology in Indonesia	**Problem-based learning**: Introduction, discussion and presentation and formulate	Suitable for materials activity library college, and case study examples	DMW, MMK
END OF SEMESTER EXAM (UAS)					

Bogor, 8 December 2022

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**BOGOR AGRICULTURAL UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **DEPARTMENT OF RESOURCE MANAGEMENT (MSP)** **BACHELOR PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
Data Analysis of Fishery Resources and Aquatic Environment	MSP1231	In-dept Prodi Course (IPC)	3	3	07-12- 2022

	Coordinator of Course	Member of Teaching Team
Teaching Team	Prof. Dr. Ir. Mennofatria Boer (MBR)	1. Dr. Ir. Rahmat Kurnia, M.Si. (RKN) 2. Dr. Ir. Nurlisa A. Butet, M.Sc. (NAB)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO 8	Able to apply the principles of data analysis of fishery resources and aquatic environment, both descriptively and inductively and temporally and spatially as well as for 1 population or many populations.
	LO of Course	
	LO of Course	After attending this course students are able to: **1. Soft skills**: Have system thinking and mastery of technology in analyzing data on fisheries resources and aquatic environment. **2. Hard skills**: Apply relevant data analysis in fishery resources and aquatic environment using Excel and R Program software.
Description of Course	Discusses the principles of data analysis of fishery resources and aquatic environment, parameter estimation, the relationship between two variables of fishery resources/aquatic environment through correlation analysis, simple regression, logistic regression, introduction of multiple regression, variance (ANOVA), variance analysis (Anacova), analysis related to time (repeated measurement), nonparametric analysis in fishery resources and aquatic environment (Chi-square test, Fisher's test, Kolmogorov Smirnov test for one sample and two samples, Mann-Whitney test for two independent samples).	
Reference	1. Johnson, R. A. dan G. K. Bhattacharyya. 1992. Statistics. Principles and Methods. John Wiley and Sons, New York. 686p. 2. Kvanli, A. H. 1988. Statistics. A Computer Integrated Approach. West Pub. Co., San Fransisco. 935p.	

<table>
<tr><td></td><td colspan="5">3. Nasoetion, A. H. dan Barizi. 1976. Metoda Statistika. Gramedia, Jakarta. 223p.
4. Sokal, R. R. dan F. J. Rohlf. 1995. Biometry. The Principles and Practice of Statistics in Biological Research. W. H. Freeman and Co., New York. 887p.
5. Walpole, R.E. 1974. Introduction to Statistics. Macmilian Publ. Co. Inc., New York</td></tr>
<tr><td rowspan="8">Learning Evaluation (Rubric)</td><td colspan="3">Assessment of Learning Outcomes</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Basis of Evaluation</td><td>Percentage (%)</td><td>Description</td><td>Quality Value</td><td>Range of Value</td></tr>
<tr><td>Participatory Activities (Attendance and activeness in class)</td><td>10</td><td>Attendance in class and activeness in discussions.</td><td rowspan="7">A
AB
B
BC
C
D
E</td><td rowspan="7">Value ≥ 80
75 ≤ Value < 80
70 ≤ Value < 75
65 ≤ Value < 70
60 ≤ Value < 65
55 ≤ Value < 60
< 55</td></tr>
<tr><td>Result of Project</td><td>20</td><td>Reports, papers, journal reviews.</td></tr>
<tr><td>Task</td><td>-</td><td></td></tr>
<tr><td>Quiz</td><td>-</td><td></td></tr>
<tr><td>Midterm exam</td><td>35</td><td>Includes lectures and practicums.</td></tr>
<tr><td>Final exams</td><td>35</td><td>Includes lectures and practicums.</td></tr>
</table>

LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1-2	Students are able to explain the principles of data analysis of fisheries resources and the aquatic environment.	Lecture contract; Introduction; Types of fishery resource data; Types of aquatic environment data; Principles of data analysis (determination of problems and objectives, data	• Lectures • Active Knowledge Sharing	1-3	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		collection, data analysis, data interpretation).			
3-7	An understanding of the analysis of the relationship between two variables of fishery resources/aquatic environment.	1. Correlation analysis • Meaning of correlation • Spearman's correlation and testing • Pearson's correlation 2. Simple linear regression analysis: • Principles and understanding of regression analysis • Regression assumptions and tests • Estimation of regression coefficients (point estimators, coefficient confidence intervals) • Testing the regression equation and interpretation • Testing the regression coefficient (b1) with a certain value • Comparison of regression parallels	• Lectures • Active Knowledge Sharing	2-5	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		• Linear transformation in the regression equation 3. Logistic regression 4. Introduction to multiple regression.			
MIDTERM EXAM (UTS)					
8-10	Understanding of experimental design and analysis of variance (ANOVA).	1. Review the experimental design principles 2. Completely Randomized Design 3. Randomized Block Design 4. Factorial Randomized Design	• Lectures • Active Knowledge Sharing	1	NAB
11	Understanding of the analysis of co-variance (ANACOVA).	Co-variance analysis	• Lectures • Active Knowledge Sharing	1,2	RKN
12	An understanding of the relationship between two time-bound variables.	Repeated measurement analysis and its interpretation.	• Lectures • Active Knowledge Sharing • Case presentations	1,2,4	RKN
13,14	Hypothesis testing related to frequency data (nonparametric) in fishery resources and aquatic environment.	1. Chi-squared test 2. Fisher's exact test 3. Kolmogorov Smirnov test for single samples	• Lectures • Active Knowledge Sharing	1,3	RKN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		4. Kolmogorov Smirnov test for two independent samples 5. The Mann-Whitney U-test for two independent samples 6. The Kruskal-Wallis test for several independent samples			
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1,2	Students are able to explain the principles of data analysis of fisheries resources and the aquatic environment.	Refreshment of microsoft excel and R.	• Lecture • Active Knowledge Sharing • Practice	1-5	MBR
3-7	An understanding of the analysis of the relationship between two variables of fishery resources/aquatic environment.	Use of Microsoft excel and R Language to analyze Correlation analysis, (simple and Introduction to multiple	• Lecture • Active Knowledge Sharing	1-5	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		regression including an understanding of correlation (Spearman da Pearson), and introduction to multiple regression.			
MIDTERM EXAM (UTS)					
8-10	Understanding of experimental design and analysis of variance (ANOVA).	The use of Microsoft excel and R in experimental design (ANOVA).	• Lectures • Active Knowledge Sharing	1	NAB
11	Understanding of the analysis of co-variance (ANACOVA).	The use of Microsoft excel and R in experimental design (ANACOVA).	• Lectures • Active Knowledge Sharing	1,2	RKN
12	An understanding of the relationship between two time-bound variables.	Use of Microsoft excel and R in experimental design (Repeated measurement analysis and interpretation).	• Lectures • Active Knowledge Sharing • Case presentations	1,2,4	RKN
13,14	Hypothesis testing related to frequency data (nonparametric) in fishery resources and aquatic environment.	The use of Microsoft excel and R in hypothesis testing (Chi-squared test, Fisher's exact test, Kolmogorov Smirnov test, Mann-Whitney UJji and Kruskal-Wallis test.	• Lectures • Active Knowledge Sharing	1,3	RKN
FINAL EXAMS (UAS)					

BOGOR AGRICULTURAL UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
DEPARTMENT OF RESOURCE MANAGEMENT (MSP)
BACHELOR PROGRAM

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
FISHERIES BIOLOGY	MSP1232	Foundational Courses (FC)	3	4	07-12- 2022

	Coordinator of Course	Member of Teaching Team
Teaching Team	Dr. Yonvitner, S.Pi., M.Si. (YVR)	1. Dr. Ir. Zairion, M.Sc. (ZAI) 2. Dr. Ali Mashar, S.Pi., M.Si. (AMR)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO1 LO2 LO3	1. Understanding the structure of fish resources includes the fish natural history 2. Identified and solving problem of fish based various natural history indicator for sustainable fish management. 3. Understanding of fisheries biology indicator on reproduction such as, sex ratio, gonado index, gonad maturity, and first at maturity 4. Understanding of fisheries biology indicator on length and weight relationship, growth rate, and length distribution frequency analysis. 5. Understanding of fisheries biology indicator on feed and feeding factor, environmental impact and biological respond on fish and biological indicator for fisheries management
	LO of Course	
	LO of Course	After attending this course students are able to: 1. ***Softskill*:** students are able to master the principles of population genetics and population ecology, including: a. Solving problem management related issues will be required for fish biology assessment b. Think critically about environmental phenomena such as climate change, the environment and stock degradation in relation to fish biology parameter.

<table>
<tr><td></td><td></td><td>c. Be able to make decisions in an effort to find solutions to fish population problems based on fish biology data
2. Hardskill:
a. Understand the various important components of fish biology related to fish populations and fisheries management.
b. Be able to carry out morphological measurements, determine reproduction, determine types of fish food and characteristics of fish behavior levels.
c. Collection of biological data, analysis using an application and compiling a fish biology information profile.
d. Be able to conduct studies by analyzing the relationship between fish biology and environmental parameters.</td></tr>
<tr><td>Description of Course</td><td colspan="2">Discusses the (natural history) of fish life cycle processes, from birth to death which includes: (a) fecundity and reproductive patterns, age at maturity and sex ratio, speed of survival and mortality at life cycle stages; (b) ecological distribution, movement and gait, fish behavior within 24 hours or from season to season; (c) intra and inter-species interactions, how species interactions in their environment will affect other populations/species; (d) population and the factors that control it, speed of growth and time to reach the average size of various kinds of fish; and (e) the effect of fishing on population, reproduction and growth.</td></tr>
<tr><td>Reference</td><td colspan="2">1. Effendie, M. I. 2002. Biologi Perikanan
2. Gulland, J. A. 1983. Fish Stock Assessment. A Manual of Basic Method. FAO, Vol. 1, John Wiley and Sons.
3. Norris, D. O. dan R. E. Jones. 1987. Hormones and reproduction in fishes, amphibians, and reptiles. Plenum Press, N. Y.
4. Ricker, W. E. 1975. Computation and Interpretation of Biological Statistics of Fish Populations. J. Fish. Res. Board Can. Bulletin 191.
5. Sparre, P. dan S. C. Venema. 1998. Introduksi pengkajian stok ikan tropis. Buku 1: Manual. FAO-Puslitbang Perikanan, Balitbang Pertanian Indonesia.
6. Weatherly, A. H. 1972. The Biologi of Fish Growth. Academic Press, London.
7. Woynarovich, E. dan H. Horvath. 1980. The artificial propagation of warm water finfish. A Manual foe extension. Fish. Tech. Pap., No. 201. FAO, Rome.
8. Yonvitner. Biologi Perikanan dan Pengelolaan. IPB Press. 2019</td></tr>
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<tr><th colspan="3">Assessment of Learning Outcomes</th><th colspan="2">Final Assessment</th></tr>
<tr><th>Basis of Evaluation</th><th>Percentage (%)</th><th>Description</th><th>Quality Value</th><th>Range of Value</th></tr>
<tr><td>Participatory Activities (Attendance and activeness in class)</td><td>5</td><td>-</td><td rowspan="3">A
AB
B
BC
C</td><td rowspan="3">Value ≥ 80
75 ≤ Value < 80
70 ≤ Value < 75
65 ≤ Value < 70
60 ≤ Value < 65</td></tr>
<tr><td>Result of Project</td><td>30</td><td></td></tr>
<tr><td>Task</td><td>-</td><td></td></tr>
</table></td></tr>
</table>

	Quiz	5	-	D E	55 ≤ Value < 60 < 55
	Midterm exam	30			
	Final exams	30			

LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Understand of fisheries biology concept (natural history concept), and the process of collecting fish biology data.	• Understand of (natural history), and population concept and parameter • Knowledge of the fish sampling process, direct (live fish) and indirect (catch) data collection processes as well as fish sample preservation techniques for which biological data will be collected. • Approach in collecting fisheries biology data according to standard standards for tropical fish.	Class Course	1,2,3,4, 5,6,7,8	YVR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
2	Understand the concept of sexuality in fish and aspects related to fish sexuality, and be able to distinguish between male and female fish both morphologically and histologically.	• Studying the different types of fish sexuality: synchronous hermaphrodite, protandry, protogyny to differentiated and undifferentiated gonochorism • Primary and secondary sexual characteristics • Provide several examples of fish sexual characteristics according to fish groups and other non-fish aquatic biota	Class Course	1,2,3,4, 5,6,7,8	YVR
3	Understanding the life cycle of fish starting from the formation of eggs and spermatozoa to the formation of new individuals (larvae).	• Understanding of fish eggs and their parts • Various forms of fish eggs • Pelagic egg classification • Grouping eggs based on several kinds of characteristics	Class Course	1,2,3,4, 5,6,7,8	AMR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		• Early formation of egg cells and spermatozoa • Fertilization, genetic factors; incubation period and larval period			
4	Knowing the process of maturity of the gonads of fish so that they can find out the development of fish reproduction and can determine when fish will spawn. EAFM for the fisheries sector in Indonesia.	• Typology of fish gonad maturity; TKG phases and stages; TKG analysis. • Factors affecting TKG of fish • The shape of the gonads according to the maturity phase of the fish and non-fish groups	Class Course	1,2,3,4, 5,6,7,8	AMR
5	Be able to determine the level of fecundity (quality and quantity) as a basis for estimating the stock/population of fish resources in Indonesia, with various important processes.	• Classification of fish based on fecundity; factors that influence the success of fecundity • Stock/population estimation based on fecundity • Relationship between fecundity and fish	Class Course	1,2,3,4, 5,6,7,8	AMR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		length/weight. condition factor			
6	Able to carry out the histological process of fish gonad maturity.	• Fish histological processes (parafine technique, cutting process) and preparation • The method of estimating the level of gonad maturity is based on the appearance of gonad sections. • Explain the characteristic indicators of each maturity phase	Class Course	1,2,3,4, 5,6,7,8	YVR
7	Understanding and able to explain the process of fertilization until the formation of a new individual.	• Genetic factor fertilization; incubation period, larval period • The process of developing larvae or eggs • Formation of organs up to new individuals from each type of fish (fish and non-fish)	Class Course	1,2,3,4, 5,6,7	YVR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
MIDTERM EXAM (UTS)					
8	Understanding and able to explain the spawning process and the factors that influence the success of spawning is aimed at rejuvenation and stock/population determination processes.	• The definition and purpose of the route as well as the concepts of the route and the types of route • factors affecting migration • the effect of displacement on the estimation of stock and share stock • Migration information for fish resource conservation activities	Class Course	1,2,3,4, 5,6,7	ZAI
9	Understanding and able to to explain ruaya principles, concepts and goals of ruaya for fisheries management.	• The definition and purpose of the route as well as the concepts of the route and the types of route • Factors affecting migration • The effect of displacement on the estimation of stock and share stock	Class Course	1,2,3,4, 5,6,7	ZAI

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		• Migration information for fish resource conservation activities			
10	Understanding and able to to explain the habits and ways of eating fish (quantity and quality of food) and their effect on populations.	• The concept of eating habits and how to eat based on the grouping of fish (herbivores, omnivores, carnivores) • The relationship of feeding to fish growth • Overlapping model of fish feeding patterns in waters	Class Course	1,2,3,4, 5,6,7	ZAI
11	Explain the process of using niches and food trophic levels (food chains/food web) on energy availability (both habitat and feed resources).	• Concept of niche utilization pattern; broad concepts of niches and overlap • use and preference of fish for habitat and feed; model of fish interaction in its utilization pattern. (K), fish age (t) and asymptotic length (L∞) • Fish growth patterns as a tool for	Class Course	1,2,3,4, 5,6,7	ZAI

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		managing fishery resources			
12	Describe various aspects of growth and factors that influence growth.	• Growth and factors influencing growth; growth relationship with the environment (habitat-feed) • The philosophy of the method for determining growth patterns and parameters: length-weight relationship (W=aLb), instantaneous growth (Wt=Wo.egt), parameter curvature (K), fish age (t) and asymptotic length (L∞) • Fish growth patterns as a tool for managing fishery resources	Class Course	1,2,3,4, 5,6,7,8	YVR
13	Explaining the condition factors of fish in populations that aim to use/manage fish resources in a sustainable manner.	• Methods of fish conditions in the tropics and subtropics • Fish grouping method in the tropics using	Class Course	1,2,3,4, 5,6,7,8	YVR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		the statistical/length frequency distribution method • Factors influencing the determination of the age/group of fish in the tropics and subtropics			
14	Re-explaining the concepts and processes developed in the study of fish biology from start to finish.	• Re evaluation both of written and oral about fisheries biology concept, parameter, and analysis • Case study based on actual research and fisheries biology data	Class Course	1,2,3,4, 5,6,7,8	YVR
FINAL EXAMS (UAS)					

BOGOR AGRICULTURAL UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
DEPARTMENT OF RESOURCE MANAGEMENT (MSP)
BACHELOR PROGRAM

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
AQUATIC MOLECULAR BIOLOGY	MSP1233	In-Depth Prodi Courses (IPC)	3	4	07-12- 2022

	Coordinator of Course	Member of Teaching Team
Teaching Team	Dr. Ali Mashar, S.Pi., M.Si. (AMR)	1. Dr. Ir. Nurlisa A. Butet, M.Sc. (NAB) 2. Agus Alim Hakim, S.Pi., M.Si. (AAH) 3. Dr. Rita Rachmawati, S.Pi., M.Sc. (RTR)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO3 Sub LO 3.2	Describe the condition and status of aquatic resources, ecosystems, environment, and areas based on their characteristics using qualitative and quantitative approaches. Accurately classify the conditions and status of aquatic resources (individuals, populations, and communities).
	LO of Course	
	LO of Course	After attending this course students are able to: 1. ***Softskill*:** students are able to master the principles of population genetics and population ecology, including: a. explain information about aquatic biology and molecular biology, b. explains the genetic principles regarding the basis of Mendel's Law of inheritance, c. explain the structure of DNA d. understand the genetic principles of gene anatomy and function, as well as dissection through mutation, e. explaining the renewal of genetic methods in the study of aquatic resource management, and f. explain the role of molecular biology in the management of aquatic resources.

		2. ***Hardskill***: carry out procedural genetic analysis techniques, including: a. correct sampling in the field, b. carry out the process of sample preparation, extraction, and DNA isolation correctly, c. practice DNA quality testing, d. carry out the process of DNA amplification, and e. the process of analyzing genetic data into information so that conclusions can be drawn.
Description of Course	The principles of genetics and population ecology which include the basis of Mendel's Law of inheritance; development of Mendel's Laws; DNA structure, replication, and recombination; gene anatomy and function, as well as dissection through mutations; protein coding genes in aquatic biota; renewal of genetic methods in the study of aquatic resource management (such as DNA barcoding, environmental DNA, and DNA metabarcoding) and strategies for managing the diversity of genetic resources.	
Reference	1. Hedrick PW. 1984. Population biology: the Evolution and Ecology of Populations. Jones and Bartlett Publishers. Boston. 2. Campbell NA, JB Reece, LA Urry, ML Cain, SA Wasserman, PV Minorsky, and RB Jackson. 2008. Biologi. Eds. 8, Jilid 2 & 3. Erlangga. Jakarta 3. Karp G. 1984. Cell Biology. McBraw Hill Book Company. 4. Freeland JR. 2005. Molecular Ecology. John & Wiley Sons. 5. Soewardi K. 2007. Pengelolaan Keragaman Genetik Sumberdaya Perikanan dan Kelautan. Bogor: Departemen Manajemen Sumberdaya Perairan. 6. Barnes MA and CR Turner. 2016. The ecology of environmental DNA and implications for conservation genetics. *Coserv. Genet.* 17:1-17 7. Pavan A, WS Lakra, and G Babu. 2015. DNA Metabarcoding: A New Approach for Rapid Biodiversity Assessment. Journal of Cell Science & Molecular Biology. 2(1): 1-9. 8. Bellemain E. 2020. eDNA barcoding and metabarcoding - General introduction -. SpyGen. 9. Herder JE, A Valentini, E Bellemain, T Dejean, JJCW van Delft, PF Thomsen, and P Taberlet, 2014. Environmental DNA - a review of the possible applications for the detection of (invasive) species. Stichting RAVON, Nijmegen. 10. Taberlet P. 2017. Introduction to DNA metabarcoding. Laboratoire d'Ecologie Alpine, CNRS UMR 5553 Université Grenoble Alpes, Grenoble, France. 11. Pradillon F and SAH Ifremer. 2016. Metabarcoding: a tool to accelerate biodiversity assessments? IUEM, France.	

Learning Evaluation (Rubric)	**Assessment of Learning Outcomes**			**Final Assessment**	
	Basis of Evaluation	**Percentage (%)**	**Description**	**Quality Value**	**Range of Value**
	Participatory Activities (Attendance and activeness in class)	10	Attitude assessment, including compliance,	A AB B	Value ≥ 80 75 ≤ Value < 80 70 ≤ Value < 75

			discipline, responsibility and student skills during learning.	BC C D E	65 ≤ Value < 70 60 ≤ Value < 65 55 ≤ Value < 60 < 55
	Result of Project	40	Students in groups get assignments to solve problems with critical analysis and creative solutions in making decisions related to the use of molecular analysis in sustainable fisheries resource management.		
	Task	5	Students (individually/groups) work on structured assignments to increase students' knowledge and understanding of learning material.		
	Quiz	5	Students individually work on questions to evaluate students' knowledge and understanding of the material/study materials.		
	Midterm exam	20	Students individually work on questions to evaluate students' knowledge and understanding of the material/study materials.		
	Final exams	20	Students individually work on questions to evaluate students' knowledge and understanding of the material/study materials.		

LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to know and explain molecular biology and its relation to aquatic resource management.	Introduction of Molecular Biology in Aquatic Resources Management	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5	AMR
2	Students are able to understand and explain: "How does the number of organisms influence the types, and how does the types of organisms (i.e., genotypes) influence the numbers?"	Ecological problems of population	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5	NAB
3	Students are able to understand and explain molecular bio-information in the management of aquatic resources.	Genetics: the study of biological information	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5	NAB
4	Students are able to understand and explain the structure of DNA.	Structure and Types of DNA	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5	NAB
5	Students are able to understand and explain genetic mutations in aquatic resources as an average of genetic variation.	Mutation	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5	NAB
6	Students are able to understand and explain concepts and DNA sequencing.	Concept of DNA 1	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5	RTR
7	Students are able to understand and explain the application of molecular biology in genetic conservation and biodiversity.	Concept of DNA 2		1,2, 3, 4, 5	RTR
MIDTERM EXAM (UTS)					
8, 9	Students are able to understand and explain DNA Barcoding and its applications.	Definition and Principles of DNA barcoding	• Lectures	1,2, 3, 4, 5	AAH

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		Application of DNA barcoding for aquatic and fisheries resources management studies	• Active Knowledge Sharing		
10,11	Students are able to understand and explain environmental DNA and its applications.	Introduction of environmental DNA (eDNA) Application of environmental DNA (eDNA) for aquatic and fisheries resources management studies	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5, 6, 8, 9	AAH
12,13	Students are able to understand and explain DNA metabarcoding and its applications.	Introduction of DNA metabarcoding Application of DNA metabarcoding for aquatic and fisheries resources management studies	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5, 7, 8, 10, 11	AMR
14	Students are able to understand and explain the role of molecular biology in the management of aquatic resources.	The role of molecular biology in aquatic and fisheries resources management	• Lectures • Active Knowledge Sharing	1,2, 3, 4, 5	AMR
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand rules, types of equipment, and safe work procedures in the laboratory and in the field.	Introduction to Laboratory Practicum	• Lecture • Active Knowledge Sharing	1,2, 3, 4, 5	AMR
2	Students are able to understand field conditions and are able to carry out genetic sampling.	Field Practicum	• Activities in the field • Active Knowledge Sharing	1,2, 3, 4, 5	AAH
3	Students are able to carry out DNA sample preparation activities correctly.	Preparation of DNA samples from several types of samples.	• Activities in the laboratory • Active Knowledge Sharing	1,2, 3, 4, 5	AAH
4	Students are able to perform DNA extraction correctly.	Introduction of tools and materials, as well as practice of DNA extraction.		1,2, 3, 4, 5	AAH
5	Students are able to isolate DNA correctly.	Introduction of tools and materials, as well as practice of DNA isolation.		1,2, 3, 4, 5	AAH
6	Students are able to make agarose gel correctly.	Introduction of tools and materials, as well as practice of making agarose gel.	• Activities in the laboratory • Active Knowledge Sharing	1,2, 3, 4, 5	AAH
7	Students are able to do the electrophoresis process correctly.	Pengenalan alat dan bahan, serta praktek uji kualitas DNA dengan metode elektroforesis		1,2, 3, 4, 5	AAH
MIDTERM EXAM (UTS)					

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Students are able to carry out the DNA amplification process using the polymerase chain reaction (PCR) method correctly.	Introduction to tools, materials, and procedures for DNA amplification using the PCR method and PCR analysis.	• Activities in the laboratory • Active Knowledge Sharing	1,2, 3, 4, 5	AAH
9	Students are able to correctly visualize DNA PCR analysis results.	Introduction to tools and materials for the visualization process of PCR product DNA, as well as the correct visualization of PCR product DNA.			AAH
10	Students are able to read the sequencing results data correctly.	Bioinformatics analysis: reading genetic data from sequencing results.	Active Knowledge Sharing	1,2, 3, 4, 5	AMR
11	Students are able to process sequencing data and interpret them correctly.	Bioinformatics analysis: interpretation of sequencing genetic data.			AMR
12	Students are able to understand the application of DNA Barcoding from previous research.	Inbound: Application of DNA Barcoding in the management of aquatic resources and fisheries	Problem Base Learning (PBL)	1,2, 3, 4, 5	AMR
13	Students are able to explain well the process of taking samples in the field, handling and analyzing DNA samples in the laboratory.				AMR
14	Students are able to explain well about the analysis and interpretation of genetic data on aquatic and fisheries resources well.				AMR
FINAL EXAMS (UAS)					

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**INSTITUT PERTANIAN BOGOR PROGRAM STUDI S1 MANAJEMEN SUMBERDAYA PERAIRN (MSP)**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

RENCANA PEMBELAJARAN SEMESTER-*SEMESTER LEARNING PLAN*

MATA KULIAH (MK) ***Course***	**KODE** ***Code***	**RUMPUN MK** ***Course Cluster***	**BOBOT (sks)** ***Credits***	**SEMESTER**	**TANGGAL PENYUSUNAN** ***Preparation Date***
Metode Karya Ilmiah (*Methods of Scientific Work*)	MSP1301	Academic Core Courses	2	5	

	Koordinator MK	**Tim Pengajar**
Pengasuh **(*Lecturer*)**	Prof.Dr. Ir. Niken TM Pratiwi, M.Si. (NTP)	1. Dr.Ir. Rahmat Kurnia, M.Si. (RKN) 2. Aliati Iswantari, S.Pi. M.Si. (AAY) 3. Dudi Muhammad Wildan, S.Pi. M.Si. (DMW) 4. Dwi Yuni Wulandari, S.Pi. M.Si. (DYW) 5. Dr. Ayu Ervinia, S.Pi M.Si. (AYU) 6. Dr. Fery Kurniawan, S.Pi. M.Si.

Capaian Pembelajaran (CP) ***Learning Outcome* (LO)**	**CPL-PRODI yang dibebankan pada MK**	
	LO2	Mengidentifikasi sumberdaya (individu, populasi, dan komunitas), ekosistem, lingkungan, dan kawasan perairan ***Identify resources (individuals, populations, and communities), ecosystems, environments, and water areas***
	Capaian Pembelajaran Mata Kuliah (CPMK)	

<table>
<tr><td></td><td>CPMK</td><td colspan="5">Setelah mengikuti kuliah ini mahasiswa mampu (After attending this lecture, students are able to):
1. Softskill:
a. memahami filosofi penelitian dalam bidang pengelolaan sumberdaya perairan dan penulisan karya ilmiah yang mencakup pola pikir ilmiah, metode pengumpulan data, pengolahan data, penyajian informasi ilmiah, dan penulisan karya ilmiah (Understand the philosophy of research in the field of aquatic resources management and writing scientific papers that include a scientific mindset, data collection methods, data processing, presenting scientific information, and writing scientific papers).
2. Hardskill:
a. menerapkan metode penulisan untuk menyajikan karya ilmiah, baik dalam bentuk presentasi oral, artikel jurnal, maupun poster (apply writing methods to present scientific papers, both in the form of oral presentations, journal articles, and posters)</td></tr>
<tr><td>Deskripsi MK
Course Description</td><td colspan="6">Filosofi penelitian dalam bidang pengelolaan sumberdaya perairan dan penulisan karya ilmiah yang mencakup pola pikir ilmiah, metode pengumpulan data, pengolahan data, penyajian informasi ilmiah, dan penulisan karya ilmiah (Research philosophy in the field of aquatic resources management and writing scientific papers that includes a scientific mindset, data collection methods, data processing, presenting scientific information, and writing scientific papers).</td></tr>
<tr><td>Pustaka
References</td><td colspan="6"></td></tr>
<tr><td rowspan="3">Evaluasi Pembelajaran (Rubrik)
(Rubric)</td><td colspan="3">Penilaian Hasil Belajar (Learning Outcomes Assessment)</td><td colspan="2">Penilaian Akhir (Final Assessment)</td></tr>
<tr><td>Basis Evaluasi (Evaluation Base)</td><td>Bobot (%) (Proportion)</td><td>Deskripsi (Description)</td><td>Nilai Mutu (Grade)</td><td>Rentang Nilai (Range of Values)</td></tr>
<tr><td>Aktivitas Partisipatif (Kehadiran dan keaktifan di kelas) (Participatory Activities (Class attendance and activity))</td><td>15</td><td>Penilaian sikap, termasuk kepatuhan, kedisiplinan, tanggung-jawab dan keterampilan mahasiswa dalam berkomunikasi dan bekerjasama dalam tim dalam</td><td>A
AB
B
BC
C
D
E</td><td>Nilai ≥ 80
75 ≤ Nilai < 80
70 ≤ Nilai < 75
65 ≤ Nilai < 70
60 ≤ Nilai < 65
55 ≤ Nilai < 60
< 55</td></tr>
</table>

			pembelajaran kolaborasi, penilaian dilakukan pada saat melakukan diskusi serta dari fasilitator. (***Attitude assessment, including compliance, discipline, responsibility and student skills in communicating and working in teams in collaborative learning, assessment is carried out during discussions and from facilitators***)		
	Hasil Projek (***Project Outcomes***)	65	Dalam pertemuan 8-10 mahasiswa mendapat tugas merancang proposal penelitian secara mandiri dan penyajian makalah (***In meetings 8-10 students get the task of designing research proposals independently and presenting papers***)		

	Tugas	0			
	Quiz	0			
	Ujian Tengah Semester (*Midterm Exam*)	10	Mahasiswa secara individu mengerjakan soal untuk mengevaluasi pengetahuan dan pemahaman mahasiswa terhadap materi/bahan kajian pada pertemuan 1-7 (***Students individually do questions to evaluate students' knowledge and understanding of the material/study materials at meetings 1-7***)		
	Ujian Akhir Semester (*Final Semester Exam*)	10	Mahasiswa secara individu mengerjakan soal untuk mengevaluasi pengetahuan dan pemahaman mahasiswa terhadap materi/bahan kajian pada pertemuan 8-14 berbagai wawasan keseluruhan		

			mengenai mata kuliah (***Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 8-14 various overall insights about the course***)		

RENCANA PELAKSANAAN KULIAH (*LECTURE IMPLEMENTATION PLAN*)

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)**	**Sumber Pustaka (*References*)**	**Dosen (*Lecturer*)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1	Memahami falsafah ilmu dan teknologi; menjelaskan esensi dan proses penelitian; pola pikir penelitian ilmiah; pola pikir penelitian ilmiah; serta topik dan masalah penelitian (***Understand the philosophy of science and technology; explain the essence and process of research; scientific research mindset; scientific research mindset; as well as research topics and problems***)	1. Deskripsi dan lingkup serta definisi sains, penelitian, dan karya ilmiah (***Description and scope and definition of***	CbL (7); CI (8)	PPKI	NTP

Minggu (*Week*)	Kemampuan akhir yang diharapkan (*Expected final capability*)	Topik & Sub Topik (*Topics & Sub Topics*)	Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)	Sumber Pustaka (*References*)	Dosen (*Lecturer*)
(1)	(2)	(3)	(4)	(5)	(6)
		science, research and scientific work)			
2	Memahami falsafah ilmu dan teknologi; menjelaskan esensi dan proses penelitian; pola pikir penelitian ilmiah; pola pikir penelitian ilmiah; serta topik dan masalah penelitian (***Understand the philosophy of science and technology; explain the essence and process of research; scientific research mindset; scientific research mindset; as well as research topics and problems***)	2. Kriteria kajian ilmiah dan bentuk-bentuk metode penelitian (***Criteria for scientific studies and forms of research methods***)	CbL (7); CI (8)	PPKI	NTP
3	Memahami falsafah ilmu dan teknologi; menjelaskan esensi dan proses penelitian; pola pikir penelitian ilmiah; pola pikir penelitian ilmiah; serta topik dan masalah penelitian (***Understand the philosophy of science and technology; explain the essence and process of research; scientific research mindset; scientific research mindset; as well as research topics and problems***)	3. Lingkup kajian berkaitan dengan kompetensi MSP di bidang biologi dan ekologi biota perairan; pengelolaan sumberdaya perairan; pengelolaan sumberdaya perikanan; pengelolaan kawasan, konsevasi, dan ekowisata perairan tawar, payau, pesisir, laut, dan pulau-pulau kecil (***The scope of study is related to MSP competence in the field of biology and ecology***	CbL (7); CI (8)	PPKI	NTP

Minggu (*Week*)	Kemampuan akhir yang diharapkan (*Expected final capability*)	Topik & Sub Topik (*Topics & Sub Topics*)	Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)	Sumber Pustaka (*References*)	Dosen (*Lecturer*)
(1)	(2)	(3)	(4)	(5)	(6)
		of aquatic biota; aquatic resources management; fisheries resource management; Area Management, Conservation, and Ecotourism of freshwater, brackish, coastal, marine, and small islands)			
4	Memahamani tentang teknik penyusunan kerangka pemikiran dan hipotesis penelitian, metode pengumpulan data, pengolahan, serta penyajian informasi ilmiah (***Understand the techniques of compiling research frameworks and hypotheses, methods of data collection, processing, and presentation of scientific inform***)	1. Langkah dan tahapan perumusan masalah sesuai dengan tujuan penelitian (***Steps and stages of problem formulation in accordance with the research objectives***)		PPKI	RKN
5	Memahamani tentang teknik penyusunan kerangka pemikiran dan hipotesis penelitian, metode pengumpulan data, pengolahan, serta penyajian informasi ilmiah (***Understand the techniques of compiling research frameworks and hypotheses, methods of data collection, processing, and presentation of scientific information***)	2. Desain riset operasional berdasarkan kompetensi MSP, variabel terpilih, pengumpulan data, dan validitas (***Operational research design based on MSP competence,***	CbL (7); CI (8)	PPKI	RKN

Minggu (*Week*)	Kemampuan akhir yang diharapkan (*Expected final capability*)	Topik & Sub Topik (*Topics & Sub Topics*)	Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)	Sumber Pustaka (*References*)	Dosen (*Lecturer*)
(1)	(2)	(3)	(4)	(5)	(6)
		selected variables, data collection, and validity)			
6	Memahamani tentang teknik penyusunan kerangka pemikiran dan hipotesis penelitian, metode pengumpulan data, pengolahan, serta penyajian informasi ilmiah (***Understand the techniques of compiling research frameworks and hypotheses, methods of data collection, processing, and presentation of scientific information***)	2. Desain riset operasional berdasarkan kompetensi MSP, variabel terpilih, pengumpulan data, dan validitas (***Operational research design based on MSP competence, selected variables, data collection, and validity***)	CbL (7); CI (8)	PPKI	RKN
7	Memahamani tentang teknik penyusunan kerangka pemikiran dan hipotesis penelitian, metode pengumpulan data, pengolahan, serta penyajian informasi ilmiah (***Understand the techniques of compiling research frameworks and hypotheses, methods of data collection, processing, and presentation of scientific information***)	3. Teknik analisis dan interpretasi data dari beberapa desain penelitian (***Data analysis and interpretation techniques from several research designs***)	CbL (7); CI (8)		
UJIAN TENGAH SEMESTER (UTS)-MID TEST					

Minggu (*Week*)	Kemampuan akhir yang diharapkan (*Expected final capability*)	Topik & Sub Topik (*Topics & Sub Topics*)	Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)	Sumber Pustaka (*References*)	Dosen (*Lecturer*)
(1)	(2)	(3)	(4)	(5)	(6)
8	Menerapkan metode penulisan untuk menyajikan karya ilmiah, baik dalam bentuk presentasi oral, artikel jurnal, maupun poster (***Apply writing methods to present scientific papers, both in the form of oral presentations, journal articles, and posters***)	1. Kategori dan teknik penelusuran pustaka dalam menyiapkan perumusan masalah dan lingkup kajian sesuai dengan kompetensi MSP (***Categories and techniques of literature search in preparing problem formulation and scope of study in accordance with MS competence***)	CbL (7); CI (8)	PPKI	NTP
9	Menerapkan metode penulisan untuk menyajikan karya ilmiah, baik dalam bentuk presentasi oral, artikel jurnal, maupun poster (***Apply writing methods to present scientific papers, both in the form of oral presentations, journal articles, and posters***)	1. Kategori dan teknik penelusuran pustaka dalam menyiapkan perumusan masalah dan lingkup kajian sesuai dengan kompetensi MSP (***Categories and techniques of literature search in preparing problem formulation and scope***	CbL (7); CI (8)	PPKI	NTP

Minggu (*Week*)	Kemampuan akhir yang diharapkan (*Expected final capability*)	Topik & Sub Topik (*Topics & Sub Topics*)	Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)	Sumber Pustaka (*References*)	Dosen (*Lecturer*)
(1)	(2)	(3)	(4)	(5)	(6)
		of study in accordance with MSP competencies)			
10	Menerapkan metode penulisan untuk menyajikan karya ilmiah, baik dalam bentuk presentasi oral, artikel jurnal, maupun poster (***Apply writing methods to present scientific papers, both in the form of oral presentations, journal articles, and posters***)	2. Tata penulisan karya ilmiah sesuai dengan panduan (***Grammar for writing scientific papers in accordance with the guidelines***)	CbL (7); CI (8)	PPKI	AAY
11	Menerapkan metode penulisan untuk menyajikan karya ilmiah, baik dalam bentuk presentasi oral, artikel jurnal, maupun poster (***Apply writing methods to present scientific papers, both in the form of oral presentations, journal articles, and posters***)	2. Tata penulisan karya ilmiah sesuai dengan panduan (***Grammar for writing scientific papers in accordance with the guidelines*)**	CbL (7); CI (8)	PPKI	AAY
12	Menerapkan metode penulisan untuk menyajikan karya ilmiah, baik dalam bentuk presentasi oral, artikel jurnal, maupun poster (***Apply writing methods to present scientific papers, both in the form of oral presentations, journal articles, and posters)***	2. Tata penulisan karya ilmiah sesuai dengan panduan (***Grammar for writing scientific papers in accordance with the guidelines*)**	CbL (7); CI (8)	PPKI	AAY
13	Menerapkan metode penulisan untuk menyajikan karya ilmiah, baik dalam bentuk presentasi oral, artikel jurnal, maupun poster (***Apply writing methods to present scientific papers, both in the form of oral presentations, journal articles, and posters***)	3. Tulisan ilmiah yang sesuai dengan panduan (***Grammar for writing scientific papers in***	CbL (7); CI (8)	PPKI	NTP

Minggu (*Week*)	Kemampuan akhir yang diharapkan (*Expected final capability*)	Topik & Sub Topik (*Topics & Sub Topics*)	Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)	Sumber Pustaka (*References*)	Dosen (*Lecturer*)
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
		***accordance with the guidelines*)**			
14	Menerapkan metode penulisan untuk menyajikan karya ilmiah, baik dalam bentuk presentasi oral, artikel jurnal, maupun poster (***Apply writing methods to present scientific papers, both in the form of oral presentations, journal articles, and posters***)	4. Materi dan melakukan presentasi dalam seminar (***Materials and making presentations in seminars***)	CbL (7); CI (8)	PPKI	NTP
UJIAN AKHIR SEMESTER (UAS) – FINAL OF SEMESTER EXAM					

Bentuk pembelajaran dengan pendekatan '*student center learning*':

1. Small group discussion (SGD)
2. Role-play & simulation (RPS)
3. Case study (CS)
4. Discovery learning (DL)
5. Self-directed learning (SDL)
6. Cooperative learning (CL)
7. Collaborative learning (CbL)
8. Contextual Instruction (CI)
9. Project based learning (PjBL)
10. Problem based learning & inquiry (PBL)

RENCANA PELAKSANAAN PRAKTIKUM (*PRACTICUM IMPLEMENTATION PLAN*)

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)**	**Sumber Pustaka (*References*)**	**Dosen (*Lecturer*)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1	Memahami dan menerapkan cara menyajikan gagasan serta topik dan masalah penelitian (***Understand and apply how to present ideas and research topics and problems***)	1. Gagasan serta topik dan masalah penelitian (***Research ideas and topics and problems***) 2. Lingkup kajian berkaitan dengan kompetensi MSP di bidang produktivitas dan lingkungan perairan, biologi dan ekologi biota perairan; pengelolaan sumberdaya perairan; pengelolaan sumberdaya perikanan; pengelolaan kawasan, konsevasi, dan ekowisata perairan tawar, payau, pesisir, laut, dan pulau-pulau kecil (***The scope of the***	CbL (7); CI (8)	PPKI	AAY

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)**	**Sumber Pustaka (*References*)**	**Dosen (*Lecturer*)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
		study is related to MSP competence in the fields of productivity and aquatic environment, biology and ecology of aquatic biota; aquatic resources management; fisheries resource management; Area Management, Conservation, and Ecotourism of freshwater, brackish, coastal, marine, and small islands)			
2	Memahami dan menerapkan cara menyajikan substansi, penyusunan perumusan masalah dan kerangka pemikiran, serta hipotesis dan tujuan penelitian ***(Understand and apply how to present substance, formulate problem formulation and frame of mind, as well as hypotheses and research objectives***)	1. Penyusunan kalimat dan alinea efektif (***Effective sentence and paragraph construction***) 2. Penyiapan substansi, perumusan masalah dan kerangka pemikiran penelitian, serta hipotesis dan tujuan penelitian	CbL (7); CI (8)	PPKI	AAY

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)**	**Sumber Pustaka (*References*)**	**Dosen (*Lecturer*)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
		(***Preparation of research synopsis, formulation of research frameworks, as well as hypotheses and research objectives***)			
3	Memahami dan menerapkan penyusunan aksiologi (***Understand and apply axiology***)	Kerangka aksiologi (***Axiological framework***)	CbL (7); CI (8)	PPKI	DYW
4	Memahamani dan menerapkan penyajian metode pengumpulan data, pengolahan, serta penyajian informasi ilmiah (1) (***Understand and apply the presentation of data collection methods, processing, and presentation of scientific information (1)***)	1. Desain riset operasional berdasarkan kompetensi MSP, variabel terpilih, pengumpulan data, dan validitas (1) (***Operational research design based on MSP competence, selected variables, data collection, and validity (1)***)	CbL (7); CI (8)	PPKI	DYW

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)**	**Sumber Pustaka (*References*)**	**Dosen (*Lecturer*)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
5	Memahamani dan menerapkan penyajian metode pengumpulan data, pengolahan, serta penyajian informasi ilmiah (2) (***Understand and apply the presentation of data collection methods, processing, and presentation of scientific information (2)***)	2. Desain riset operasional berdasarkan kompetensi MSP, variabel terpilih, pengumpulan data, dan validitas (2) (***Operational research design based on MSP competence, selected variables, data collection, and validity (2)***)	CbL (7); CI (8)	PPKI	FRK
6	Memahamani tentang teknik penyusunan kerangka pemikiran dan hipotesis penelitian, metode pengumpulan data, pengolahan, serta penyajian informasi ilmiah (3) (***Understand and apply the presentation of data collection methods, processing, and presentation of scientific information (3)***)	3. Teknik analisis data dan interpretasi data dari beberapa desain penelitian (***Data analysis and data interpretation from several research designs***)	CbL (7); CI (8)	PPKI	FRK
7	Memahamani dan menerapkan pengacuan Pustaka yang sesuai dengan ketentuan penulisan karya ilmiah (***Understand and apply library references in accordance with the provisions for writing scientific papers***)	***1.*** **Parafrase (*Paraphrase*)** 2. Pengecekan plagiarisme (***Plagiarism checking***)	CbL (7); CI (8)	PPKI	FRK

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)**	**Sumber Pustaka (*References*)**	**Dosen (*Lecturer*)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
		3. Penulisan bibliografi (***Bibliographic writing***)			
8	Memahami dan menerapkan teknik penyusunan proposal penelitian (***Understand and apply research proposal preparation techniques***)	Teknik penyusunan proposal penelitian (***Technique of Research proposal preparation***)	CbL (7); CI (8)	PPKI	FRK
9	Memahami dan menerapkan cara menyajikan hasil penelitian sesuai dengan ketentuan penulisan karya ilmiah (1) (***Understand and apply how to present research results in accordance with the provisions of writing scientific papers (1)***)	1. Cara menyajikan hasil penelitian sesuai dengan ketentuan penulisan karya ilmiah (***How to present research results in accordance with the provisions of writing scientific papers***)	CbL (7); CI (8)	PPKI	DYW
10	Memahami dan menerapkan cara menyajikan hasil penelitian sesuai dengan ketentuan penulisan karya ilmiah (2) (***Understand and apply how to present research results in accordance with the provisions of writing scientific papers (2)***)	2. Cara menginterpretasi data hasil penelitian (***How to interpret research data***)	CbL (7); CI (8)	PPKI	DYW
11	Memahami dan menerapkan cara menyajikan hasil penelitian sesuai dengan ketentuan penulisan karya ilmiah (3) (***Understand and apply how to present***	3. Cara menyajikan pembahasan (***How to***	CbL (7); CI (8)	PPKI	DMW

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)**	**Sumber Pustaka (*References*)**	**Dosen (*Lecturer*)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	***research results in accordance with the provisions of writing scientific papers (3)*)**	***present the discussion***) 4. Cara menyajikan penutup tulisan (kesimpulan, saran, dan persantunan) (***How to present the closing of the writing*** (***conclusion, advice, and aknowledgement***))			
12	Memahami dan menerapkan teknik penyusunan karya ilmiah (***Understand and apply techniques for preparing scientific papers***)	1. Teknik penulisan skripsi sesuai dengan panduan IPB (***Thesis writing techniques in accordance with IPB guidelines***) 2. Teknik penulisan naskah artikel jurnal sesuai dengan panduan bagi penulis ***(Journal article manuscript writing techniques in accordance with the guidelines for authors***)	CbL (7); CI (8)	PPKI	DMW

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran Tatap Muka/Daring (*Learning Methods: offline or online*)**	**Sumber Pustaka (*References*)**	**Dosen (*Lecturer*)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
13	Menerapkan metode penulisan untuk menyajikan karya ilmiah dalam bentuk presentasi oral (***Apply writing methods to present scientific papers in the form of oral presentation***s)	Teknik menyiapkan presentasi oral (***Techniques for preparing oral presentations***)	CbL (7); CI (8)	PPKI	AYU
14	Menerapkan metode penulisan untuk menyajikan karya ilmiah dalam bentuk poster fisik dan virtual (***Apply writing methods to present scientific papers in the form of physical and virtual posters***)	Teknik menyiapkan poster fisik dan virtual (***Techniques for preparing physical and virtual posters***)	CbL (7); CI (8)	PPKI	AYU
UJIAN AKHIR SEMESTER (UAS)—PRESENTASI PROPOSAL (*FINAL SEMESTER EXAM—PROPOSAL PRESENTATION*)					

Bentuk pembelajaran dengan pendekatan '*student center learning*':

1. Small group discussion (SGD)
2. Role-play & simulation (RPS)
3. Case study (CS)
4. Discovery learning (DL)
5. Self-directed learning (SDL)
6. Cooperative learning (CL)
7. Collaborative learning (CbL)
8. Contextual Instruction (CI)
9. Project based learning (PjBL)
10. Problem based learning & inquiry (PBL)

Bogor, …….. 2022

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainabl	**IPB UNIVERSITY FACULTY OF FISHERIES AND MARINE SCIENCES AQUATIC RESOUCES MANAGEMENT BACHELOR DEGREE PROGRAM**	ARM Department of Aquatic Resources Management Faculty of Fisheries and Marine Sciences IPB University — Bogor Indonesia —

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Water Pollution and Treatment	MSP1311	In-Depth Prodi Courses (IPC)	3	5	Desember 2022

	Course Coordinator	Team Lecturer
Lecturer	Prof. Dr. Ir. Hefni Effendi, M.Phil (HEF)	1. Dr. Ir. Sigid Hariyadi, MSc (SGH) 2. Dr. Majariana Krisanti, SPi, MSi (MJK) 3. Dr. Zulhamsyah Imran, S.Pi, M.Si (ZIM) 4. Aliati Iswantari, S.Pi, M.Si (AAY) 5. Inna Puspa Ayu, S.Pi, M.Si (IPA) 6. Dwi Yuni Wulandari, S.Pi, M.Si (DYW)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO3	Describe the condition and status of resources, ecosystems, environments, and water areas based on their characteristics with qualitative and quantitative approaches.
	Sub LO3.3	Describe the condition of ecosystems, environments and water areas comprehensively.
	COURSE LEARNING OUTCOME	

<table>
<tr><td></td><td>LO</td><td>After attending this lecture, students are able to:
1. Soft skills: students are able to master the principles of water pollution and water treatment techniques which include:
1. Pollution sourced from organic matter
2. Pollution sourced from inorganic materials
3. Water treatment mechanism and process for raw water
4. Wastewater treatment mechanism and process
2. Hardskill: students are able to master water treatment techniques
1. Water treatment techniques physically, chemically, and biologically, as well as disfection
2. Water treatment techniques for raw water (WTP)
a. Wastewater treatment plant (WWTP)</td></tr>
<tr><td>Course Description</td><td colspan="2">Understanding water pollution, sources of water pollution, types of water pollutants, and their impact on the aquatic environment and aquatic organisms and humans. Water treatment, both physically, chemically and biologically for the benefit of raw water and wastewater treatment.</td></tr>
<tr><td>References</td><td colspan="2">1) Clark, R.B. 1986. Marine Pollution. Clarendon Press, Oxford. 215 p.
2) Laws, E.A. 1993. Aquatic Pollution : An introductory text. Wiley Interscience, New York. 611p.
3) Mason, C.F. 1991. Biology of freshwater pollution. 2nd ed. Longman Scientific & Technical, Essex, UK. 351 p.
4) Effendi, H. 2003. Telaah Kualitas Air bagi Pengelolaan Sumberdaya dan Lingkungan Perairan. Kanisius. Jogjakarta.
5) Eckenfelder Jr. W.W. 1989. Industrial Water Pollution Control. 2nd Edition. Mc. Graw-Hill International Edition. 400 pp.
6) David, M.L. and David, A.C. 1991. Introduction to environmental Engineering. Mc Graw-Hill International. 822 pp.
7) Mara, D. 1976. Sewage Treatment in Hot Climate. A. Willey-Interscience Publication. 168 pp.
8) Metcalf and Eddy, Inc. 1991. Wastewater Engineering: treatment, disposal, reuse. 3rd edition. Singapore. 1334 p.</td></tr>
<tr><td>Learning Evaluation (Assessment Rubric)</td><td colspan="2">
<table>
<tr><th colspan="3">Learning Outcomes Assessment</th><th colspan="2">Final Assessment</th></tr>
<tr><th>Grade</th><th>Description</th><th>Grade</th><th>Description</th><th>Grade</th></tr>
<tr><td>Participatory Activities (Class attendance and activity)</td><td>5 %</td><td>Penilaian sikap, termasuk Compliance</td><td>A
AB
B</td><td>Score ≥ 80
75 ≤ Score < 80
70 ≤ Score < 75</td></tr>
</table>
</td></tr>
</table>

			discipline, responsibility and student skills during learning.	BC C D E	65 ≤ Score < 70 60 ≤ Score < 65 55 ≤ Score < 60 < 55
	Project Outcomes	25%	Students in groups get Assignment to solve problems with critical analysis and creative solutions in decision making related to water pollution and water treatment		
	Assignment	-	-		
	Quiz	-	-		
	Mid Test	35%	Students individually work on Questions to evaluate knowledge and understanding of lecture material 1-7.		
	Final Test	35%	Students individually work on Questions to evaluate knowledge and understanding of lecture material 8-14.		

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand and explain the meaning of water pollution in *inland waters* and seas, as well as water treatment for clean water supply and limba water treatmenth	○ Pollution (definition, types, and sources of pollution) ○ Water treatment (for clean water and wastewater supply)	○ Talk ○ Discussion	1,2,3,4	HEF
2	Students are able to understand and explain the impact of oil pollution on freshwater and marine ecosystems, as well as examples of oil pollution in the sea.	○ Oil pollution (crude oil, oil composition, oil pollution behavior and its effects) ○ Examples of oil pollution	○ Talk ○ Discussion	1,2,3,4	HEF
3	Students are able to understand and explain water pollution caused by POPs (*Persistent Organic Pollutants*) and its implications for aquatic organisms.	○ Definition of POPs (types of POPs and POPs Conventions) ○ 12 pollution of POPs (Dirty Dozen) (origin of POPs) ○ Behavior and effects of POPs on aquatic and human environments	○ Talk ○ Discussion	1,2,3,4	HEF
4	Students are able to understand and explain heavy metal pollution and its effects on freshwater and marine environments as well as aquatic organisms and humans.	○ Toxic Polluting Groups ○ The benefits of heavy metals in life ○ Understanding heavy metals ○ Bioaccumulation and Biomagnification	○ Talk ○ Discussion	1,2,3,4	HEF

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
5	Students are able to understand and explain radioactive pollution and its implications for freshwater and marine environments and aquatic organisms.	○ What is Radioactive ○ Radioactive Presence on Land and Water ○ Radioactive Impact on the aquatic environment dan organisme akuatik	○ Talk ○ Discussion	1,2,3,4	HEF
6	Students are able to explain heat pollution and its impact on the aquatic environment and organisms inhabiting freshwater and marine aquatic ecosystems	○ Sources of heat pollution ○ Impact of heat pollution on the aquatic environment and aquatic organisms	○ Talk ○ Discussion	1,2,3,4	HEF
7	Students are able to understand and explain the types of domestic pollution (housing and hotels) and their implications for the aquatic environment and aquatic organisms.	○ Household domestic waste ○ Hospitality domestic waste ○ Urban domestic waste ○ Agricultural domestic waste	○ Talk ○ Discussion	1,2,3,4	SGH
MIDTERM EXAM					
8	Students are able to understand and explain pollution that produces biogas such as: CH3, NH3, H2S.	○ Polluters that produce CH3 ○ Polluters that produce NH3 ○ Contaminants that produce H2S	○ Talk ○ Discussion	1,2,3,4	SGH
9	Students are able to understand and explain microbiological pollution in waters and diseases originating from poor water sanitation	○ Probiotics and prebiotics ○ Pathogenic bacteria ○ Waterborne disease ○ Bacterial indicators	○ Talk ○ Discussion	1,2,3,4	SGH

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
10	Students are able to understand and explain the stages of water treatment in physics for the purposes of raw water and waste treatment	o Water treatment plant (WTP) o Wastewater trreatment plant (WWTP) o Physical water treatment	o Talk o Discussion	5,6,7,8	MJK
11	Students are able to understand and explain the stages of chemical water treatment for raw water and waste treatment purposes	o Coagulation o Flocculation o Jar Test	o Talk o Discussion	5,6,7,8	MJK
12	Students are able to understand and explain the stages of biological water treatment for raw water and waste treatment purposes	o Activated sludge, Activated carbon, Trickling filter	o Talk o Discussion	5,6,7,8	MJK
13	Students are able to understand and explain the stages of wastewater treatment, sludge removal and disenfection	o Sludge removal o Removal of bacteria (disenfection)	o Talk o Discussion	5,6,7,8	MJK
14	Students are able to understand and explain wastewater treatment with the artificial swamp method	Wastewater treatment using artificial swamp method that utilizes a consortium of aquatic plants and aquatic microorganisms on open land	o Talk o Discussion	5,6,7,8	MJK
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Understand mandatory and voluntary regulations related to pollution	Laws and regulations related to pollution and wastewater treatment	BP: TM, RT MP: DK, SP, PK, PL	1,3,4,6	MJK
2	Understand microbiological analysis (*Coliform Group*) related to pollution	Practice analysis and calculation of coliform bacteria. Observations and presentations	BP: TM, RT MP: DK, SP, PK, PL	1.2.3	AAY
3					
4					
5	Understand the role of biology in determining environmental quality status (bioindicators)/*bioassay*	○ Introduction to Water Bugs and Bentos and bioindicators ○ Pollution experiment/*bioassay*	BP: TM, RT, P MP: DK, SP, PK	1,2,5,6	IPA
6					
7					
MIDTERM EXAM					
8	Apply and analyze wastewater treatment physically, chemically, and biologically	Jartest	BP: TM, RT, P MP: DK, SP, PK	4,5,6	MJK
9	Apply and analyze phytoremediation-hydroponics/aquaponics	○ Preparation of phytoremediation experiments ○ Hydroponic practice ○ Aquaponics Practices ○ Presentation of results	BP: TM, RT, P MP: DK, SP, PK	1,2,7,8	ZIM
10					
11					
12	Understand the science of water treatment to companies or industries of water treatment or wastewater treatment	○ Field visits to several companies or	BP: TM, RT, P MP: DK, SP, PK, PL	1,2,3	ZIM

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
13 14		water/wastewater treatment industries ○ Presentation of visit results			
FINAL EXAM					

Keterangan:

1. BP = Bentuk Pembelajaran:
   a. TM = Tatap Muka/Tatap Maya
   b. RT = Responsi dan Tutorial
   c. S = Seminar
   d. P = Praktikum di Laboratorium, Praktek Studio, Praktek Bengkel, Praktek Lapangan, Praktek Kerja
   e. PE = Penelitian, Perancangan, Pengembangan
   f. PM = Pelatihan Militer
   g. PP = Pelatihan Pelajar
   h. M = Magang
   i. W = Wirausaha
   j. LL = Bentuk Lain-Lain Pengabdian kepada Masyarakat
2. MP = Metode Pembelajaran:
   a. DK = Diskusi Kelompok
   b. SP = Simulasi, Presentasi
   c. SK = Studi Kasus, Pembelajaran Berbasis Masalah
   d. PK = Pembelajaran Kolaboratif, Pembelajaran Kooperatif
   e. PL = Pembelajaran Lain-lain yang Efektif untuk Pemenuhan Capaian: PjBL dan lain-lain

Bogor, 7 Desember 2022

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY FACULTY OF FISHERIES AND MARINE SCIENCES AQUATIC RESOUCES MANAGEMENT BACHELOR DEGREE PROGRAM**	ARM Department of Aquatic Resources Management Faculty of Fisheries and Marine Sciences IPB University — Bogor Indonesia —

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Productivity	MSP1312	IN-DEPT PRODI COURSES (IPC)	3	6	

	Course Coordinator	Lecturer Team
Lecturer	Prof.Dr.Ir. Niken TM Pratiwi, M.Si. (NTP)	1. Dr. Majariana Krisanti, S.Pi. M.Si. (MYK), 2. Inna Puspa Ayu S.Pi.,M.Si. (IPA), 3. Aliati Iswantar S.Pi. M.Si. (AAY), 4. Dwi Yuni Wulandari, S.Pi. M.Si. (DYW)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO3 Sub-LO3.3	Describe the condition and status of resources, ecosystems, environments, and marine areas based on their characteristics with qualitative and quantitative approaches: Describe the condition of ecosystems, environments and water areas comprehensively
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: 1. Soft skills: a. describe the role of primary and secondary producers in waters in supporting water fertility levels in general and fisheries productivity levels in particular, as well as how to measure and their constituent components b. communicate effectively and work together in multidisciplinary teams c. think critically, creatively, and innovatively, and have the intellectual ability to solve problems at individual and group levels

<table>
<tr><td></td><td></td><td>2. Hardskill:
a. Demonstrate the role of primary and secondary producers in waters in supporting water fertility levels in general and fisheries productivity levels in particular through direct observation or through experiments in the field or in the laboratory by:
b. The role of decomposers in aquatic productivity in the laboratory
c. measuring the primary productivity of waters
d. Conduct practice and analysis of aquatic primary production, both microscopic and macroscopic
e. Conduct practice and analysis of aquatic secondary production, both microscopic and macroscopic</td></tr>
<tr><td>Course Description</td><td colspan="2">Analysis of primary and secondary production, including aquatic biological pumps; assessment of aquatic fertility with physical, chemical, and biological approaches in accordance with the typology and characteristics of aquatic ecosystems; and the role of technology in determining and increasing aquatic productivity in resource management efforts.</td></tr>
<tr><td>References</td><td colspan="2">1. Hefni Effendi, Majariana Krisanti, Yusli Wardiatno, Niken TM Pratiwi, Sigid Hariyadi, Inna Puspa Ayu, Aliati Iswantari. 2018. Buku ajar limnologi pengantar. IPB Press 94 hlm
2. Wetzel, R.G. and G.E. Likens, 1979. Limnological Analyses. W.B. Saunders Company. Philadelphia-London-Toronto. 357 pp.
3. Cole, G.A., 1991. Textbook of Limnology. 2nd Edition. Saint Louis. The C.V. MOSBY Company. 283 pp
4. Schwoerbel, J., 1970. Methods of Hydrobiology (Freshwater Biology). Pergamon Press. Oxford-London-Toronto-SydneyBraunschweig. 200 pp
5. Giesen, W. 1991. Checklist of the Indonesia Freshwater Aquatic Herb. PHPA/AWB Sumatera Wetland Project (draft version).
6. Santos AM Dos, Esteves F De A. 2004. Comparison of calculation procedures of primary productivity by aquatic macrophytes in shallow tropical coastal lagoon. Acta Limnol. Bras. 16 (3): 329-249.
7. Reynolds, C.S. 1984. The Ecology of Freshwater Phytoplankton. Cambridge University Press. Cambridge. 381 p
8. Sainty, G.R. and S.W.L. Jacobs. 1944. Waterplants in Australia: A Field Guide. 3rd Ed. CSIRO. Australia. 327 p.
9. Ravera, O. 1979. Biological Aspect of Freshwater Pollution. Pergamon Press Oxford. 214 p.
10. Susanti, S. 1998. Mengenal Capung. Puslitbang Biologi-LIPI, Bogor
11. VanBenthem, W.S.S.J. 1952. Systematic Studies on the Non-Marine Mollusca of the Indo-Australian Archipelago: III. Critical Revision of the Javanese Pulmonate Land-Snails of the Family Ellobiidae to Limacidae, with an Appendix on Helicarionidae. Treubia Vol. 21 Part : 291-433.
12. Freshwater Biology Association., 1984. Methods of Measuring Secondary Productivity.</td></tr>
<tr><td rowspan="2">Learning Evaluation (Assessment Rubric)</td><td colspan="3">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Description</td><td>Grade</td><td>Description</td><td>Grade</td><td>Description</td></tr>
</table>

	Participatory Activities (Class attendance and activity)	10	Attitude assessment, including compliance, discipline, responsibility and student skills in communicating and working in teams in collaborative learning, assessment is carried out during discussions and from facilitators (at least 2 facilitators).	A AB B BC C D E	Grade≥ 80 75 ≤ Rated < 80 70 ≤ Rated < 75 65 ≤ Rated < 70 60 ≤ Rated < 65 55 ≤ < rated 60 < 55
	Project Outcomes	65	In the meeting, 6-10 students were tasked with concocting material based on triggers prepared through the results of discussions looking for learning issues according to the topic or subject matter designed by the facilitator. Each topic or subject matter requires 3-4 meetings		
	Assignment	0			
	Quiz	0			
	Midterm Exam	15	Students individually do questions to evaluate students' knowledge and		

			understanding of the material / study materials at meetings 1-7		
	Final Exam	10	Students individually do questions to evaluate students' knowledge and understanding of the material / study materials at meetings 8-14 and various overall insights about the course		

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	An understanding of the typology, characteristics, and productivity potential of waters; the process of regeneration of nutrients and oxygen sources in waters, primary production in various types of aquatic ecosystems	• Introduction; • Typology , characteristics of aquatic ecosystems, and potential productivity of waters	CI (8)	1,2,3,4	
2	An understanding of the typology, characteristics, and productivity potential of waters; the process of regeneration of nutrients and oxygen sources in waters, primary production in various types of aquatic ecosystems	• Source and production of oxygen in waters, • Decomposition and material cycle	CI (8)	1,2,3,4	
3	An understanding of the typology, characteristic and productivity potential of waters; the process of regeneration of nutrients and oxygen sources in waters, primary production in various types of aquatic ecosystems	Produksi primer pada berbagai tipe ekosistem perairan	CL (6); CI (8)	1,2,3,4	
4	Understanding of primary production processes and processes supporting aquatic productivity levels; methods of determining primary productivity; determinants and behavior of the determinants of the substance of primary production, both in the column and at the bottom of the waters; as well as the role of primary production in aquatic ecological processes	Energy flows and terms and definitions, as well as the constituent components of production processes in waters	CL (6); CI (8)	5,6,7	
5	Understanding of primary production processes and processes supporting aquatic productivity levels; methods of determining primary productivity; determinants and behavior of the determinants of the substance of primary production, both in the column and at the bottom of the waters; as well as the role of primary production in aquatic ecological processes	Light and photosynthesis	CL (6); CI (8)	5,6,7	

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
6	Understanding of primary production processes and processes supporting aquatic productivity levels; methods of determining primary productivity; determinants and behavior of the determinants of the substance of primary production, both in the column and at the bottom of the waters; as well as the role of primary production in aquatic ecological processes	Cycles N and P, as well as nutrient budget	CL (6); CI (8)	5,6,7	
7	Understanding of primary production processes and processes supporting aquatic productivity levels; methods of determining primary productivity; determinants and behavior of the determinants of the substance of primary production, both in the column and at the bottom of the waters; as well as the role of primary production in aquatic ecological processes	Methods of measuring the primary productivity of planktonic and periphytic microalgae and macrophytes	CL (6); CI (8)	5,6,7	
MIDTERM EXAM					
8	An understanding of the productivity potential of waters is associated with aquatic hydrodynamics, trophic status, and microbial productivity	1. Zeu and Zmix, and their relation to productivity 2.Determination of hypolimnion area	CL (6); CI (8)	8	
9	An understanding of the productivity potential of waters is associated with aquatic hydrodynamics, trophic status, and microbial productivity	3. Determination of the trophic status of waters	CL (6); CI (8)	2,3,9	
10	An understanding of the productivity potential of waters is associated with aquatic hydrodynamics, trophic status, and microbial productivity	4. Microbial loop, marine snow 5.Method of determining microbial productivity	CL (6); CI (8)	2,3,9	

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	An understanding of the concept of river continuum is associated with secondary producers; methods of determining secondary productivity; Secondary determinants of productivity	• Review of river ecology	CL (6); CI (8)	10,11	
12	An understanding of the concept of river continuum is associated with secondary producers; methods of determining secondary productivity; Secondary determinants of productivity	• River continuum concept • The Relationship of River continuum Concept with river biota	CL (6); CI (8)	10,11	
13	An understanding of the concept of river continuum is associated with secondary producers; methods of determining secondary productivity; Secondary determinants of productivity	1. Secondary productivity 1: concept + 3 • Secondary productivity 2: methods of determining secondary productivity	CL (6); CI (8)	10,11	
14	An understanding of the concept of river continuum is associated with secondary producers; methods of determining secondary productivity; Secondary determinants of productivity	1. Secondary productivity 3: factors affecting secondary productivity • Application of secondary productivity methods	CL (6); CI (8)	12	
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Explain basic concepts about the role of decomposers in aquatic productivity	1. Decay rate of organic matter 2. Mineralization process in aquatic ecosystems	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	1,2,3,4	
2	Explain basic concepts about the role of decomposers in aquatic productivity	3. Environmental factors affecting the decomposition process of organic matter	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	1,2,3,4	
3	Explain ways to measure primary productivity	1. Calculation and determination of primary productivity by oxygen method 2. Dark-light bottle incubation technique 3. Analysis of dissolved oxygen content	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	1,2,3,4	
4	Explain the relationship between components that play a role in the production process of phytoplankton and aquatic plants	1. Abundance and succession of phytoplankton 2. Biomass and area of cover of aquatic plants	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	5,6,7	

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
5	Explain the relationship between components that play a role in the production process of phytoplankton and aquatic plants	3. The presence of nutrients	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	5,6,7	
6	Explain the relationship between components that play a role in the production process of phytoplankton and aquatic plants	4. Environmental factors that affect the production process of phytoplankton and aquatic plants	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	5,6,7	
7	Explain basic concepts about the role of decomposers in aquatic productivity; ways of measuring primary productivity; The relationship between components that play a role in the phytoplankton production process in microecosystems and aquatic plants	1. Presentation of decomposition experiments 2.Presentation of primary productivity determination of oxygen method 3.Presentation of phytoplankton production 4.Presentation of aquatic plant production	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	5,6,7	
MIDTERM EXAM					
8	Explain the relationship between components that play a role in the benthos production process in the river	1. Determination of secondary production of river ecosystems	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	8	

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
9	Explain the relationship between components that play a role in the benthos production process in the river	2. Benthos identification	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	2,3,9	
10	Explain the relationship between components that play a role in the benthos production process in the river	3. Length measurement and determination of benthos weight	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	2,3,9	
11	Explain the interrelationships between components that play a role in the benthos production process in flooded microecosystems	1. Determination of secondary production of flooded ecosystems 2. Benthos growth	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	10,11	
12	Explain the interrelationships between components that play a role in the benthos production process in flooded microecosystems	3. Benthos breed identification	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	10,11	
13	Explain the interrelationships between components that play a role in the benthos production process in flooded microecosystems	4. Length measurement and determination of benthos biomass	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	10,11	
14	Explain the interrelationships between components that play a role in the benthos production process in rivers and in flooded microecosystems	Secondary prodiactivity presentation	CS (3); CL (6); CbL (7); CI (8); PjBL (9)	12	
FINAL EXAM					

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**BOGOR AGRICULTURAL INSTITUTE FACULTY OF FISHERIES AND MARINE SCIENCE WATER RESOURCES MANAGEMENT (MSP) GRADUATE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Animal Physiology	MSP1321	*Academic Core Course* (ACC)	3(2-1)	5	07 December 2022

	Coordinator MK	Teaching Team
Lecturer	Prof. Dr. Ir. Ridwan Affandi, DEA (RAF)	1. Prof. Dr. Ir. Djamar T. F. Lumbanbatu, M.Agr (DTF) 2. Prof. Dr. Ir. Etty Riani. MS. (ETR) 3. Dr. Ir. M. Mukhlis Kamal, M.Sc. (MMK) 4. Dudi M. Wildan, S.Pi., M.Si. (DMW)
	STUDY PROGRAM LEARNING OUTCOME	

LEARNING OUTCOME (LO)	LO 1	1. Able to explain the basic sciences that support the scientific management of aquatic resources 2. Able to identify biological resources, ecosystems, environment, and water areas 3. Able to describe the conditions and utilization of biological resources, ecosystems, environment, and water areas based on their characteristics using qualitative and quantitative approaches

		4. Able to link the variables of biological resources, ecosystems, environment, and water areas through partial and integrative analysis of ecological interactions 5. Able to apply the science of management of aquatic resources, fisheries resources based on the principle of carrying capacity for resource sustainability.
	Course Learning Outcomes (CPMK)	
	LO	After attending this course students are able to: 1. Softskill: a. Explain communicatively about physiological processes in aquatic animals in relation to the management of aquatic biological resources b. Applying physiological methods in the field of managing aquatic biological resources cooperatively. 2. Hard skills: Carry out precise measurements of physiological parameters, the data of which is for the management of aquatic biological resources
Course Description	This course explains the physiological processes in individual aquatic animals which include: circulation, respiration, excretion and osmoregulation, digestion, growth, and reproduction.	

<table>
<tr><td>References</td><td colspan="5">1. Hoar W.S. 1984. General and Compraratif Physiology. Hal 07. Prentice Hall of India Private United. New Delhi. 110001
2. Hoar W.S. and D.J. Randall. Fish Physiology Vol I
3. Fish Physiology, Digestion and Food Absorption. Affandi R. Sjafei D. Rahadjo M.F. Sulistiono. 2009. IPB Press.
4. Physiology of aquatic animals. Affandi and Tang U M. 2017. Intermedia.</td></tr>
<tr><td rowspan="8">Learning Evaluation (Rubric)</td><td colspan="3">Assessment of Learning Outcomes</td><td colspan="2">Final Evaluation</td></tr>
<tr><td>Evaluation Base</td><td>Percentage (%)</td><td>Description</td><td>Grade</td><td>Score</td></tr>
<tr><td>Participatory Activities (Attendance and activity in class)</td><td>10%</td><td></td><td rowspan="7">A
AB
B
BC
C
D
E</td><td rowspan="7">Score ≥ 80
75 ≤ Score < 80
70 ≤ Score < 75
65 ≤ Score < 70
60 ≤ Value < 65
55 ≤ Score < 60
Score < 55</td></tr>
<tr><td>Project results</td><td>-</td><td></td></tr>
<tr><td>Task</td><td>20%</td><td></td></tr>
<tr><td>Quiz</td><td>-</td><td></td></tr>
<tr><td>Midterm exam</td><td>35%</td><td></td></tr>
<tr><td>Final exams</td><td>35%</td><td></td></tr>
<tr><td></td><td>10%</td><td></td></tr>
</table>

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students can understand the definition of cell physiology, understand the processes that occur in cells, parameters that affect cell physiology.	Cell physiology 1. Definition of cell physiology 2. Processes of cell physiology 3. Parameters that influence cell physiology	Face to Face in Class	1,2,3	DTF
2	Students can understand the definition of tissue physiology, understand the processes that occur in the network, parameters that affect tissue physiology.	Tissue physiology 1. Definition of tissue physiology 2. Physiological processes network 3. Parameters are influence tissue physiology	Face to Face in Class	3	DTF
3	Students can understand the definition of nerves, understand the processes that occur in nerves, parameters that affect tissue physiology.	Nerves 1. Definition of nerves 2. Nervous performance processes	Face to Face in Class	2,3	ETR

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		3.Parameters are influence nervous system performance			
4	Students can understand the definition of hormones, understand the process of hormone performance, the influence of parameters that affect hormone performance.	Hormones 1. Definition of hormones 2. Process performance hormones 3. Parameters are influence hormone performance	Face to Face in Class	1,3,4	ETR
5	Students can understand the physiological processes that occur in the bodies of aquatic animals, when animals adapt to a changing environment.	Environmental adaptation 1. Definition of environmental adaptation 2. Adaptation process environment	Face to Face in Class	6	RAF

6	Students can understand the definition of a circulation system, understand the process of circulation system performance, parameters that affect circulation system performance	Circulation 1. Definition of circulation 2. Process of circulation system performance 3. Parameters are influence system performance circulation	Face to Face in Class	1,3,4	ETR
7	Students can understand the definition of the respiratory system, understand the process of the performance of the respiratory system, the parameters that affect the performance of the respiratory system.	Respiration 1. Definition of respiration 2. The process of performance of the respiratory system Parameters are influence system performance 3. respiration	Face to Face in Class	1,3,4	MMK
MIDDLE SEMESTER EXAMINATION (UTS)					
8	Students can understand the definition of nitrogen excretion, understand the process of nitrogen excretion performance, parameters that affect nitrogen excretion performance.	Nitrogen excretion 1. Definition of nitrogen excretion 2. Process performance nitrogen excretion 3. Parameters are influence excretion performance nitrogen	Face to Face in Class	1,3,4	MMK

9	Students can understand the definition of osmoregulation, understand the process of osmoregulation system performance, parameters that affect osmoregulation system performance.	Osmoregulation 1. Definition osmoregulation 2. The process of osmoregulation system performance 3. Parameters are influence system performance osmoregulation	Face to Face in Class	1,3,4	MMK
10	Students can understand the definition of digestion and absorption of food, understand the process of performance of the digestive system and food absorption, parameters that affect the performance of the digestive system and absorption of food.	Digestion and absorption of food 1. Definition of digestion and absorption food 2. Process performance of the digestive system and food absorption 3. Parameter a influence system performance digestion and absorption of food	Face to Face in Class	5	DMW

11	Students can understand the definition of growth, understand the process of growth performance, parameters that affect growth performance.	Growth 1. Definition growth 2. Process system performance growth 3. Parameters are influence growth performance	Face to Face in Class	1,3,4	DMW
12	Students can understand the definition of bioenergetics, understand the process of bioenergetic performance, bioenergetic engineering.	Bioenergetics 1. Definition bioenergetics 2. Process performance bioenergetics 3. Engineering bioenergetics	Face to Face in Class	1,3,4	ETR
13	Students can understand the definition of reproduction, understand the process of reproductive performance, parameters that affect reproductive performance.	Reproduction 1. Definition of reproduction 2. The process of performance of the reproductive system 3. Parameters are Influence system performance reproduction	Face to Face in Class	1,3,4	RAF
14	Students can apply the physiology of aquatic animals in the field of fisheries	Physiology Applications Aquatic Animals in the Field of Fisheries	Face to Face in Class	1,3,4	RAF

END OF SEMESTER EXAM (UAS)

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain matters relating to practical work in the laboratory (tools and materials) and methods commonly used.	Introduction	Face to face	1,2,3,4	RAF
2	Students are able to measure the biometric parameters of aquatic animals	Measurement of biometric parameters	Observation and measurement	1,2,3,4	DMW

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
3	Students are able to determine the tolerance range, and the optimum range of environmental parameters (temperature and pH) for a type of aquatic animal.	Measurement of the effect of temperature and pH on the survival of aquatic animals	Direct measurement.	1,2,3,4	DMW
4	Students are able to determine the tolerance range, and the optimum range of environmental parameters (turbidity and detergent) for a type of aquatic animal.	Measurement of the effect of turbidity and detergent on the survival of aquatic animals	Direct measurement.	1,2,3,4	DMW
5	Students are able to determine the tolerance range, and the optimum range of environmental parameters (electricity) for a type of aquatic animal.	Electrophysiology	Direct measurement.	1,2,3,4	DMW
6	Students are able to measure oxygen demand in aquatic animals in water media.	Measurement of the level of oxygen consumption in aqueous media	Direct measurement.	1,2,3,4	ETR
7	Students are able to measure the need for oxygen in aquatic animals outside of water media.	Measurement of the level of oxygen consumption in the outer medium of water	Direct measurement.	1,2,3,4	MMK

MIDDLE SEMESTER EXAMINATION (UTS)					
8	Students are able to measure the ability/endurance of aquatic animals outside of water media	Test the survival of fish out of water	Direct measurement.	1,2,3,4	RAF
9	Students are able to determine the tolerance range, and the optimum range of environmental parameters (salinity) for a type of aquatic animal.	Optimum salinity determination for minimize osmotic load	Direct measurement.	1,2,3,4	ETR
10	Students are able to measure the gastric emptying rate of aquatic animals	Velocity measurement gastric emptying	Direct measurement.	1,2,3,4	DMW
11	Students are able to measure in vivo and invitro digestibility of aquatic animals	In vivo and in vitro digestibility measurements	Direct measurement.	1,2,3,4	DMW
12	Students are able to measure the stomach growth rate of aquatic animals	Velocity measurement growth	Direct measurement.	1,2,3,4	DMW
13	Students are able to measure the frequency of crustacean molting	Measurement of molting frequency	Direct measurement.	1,2,3,4	ETR
14	Students are able to determine the quality of good sperm and egg cells	Quality measurement sperm and egg cells	Direct measurement.	1,2,3,4	RAF
END OF SEMESTER EXAM (UAS)					

Bogor, 07 December 2022

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Coastal Ecosystems, Small Island Islands and Tropical Seas	MSP1322	Indepth Course (IC)	3	Even	7 Dec 2022

	Course Coordinator	Lecturer Team
Lecturer	Prof. Dr. Ir. Ario Damar, M.Si. (ADR)	Prof. Dr. Ir. Fredinan Yulianda (FRY) Dr. Ir. M. Mukhlis Kamal, M.Sc. (MMK) Ir. Agustinus M. Samosir, M.Phil. (AMS) Dr. Charles P Simanjuntak (CPS)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO2	1. Evaluate the implementation of integrated management of coastal, small island, and marine resources based on the principles of carrying capacity, conservation, and sustainable development. 2. Planning the development of integrated management of coastal, small island, and marine resources through spatial and temporal approaches, ecological systems, social, economic, institutional, and policy. 3. Develop an integrated management system of coastal, small islands, and marine resources through evaluation and planning to produce works that have novelty and innovation.
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: Mastering the principles of studying coastal ecosystems and tropical oceans as a unity between the environment (physical factors) and biology. Comprehensive habitat assessment (macrohabitat) and then derived into smaller divisions (microhabitat). Types of types of coastal and marine ecosystems in the tropics and their differences with temperate ecosystems. Relationships

<table>
<tr><td></td><td></td><td>between ecosystems in a coastal area and between organisms in an ecosystem. The interaction between organisms in a community and their abiotic environment from the point of view of the ecosystem. Also provided is the basic basis for the use of coastal ecosystem knowledge for the management of tropical coastal and marine ecosystems. its management.</td></tr>
<tr><td>Course Description</td><td colspan="2">This course provides students with knowledge about tropical marine coastal ecosystems which includes the principles and processes in them. This MK also provides typologies of the main tropical coastal ecosystems, namely estuaries, coral reefs, mangroves, seagrasses, intertidal and nektonic-based estuary ecosystems. This course also explained the difference with non-tropical sea coasts, the character of ecosystem metabolic processes in them as well as interactions between ecosystems and various threats to the sustainability of ecosystem services, both anthropogenic and natural threats, and management directions.</td></tr>
<tr><td>References</td><td colspan="2">1. Brown, JA. Colling D. Park J. Phillips D. Rothery and J Wright. 1989. Seawater : Its Composition, Properties and Behaviour. Pergamonn Press. Osford. pp 5 – 38.
2. Odum EP. 1971. Fundamentals of Ecology. Third Edition. pp : 352 – 361.
3. Nybakken JW. 1993. Marine Biologi. An Ecological Approach. Third ditian. Harper Collins College Publishers, Inc. New York. 426p. Marine Biologi. International Journal on Life in Ocean and Coastal Waters. ISSN 0025-3162. Springer International.
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5. Reise K. 2001. Ecological Comparisons of Sedimentary Shores. Ecological Studies 151. Springer-Verlag. Berlin.
6. Lowe-McConnel RH. 1987. Ecological studies in Tropical fish communities.
7. Heath MR. 1992. Field investigation of the early life stages of marine fish. In: Advance in Marine Biology Vol. 28
8. Primavera JH. 1998. Mangrove as nursery area. Estuarine, Coastal, and Shelf Science 46: 457-464
9. Sale FP. 1980. The ecology of fishes on coral reefs. Oceanography and Marine Biology Annual Review 18: 367-421
10. Sale, F.P., G.E. Forrester, and P. Levin. 1994. Reef fish management. National Geographic Research & Exploitation 10(2): 2244-235
11. FAO. 1994. Mangrove forest management guidelines. FAO Forestry Paper 117 : 5-44</td></tr>
<tr><td rowspan="2">Learning Evaluation (Assessment Rubric)</td><td rowspan="2">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Grade</td><td>Score</td></tr>
<tr><td></td><td>Class attendance & activeness : 80 % (optional)
Midterm Exam: 40 %
Final Exam: 40 %
Assignments: 20 %</td><td>A
AB
B
BC
C
D
E</td><td>Nilai ≥ 80
75 ≤ Nilai < 80
70 ≤ Nilai < 75
65 ≤ Nilai < 70
60 ≤ Nilai < 65
55 ≤ Nilai < 60
< 55</td></tr>
</table>

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students can understand the understanding and definition of coastal ecosystems, especially tropical coastal ecosystems	Understanding and definition. Ecological boundaries of coastal areas. Coastal area management boundaries. Ecotypology of coastal environments based on physical-chemical and biological characteristics. Vulnerability and advantages of coastal ecosystems. The complexity of coastal ecosystems and the dynamics of coastal ecosystems.	Lectures, discussion	1,4,6	ADR
2	Students can understand about physical and chemical processes in coastal waters	Coastal and coastal currents, physical and chemical properties of seawater, stirring-turbulence, vertical and horizontal zoning, distribution of light in the water column, salinity, radiation of sunlight, sound transmission in seawater, horizontal and vertical distribution of nutrients, viscosity and temperature of water.	Lectures, discussion	3,5,6,7	ADR
3	Students can understand about the ecological processes of estuarial aquatic ecosystems, especially about the general character and estuarial typology	Definition of estuarial waters, types of estuaries, estuaries and estuaries of rivers, physical-chemical processes in estuarial waters, estuarial morphology, patterns of biota distribution, and biological productivity of estuarial waters, and estuarial biota. Primary productivity planktonis. Geographic variation of primary productivity. Factors that affect primary productivity. Microbial Loop.	Lectures, discussion	3,5,6,7	ADR
4	Students can understand about intertidal ecosystems, types of intertidal beach types, the consequences of tidal exposure to biota life and its various adaptations	Intertidal definitions and boundaries. Important factors for intertidal habitats. Different types of intertidal in various types of ups and downs. Biota adaptation in relation to the position at tide and low tide	Lectures, discussion	3,5,6,7	CPS
5	Students can understand about intertidal ecosystems, especially about substrate types and ecological processes in waters benthically based.	Sediment type (substrate), typology of waters based on basic type (substrate) coastal waters and physical factors causing the spread of species Substrate. General description of ecological processes in benthic ecosystems, limiting factors and distribution patterns of benthos biota. The interaction of the water column with the substrate	Lectures, discussion	3,5,6,7	CPS

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
6	Students can understand about intertidal ecosystems, especially about biota ecobiology and growth processes and biota adaptation strategies	Growth and life cycle of benthos. Strategies against extreme conditions, different environments and substrates. The role of benthos in the process of decomposition/recycling of organic materials. Benthos function as an indicator of coastal water pollution.	Lectures, discussion	4,5,6,8,9	CPS
7	Provide students with an understanding of mangrove ecosystems (1)	Outline of mangrove swamp forest biology, zoning and vegetation types, composition and form of adaptation of flora and fauna. Constituent of mangrove ecosystems.	Lectures, discussion	4,5,6,8,9	AMS
MIDTERM EXAM					
8	Provide students with an understanding of mangrove ecosystems (2)	The relationship of mangrove ecosystems with other ecosystems in coastal areas, their relation to fisheries production, the ecological function of mangroves	Lectures, discussion	4,5,6,11,16, 19,20	AMS
9	Students can understand about coral reef ecosystems, especially about the geological distribution of coral reefs and reef types and various functions of coral reef ecosystems and ecological interactions within and outside the ecosystem	The history of reef formation, coral reef type. Global distribution Reefs, Indo-Pacific and Atlantic and Limiting Factors spread. The constituent composition of coral reef ecosystems, etc.	Lectures, discussion	4,5,6,11,16, 19,20	FRY
10	Students can understand about coral reef ecosystems, especially about the geological distribution of coral reefs and reef types and various functions of coral reef ecosystems and ecological interactions within and outside the ecosystem	The productivity of coral reef waters, the relationship of coral reef ecosystems with other ecosystems in coastal areas such as seagrass beds and estuaries and threats to coral reefs.	Lectures, discussion	10, 11, 12, 13, 14, 15	FRY
11	Students can understand about seagrass ecosystems	Outline of seagrass biology, types and functions of seagrass, composition and fauna associations of seagrass meadows.	Lectures, discussion	10, 11, 12, 13, 14, 15	FRY

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
12	Students can understand about estuarial ecosystems based on the nectonic system.	Ikhtioplankton, fish larvae survival strategies, fish recruitment, environmental carrying capacity to successful fish recruitment	Lectures, discussion	10, 11, 12, 13, 14, 15	MMK
13	Students can understand about estuarial ecosystems based on nektonic systems	Comparison of fish survival strategies in several coastal ecosystems, secondary and tertiary productivity	Lectures, discussion	2, 3	MMK
14	Students can understand the basics of coastal ecosystem management based on ecological knowledge of coastal areas	General description of the impact caused to the marine environment as a result of human activities both on land and at sea. Water pollution, eutrophication, heavy metals and oil The effect of watershed management on coastal, integrated coastal area management.	Lectures, discussion	2, 3	ADR
UJIAN AKHIR SEMESTER (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Know the rules and practicum procedures for coastal and marine ecosystems.	1. Explain practicum rules and ethics of working in the laboratory 2. Explain the scope of the entire Quiz material 3. Explain the scope of the overall practicum material 4. Explain the introduction and procedure for making practicum preparations and equipment	Classes, discussions	1,4,6	ADR
2	Able to be skilled in sampling and measuring coastal and marine ecosystems: Mangrove Ecosystems	1. Do quiz questions 2. Large and small transect plot determination methods 3. Methods of enumerating trees, tihang and mangrove saplings 4. Mangrove identification methods 5. Measurement of environmental parameters in mangrove ecosystems 6. Preparation of data collection form sheets	Kelas, diskusi kelompok	4,5,6,8,9	AMS
3	Able to be skilled in sampling and measuring coastal and marine ecosystems: Mangrove Ecosystem	1. Analyze mangrove ecosystem data 2. Density 3. Species Diversity 4. Important Value Index 5. Analysis of the correlation between environmental factors and mangroves 6. Guide to making mangrove research reports	Classes, group discussions	4,5,6,8,9	AMS
4	Able to be skilled in sampling and measuring coastal and marine ecosystems: Coral Reef Ecosystems	1. Do quiz questions 2. Method of determination of transect plot measurement method 3. for coral reef ecosystem research 4. Methods of identifying life forms and coral genera	Classes, group discussions	4,5,6,11,16, 19,20	FRY

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		5. Fish survey methods and fish identification 6. Measurement of environmental parameters in ecosystems 7. coral reefs 8. Preparation of data collection form sheets			
5	Able to be skilled in sampling and measuring coastal and marine ecosystems: Coral Reef Ecosystems	1. Analyze coral reef ecosystem data 2. Coverage 3. Species Diversity 4. Analysis of the correlation between environmental factors and coral reefs 5. Guidelines for making coral reef research reports 6. Various coral reef lifeforms and histograms	Classes, group discussions	4,5,6,11,16, 19,20	FRY
6	Able to be skilled in sampling and measuring coastal and marine ecosystems: Seagrass Ecosystem	1. Do quiz questions 2. Large and small transect plot determination methods 3. Seagrass density enumeration method 4. Seagrass identification methods 5. Measurement of environmental parameters in seagrass ecosystems 6. Preparation of data collection form sheets	Classes, group discussions	4,5,6,11,16, 19,20	AMS
7	Able to be skilled in sampling and measuring coastal and marine ecosystems: Seagrass Ecosystem	1. Analyze seagrass ecosystem ecosystem data 2. Density 3. Species Diversity 4. Important Value Index 5. Analysis of the correlation between environmental factors and seagrass ecosystems 6. Guidelines for creating ecosystem research reports 7. Seagrass	Classes, group discussions	4,5,6,11,16, 19,20	AMS
MIDTERM EXAM					

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Able to be skilled in sampling and measuring coastal and marine ecosystems: Intertidal Ecosystem	1. Do quiz questions 2. Methods of determining large and small transect plots in intertidal ecosystems 3. Benthic enumeration method on transect plots 4. Benthic biota identification methods 5. Measurement of environmental parameters in intertidal ecosystems 6. Preparation of data collection form sheets	Classes, group discussions	4,5,6,8,9	ADR
9	Able to be skilled in sampling and measuring coastal and marine ecosystems: Intertidal Ecosystem	1. Perform intertidal ecosystem data analysis 2. Benthic density/density 3. Species Diversity 4. Analysis of the correlation between environmental and intertidal factors 5. Intertidal research report preparation guide	Classes, group discussions	4,5,6,8,9	ADR
10	Able to be skilled in sampling and measuring coastal and marine ecosystems: Pelagic Estuarial Ecosystems	1. Do quiz questions 2. Sampling methods of water, plankton, and chlorophyll 3. Measurement of environmental parameters in pelagic estuarial ecosystems 4. Preparation of data collection form sheets	Classes, group discussions	3,5,6,7	ADR
11	Able to be skilled in sampling and measuring coastal and marine ecosystems: Pelagic Estuarial Ecosystems	1. Perform data analysis of pelagic estuarial ecosystems 2. Analysis of plankton data 3. Analysis of chlorophyll-a data 4. Guide to making pelagic estuarial research reports	Classes, group discussions	3,5,6,7	ADR
12	Able to be skilled in sampling and measuring coastal and marine ecosystems: Pelagic Estuarial Ecosystem Nekton	1. Do quiz questions 2. Nekton sampling plot determination method 3. Nekton enumeration method 4. Nekton identification methods 5. Measurement of environmental parameters in ecosystems	Classes, group discussions	10,11,12,13,14, 15	MMK

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		6. Nekton Pelagic Estuarial Ecosystem 7. Preparation of data collection form sheets			
13	Able to group students based on their abilities: Pelagic Estuarial Ecosystem Nekton	1. Perform ecosystem data analysis Ecosystem 2. Nekton Pelagic Estuary 3. Density 4. Species Diversity 5. Analysis of the correlation between environmental factors and nekton 6. Guide to making research reports on the Nekton Pelagic Estuarial Ecosystem	Classes, group discussions	10,11,12,13,14, 15	MMK
14	Able to explain the results of writing scientific papers on coastal and marine ecosystems	Presentation of posters of each group on research methods in coastal and marine ecosystems. Students are grouped into ecosystem groups	Classes, group discussions	1-20	ADR, FRY, AMS, MMK
FINAL EXAM					

Bogor, 7 December 2022
Course Coordinator of MSP1322
Coastal Ecosystems, Small Island Islands and Tropical Seas

Prof. Dr. Ir. Ario Damar, M.Si.

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Ecotoxicology	MSP1323	Indepth Course (IC)	3(2-1)	6	Desember 2022

	Course Coordinator	Lecturer Team
Lecturer	Ir. Agustinus M. Samosir, M.Phil. (AMS)	Dr. Ayu Ervinia, S.Pi., M.Sc. (AYE) Prof. Dr. Ir. Djamar TF. Lumbanbatu, M.Agr. (DFL)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO 3	Describe the condition and status of resources, ecosystems, environments, and water areas based on their characteristics with an approach
	Sub LO 3.2	Classify the condition and status of aquatic resources (individuals, populations, and communities) appropriately
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: 1. Softskill: a. After attending this lecture, students are expected to be able to think critically, work together, solve problems in assessing the biological effects of toxicants b. Mastery of technology in monitoring and evaluation to support environmental management honestly, accurately and efficiently. 2. Hardskill: a. After participating in this practicum, students are expected to be able to prepare practical designs, acclimatize test animals, conduct toxicity tests. b. Perform blood, liver, kidney, bile, meat and store samples in frecur, extract and determine heavy metals and pesticides in samples with AAS and GC, analyze and generate reports

<table>
<tr><td>Course Description</td><td colspan="5">Aquatic ecotoxicology provides an understanding of the sources, properties and influence of toxic substances on biota and the aquatic environment through approaches to absorption, distribution, excretion, biotransformation, metabolism and chemical and physical transformations</td></tr>
<tr><td>References</td><td colspan="5">1. Batu LDF. 2017. Ekotoksikologi Perairan. IPB Press. 236 Halaman
2. Batu LDF. 2001. Metabolisme dari Bahan-bahan Toksik. Laboratorium Ekobiologi Perairan. Departemen manajemen Sumberdaya Perairan, FPIK - IPB. 108 Halaman
3. Batu LDF. 2002. Sel dan Organisasi Biokimia. Laboratorium Ekobiologi Perairan. Departemen manajemen Sumberdaya Perairan, FPIK - IPB. 59 Halaman
4. Batu LDF. 2002. Pengaturan Hormonal. Modul 3. Diktat Kuliah: Fisiologi Organisme Laut. Laboratorium Ekobiologi Perairan. Departemen manajemen Sumberdaya Perairan, FPIK - IPB. 51 Halaman
5. Des W C and Greg JM. 2022. Chemistry and Toxicology of Pollution. John Wiley & Sons, Dec 2022.</td></tr>
<tr><td rowspan="8">Learning Evaluation (Assessment Rubric)</td><td colspan="3">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Component</td><td>Proportion (%)</td><td>Description</td><td>Grade</td><td>Score</td></tr>
<tr><td>Participatory Activities (class attendance and activeness)</td><td>5</td><td>Students actively ask and answer during lecture discussion sessions</td><td rowspan="7">A
AB
B
BC
C
D
E</td><td rowspan="7">Nilai ≥ 80
75 ≤ Nilai < 80
70 ≤ Nilai < 75
65 ≤ Nilai < 70
60 ≤ Nilai < 65
55 ≤ Nilai < 60
< 55</td></tr>
<tr><td>Project outcomes</td><td>20</td><td>Results of a comprehensive study of cases of aquatic resources conservation problems</td></tr>
<tr><td>Assignment</td><td>10</td><td>Case study of each topic</td></tr>
<tr><td>Quiz</td><td>5</td><td>Questions from the lecture material at the meeting</td></tr>
<tr><td>Midterm Exam</td><td>30</td><td>Test learning outcomes from week 1-7</td></tr>
<tr><td>Final Exam</td><td>30</td><td>Test learning outcomes from week 8-14</td></tr>
</table>

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand the meaning and scope of Aquatic Ecotoxicology	1. Understanding Aquatic Ecotoxicology 2. Position in science	Lectures, discussion	1-4	DFL
2	Students are able to identify organic and inorganic toxic compounds	1. The role of chlorhydrocarbon, IDA, the presence of PAHs 2. Photooxidation 3. Chemical oxidation	Lectures, discussion	1-4	DFL
3	Students are able to identify organic and inorganic toxic compounds	1. Biological transformations 2. Toxicity of PAHs 3. Chronic effects 4. Toxic effects 5. Pesticides	Lectures, discussion	1-4	DFL
4	Students are able to identify organic and inorganic toxic compounds	1. Degradation 2. Organic chlorine 3. Solubility 4. PCBs 5. Carcinogenic compounds 6. Inorganic toxic	Lectures, discussion	1-4	DFL
5	Students are able to explain and identify physico-chemical characteristics of heavy metals	1. Physico-chemical characteristics of heavy metals 2. Accumulation, absorption, interaction with other metals	Lectures, discussion	1-4	DFL
6	Students are able to explain responses and identify toxicity of some types of heavy metals	1. Toxicity of some types of heavy metals 2. Nature and interaction of the environment	Lectures, discussion	1-4	DFL
7	Students are able to explain the interaction of mercury metal & aquatic ecosystems	1. Fate of mercury Hg in waters, 2. Sources of Hg in sediments, waters, biota, bioaccumulation	Lectures, discussion	1-4	DFL
MIDTERM EXAM					

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Students are able to explain toxic ingredients, chemical and functional classification	Toxic ingredients, chemical and functional classification	Lectures, discussion	1-4	AMS, AYE
9	Students are able to explain toxicity test	1. Dosage and response 2. Toxicity test 3. Acute, sub-acute & chronic tests	Lectures, discussion	1-4	AMS, AYE
10	Students are able to explain endocrine disrupter chemicals	1. Endocrine Disrupter Chemicals: 2. Source, Transport, Absorption, Effects on humans	Lectures, discussion	1-4	AMS, AYE
11	Students are able to explain biological effects of endorine disrupter chemicals on aquatic biotas	Biological effects of endorine disrupter chemicals on aquatic biotas	Lectures, discussion	1-4	AMS, AYE
12	Students are able to explain Quantitative Stucture-Activity Relationship I	Quantitative Stucture-Activity Relationship I	Lectures, discussion	1-4	AMS, AYE
13	Students are able to explain Quantitative Stucture-Activity Relationship II	Quantitative Stucture-Activity Relationship II	Lectures, discussion	1-4	AMS, AYE
14	Students are able to explain ecotoxicology applications	Ecotoxicology Applications: 1. Monitoring methods 2. Toxicant evaluation 3. Policy maker	Lectures, discussion	1-4	AMS, AYE
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to prepare heavy metal bioaccumulation practice design	Blood, liver, kidneys, bile, meat	Practical work	Practicum Guideline	AMS, AYE
2	Students are able to do sampling, prepare samples from meat, liver, reproductive organs in test animals (shellfish)	Blood, liver, kidneys, bile, meat	Practical work	Practicum Guideline	AMS, AYE
3	Students are able to extract and determine heavy metals, Hg, Cd, Pb, Cr in shells with AAS	Heavy metal detemination samples with Atomic Absorption Spectrophotometer	Practical work	Practicum Guideline	AMS, AYE
4	Students are able to prepare the design of organic toxicant bioaccumulation practices (pesticides)	Heavy metal detemination samples with Atomic Absorption Spectrophotometer	Practical work	Practicum Guideline	AMS, AYE
5	Students are able to conduct sampling and sample preparation for pesticide analysis	Heavy metal detemination samples with Atomic Absorption Spectrophotometer	Practical work	Practicum Guideline	AMS, AYE
6	Students are able to carry out extraction and determination of organic pesticide toxicants with Gas Chromatography	Results of determination	Practical work	Practicum Guideline	AMS, AYE
7	Students are able to analyze and make reports on bioaccumulation practices	Toxicity data, LC50, safe dosage	Practical work	Practicum Guideline	AMS, AYE
MIDTERM EXAM					
8	Students are able to prepare morphological effect practice design	Practicum design, equipment, organ identification, observation methods	Practical work	Practicum Guideline	AMS, AYE
9	Students are able to perform morphological measurements and analysis	Length, width, factor analysis Condition, weight, abnormalities	Practical work	Practicum Guideline	AMS, AYE
10	Students are able to design media and test animals (fish) and measurements for physiological effects	Aquarium, making solutions / media, acclimatization of fish	Praktikum	Practicum Guideline	AMS, AYE

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	Students are able to conduct experiments of physiological sublethal effects on fish	DO observation, analyzing the rate of respiration	Praktikum	Practicum Guideline	AMS, AYE
12	Students are able to acclimatize and determine dosage	Acclimatization of daphnia, maintenance, making media solutions	Praktikum	Practicum Guideline	AMS, AYE
13	Students are able to conduct population growth-based toxicity tests on daphnia growth	Calculate the population every day and calculate the rate	Praktikum	Practicum Guideline	AMS, AYE
14	Students are able to calculate LC50 and EC50	Menghitung EC50 dan LC50	Praktikum	Practicum Guideline	AMS, AYE
MIDTERM EXAM					

Bogor, 7 December 2022
Course Coordinator of MSP1323 Aquatic Ecotoxicology

Ir. Agustinus M. Samosir, M.Phil.

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Conservation Management of Aquatic Resources	MSP1324	In depth Prodi Courses (IPC)	3(2-1)	Odd	07 December 2022

	Course Coordinator	Lecturer Team
Lecturer	Prof. Dr. Ir. Fredinan Yulianda, M.Sc. (FRY)	Ir. Agustinus M Samosir, M.Phill. (AMS) Dr. Ayu Ervinia, S.Pi., M.Sc. (AYE) Dr. Handoko Adi Susanto, M.Sc. (HAS) Dr. Fery Kurniawan, S.Kel., M.Si. (FRK)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO-5	Apply the science of resource management, ecosystems, environment, and aquatic areas based on the principles of carrying capacity, conservation, and sustainability **Sub-LO 5.2** Decide on management models of resources, ecosystems, environment, and marine areas based on the principles of carrying capacity, conservation, and sustainability
	COURSE LEARNING OUTCOME	
	CPMK	After attending this lecture, students are able to: 1. Softskill: Students are able to carry out management of resources, ecosystems, and marine areas based on the concept of protection and sustainable use by prioritizing the integrity of biodiversity, the function of ecological systems, limited use within the area, rehabilitation efforts, and optimizing the contribution of natural resource benefits outside the conservation area for the benefit of sustainable development

		2. Hardskill: a. Students are able to identify problems of threats and damage to aquatic resources b. Students are able to make management recommendations based on conservation philosophy c. Students are able to zoning conservation areas d. Students are able to develop strategies for marine resources conservation management
Course Description	Management of resources, ecosystems, and marine areas based on the concept of protection and sustainable use by prioritizing the integrity of biodiversity, the function of ecological systems, limited use within the area, rehabilitation efforts, and optimizing the contribution of benefits outside conservation areas for the benefit of sustainable development.	
References	1. Elliott AN. 1993. Global Marine Biological Diversity: Strategy for Building Conservation into Decision Making, Island Press, Suite 300. 1718 Connecticut Avennue, N.W. Washington DC. 2. Howard SS. 2008. Marine Conservation Agreements: The law and policy of Reservation and vetoes. Martinus nijhoff publisher, Leiden/ Boston. 297 p 3. Peraturan Menteri Kelautan dan Perikanan Republik Indonesia Nomor per 02./Men/ 2009 Tentang Tata cara penetapan Kawasan Konservasi Perairan 4. Richard BP, Jatna S, Indrawan M, dan Kramadibrata P. 1998. Biologi Konservasi. Yayasan Obor Indonesia. Jakarta. 5. Rodney V. Salm. IUCN, 1989. Marine and Coastal Protected Areas: A g Guide for Planners and Manger. Avennue Du Mont Blance CH-1196 Gland, Switzerland. 6. Grafton RQ, Hilborn R, Dale Squires, Tait M, Williams MJ. 2010. Marine Fisheries Conservation and Management. Oxford University Pres. Inc. Publ. 785p. 7. Soule ME. 1986. Conservation Biology (The science of scarcity and diversity). Sinauer Associates Inc, Pub. Sinterland, Massachusate USA. 8. Agardy TS. 1997. Marine Protected Areas and Ocean Conservation. R.G. Landes Company and Academic Press, Inc. 259p 9. Yulianda F, Atmadipoera AS. 2019. Kawasan Konservasi Laut. Bogor (ID): IPB Press. 10. Ditjen P3K, Departemen Kelautan dan Perikanan, 2003. Pedoman Wisata Bahari Berbasis Masyrakat di Kawasan Konservasi Laut. Jakarta-DKP. 11. CITES: https://cites.org/eng	

Learning Evaluation (Assessment Rubric)	Learning Outcomes Assessment			Final Assessment	
	Component	Proportion (%)	Description	Grade	Score
	Participatory Activities (Class attendance and activity)	20	Students actively ask and answer during lecture discussion sessions	A AB B	Score ≥ 80 75 ≤ Score < 80 70 ≤ Score < 75

	Project Results (Practicum Exam))	30	Results of a comprehensive study of cases of aquatic resources conservation problems	BC C D E	65 ≤ Score < 70 60 ≤ Score < 65 55 ≤ Score < 60 Score < 55
	Assignments	10	Case study of each topic		
	Quiz	5	Questions from the lecture material at the meeting		
	Midterm Exam	15	Test learning outcomes from week 1-7		
	Final Exam	20	Test learning outcomes from week 8-14		

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain the notion of conservation, the history of the development of the concept of natural resource balance	1. Introduction 2. Definition of Conservation 3. The concept of natural balance	Introduction, student perception, discussion	4, 7	FRY
2	Students are able to explain the characteristics of aquatic resources that need to be protected in accordance with the function of the ecological system	1. Characteristics and concept of protection of aquatic resources 2. The concept of balance of aquatic resources according to the function of the ecological system	Correspondent, introduction, discussion	1, 4, 6, 7	FRY
3	Students are able to explain the threat of damage and disruption of biological resources and the aquatic environment	1. Types of damage and disruption of resources 2. Factors causing damage and disruption of resources and the environment 3. Impact of damage and disruption and capabilities	Case study assignment, introduction, discussion	1, 4, 6, 7	FRY
4	Students are able to explain regulations and policies for conservation of aquatic resources in Indonesia	1. Regulation of protection of nature, aquatic environment, and fisheries 2. Implementation of conservation policies and utilization of aquatic resources	Introduction, literature study, discussion	5, 6, 8, 9	FRY
5	Students are able to describe the functions and benefits of marine resources conservation management	1. Zoning system and conservation functions 2. Integrity of resource diversity 3. The role of conservation management for sustainable resource use	Introduction, literature study, discussion	5, 6, 8, 9	FRY
6	Students are able to describe resource priorities for conservation management	1. Criteria and types of aquatic resources that need to be protected	Introduction, literature study, discussion	5, 6, 8, 9	AYU

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		2. Resource and environmental parameters considered in conservation management			
7	Students are able to compile the concept of conservation of types of flora and fauna and protected ecosystems	1. Ecosystem approach in the management of protected types of aquatic resources 2. The concept of type conservation management	Introduction, literature study, discussion	1, 6, 7	AYU
MIDTERM EXAM					
8	Students are able to determine marine protected areas	1. Resource suitability analysis for marine protected areas 2. Zoning analysis and management supporting factors	Introduction, simulation, discussion	3, 6, 10	FEK
9	Students are able to place conservation functions in the integration of spatial planning and management of aquatic resources	1. Conservation function in general management of aquatic resources 2. Conservation approach in spatial planning	Case study assignment, introduction, discussion	2, 5, 6	HAS
10	Students are able to describe the role of conservation in fisheries resource management	1. Ecological systems in supporting the sustainability of fish resources 2. Contribution of conservation to society and fisheries development	Introduction, literature study, discussion	2, 5, 6	HAS
11	Students are able to formulate the concept of conservation in economic development	1. Conservation linkage through resource availability with utilization rate 2. The concept of conservation in the sustainability of the economic use of resources	Introduction, simulation, discussion	2, 6, 9, 10	AMS
12	Students are able to develop strategies for the use of aquatic resources in the context of conservation	1. Utilization of aquatic resources that have the potential to disrupt and decrease resources	Introduction, simulation, discussion	6, 9, 10	AMS

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		2. Strategies for utilizing aquatic resources based on the concept of conservation			
13	Students are able to develop additional strategies in increasing the sustainable use of aquatic resources	1. Looking for opportunities to conserve aquatic resources for economic development 2. The concept of national and international trade (CITES) 3. Conservation utilization strategies	Introduction, simulation, discussion	1, 6, 9, 10	AMS
14	Students are able to develop integrated aquatic resources conservation management strategies	1. The concept of ecotourism in regional spatial planning 2. Ecotourism integration with other sectors	Introduction, simulation, case study, discussion	6, 8, 9	FRY
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain the notion of conservation, the history of the development of the concept of natural balance	Conservation area profile case overview	Discussion of case studies	4,7	FRY
2	Students are able to explain the characteristics of aquatic resources that need to be protected in accordance with the function of the ecological system	1. Characteristics and concept of protection of aquatic resources 2. The concept of balance of aquatic resources according to the function of the ecological system	Discussion of case studies	1, 4, 6, 7	AYU
3	Students are able to explain the threat of damage and disruption of biological resources and the aquatic environment	1. Types of damage and disruption of resources 2. Factors causing damage and disruption of resources and the environment 3. Impact of damage and disruption and capabilities	Discussion of case studies and group presentations	1, 4, 6, 7	AYU
4	Students are able to explain regulations and policies for conservation of aquatic resources in Indonesia	1. Regulation of protection of nature, aquatic environment, and fisheries 2. Implementation of conservation policies and utilization of aquatic resources	Literature review and analyze water conservation regulations/policies	2, 3, 10, 11	AYU
5	Students are able to describe the functions and benefits of marine resources conservation management	1. Zoning system and conservation functions 2. Integrity of resource diversity 3. The role of conservation management for sustainable resource use	Conservation area case analysis, discussion, and presentation	5, 6, 8, 9	AYU
6	Students are able to describe resource priorities for conservation management	1. Criteria and types of aquatic resources that need to be protected	Analysis the status of protected aquatic	5, 6, 8, 9	AYU

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		2. Resource and environmental parameters considered in conservation management	resources, discussions, and presentations		
7	Students are able to compile the concept of conservation of types of flora and fauna and protected ecosystems	1. Ecosystem approach in the management of protected types of aquatic resources 2. The concept of type conservation management	Case studies discussion, presentation	1, 6, 7	FRY
MIDTERM EXAM					
8	Students are able to determine marine protected areas	1. Resource suitability analysis for marine protected areas 2. Zoning analysis and management supporting factors	Conservation resource suitability analysis, case study discussion	3, 6, 10	FEK
9	Students are able to place conservation functions in the integration of spatial planning and management of aquatic resources	1. Conservation function in general management of aquatic resources 2. Conservation approach in spatial planning	Design conservation area functions, case study discussion	2, 5, 6	FEK
10	Students are able to describe the role of conservation in fisheries resource management	1. Ecological systems in supporting the sustainability of fish resources 2. Contribution of conservation to society and fisheries development	Discussion of case studies the role of conservation roles	2, 5, 6	FEK
11	Students are able to formulate the concept of conservation in economic development	1. Conservation linkage through resource availability with utilization rate 2. The concept of conservation in the sustainability of the economic use of resources	Discussion of case studies and presentations	2, 6, 9, 10	AMS
12	Students are able to develop strategies for the use of aquatic resources in the context of conservation	1. Utilization of aquatic resources that have the potential to disrupt and decrease resources	Discussion of case studies and presentations	6, 9, 10	AMS

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		2. Strategies for utilizing aquatic resources based on the concept of conservation			
13	Students are able to develop additional strategies in increasing the sustainable use of aquatic resources	1. Looking for opportunities to conserve aquatic resources for economic development 2. The concept of national and international trade (CITES) 3. Conservation utilization strategies	Discussion of case studies and presentations	1, 6, 9, 10	AMS
14	Students are able to develop integrated aquatic resources conservation management strategies	1. The concept of integration of resource management and water areas 2. Integrated marine conservation management strategy	Discussion of case studies and presentations	6, 8, 9	FRY
MIDTERM EXAM					

Bogor, 7 December 2022
Course Coordinator of MSP1324 Conservation Management of Aquatic Resources

Prof. Dr. Ir. Fredinan Yulianda, M.Sc.

BOGOR AGRICULTURAL UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
DEPARTMENT OF RESOURCE MANAGEMENT (MSP)
BACHELOR PROGRAM

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World

MSP | Departemen Manajemen Sumberdaya Perairan — Fakultas Perikanan dan Ilmu Kelautan (FPIK)

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
Fish Population Dynamics	MSP1332	Academic Core Course (ACC)	3	5	07-12- 2022

Teaching Team	Coordinator of Course	Member of Teaching Team
	Dr. Ir. Zairion, M.Sc. (ZAI)	1. Dr. Ir. Rahmat Kurnia, M.Si. (RKN) 2. Dr. Ali Mashar, S.Pi., M.Si. (AMR) 3. Agus Alim Hakim, S.Pi., M.Si. (AAH)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO 2	Solving problems of aquatic resources, fishery resources, and aquatic environment based on the principles of carrying capacity, conservation and sustainability.
	LO of Course	
	LO of Course	After attending this course students are able to: **1. Soft skills**: describe the condition and status of aquatic resources (population) through a systematic and easy-to-understand presentation (complex problem solving). **2. Hard skills**: Estimating and using models for estimating population dynamics parameters and understanding the behavior of these models using Excel, FISAT and R Program software.
Description of Course	This course provides an explanation of the status and changes that occur in a population of fishery resources which include growth, mortality, recruitment, and various methods for estimating the abundance of fishery resources.	
Reference	1. Schaefer MB. 1954. Some aspects of the dynamics of populations important to the management of the commercial marine fisheries. La Jolla, California 2. Beverton RJH dan Holt SJ. 1957. On the Dynamics of Exploited Fish Populations. Fish Invest. London, Ser. 2, 19:533p.	

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3. Ricker WE. 1975. Computation and Interpretation of Biological Statistics of Fish Populations. J. Fish. Res. Board Can. Bulltein. 191.
4. Lackey RT dan Hubert WA. 1978. Analysis of Exploited Fish Population., Virginia Polytecniquers Institut and Univ. Blacksburg, Virginia
5. Pauly D. 1980. On the interrelation between natural mortality, growth parameter, and mean environmental temperature in 175 fish stock. Conseil International pour L'Exploration de la Mer. Journal du Conseil 39: 175-195.
6. Pauly D. 1984. Fish population dynamics in Tropical Waters: A manual for use with programmable calculator. ICLARM Studies and Reviews 8. Manila: International Center for Living Aquatic Resources Management. 325 p
7. King M. 1995. Fisheries biology, assessment, and management. Oxford (GB): Fishing News Books/Blackwell Scientific Books. 352p.
8. Sparre P dan Venema SC. 1998. Introduction to tropical fisheries stock assessment, Part I: Manual. Rome (IT): FAO Fisheries technical paper 306/1, Rev. 2. 407p.
9. Simmonds EJ & MacLennan DN. 2005. Fisheries Acoustics: Theopry and Practices, 2nd Ed. Blackwell Publishing, Oxford, 456 pp.
10. Gayanilo FC Jr, Sparre P, dan Pauly D. 2005. The FAO-ICLARM Stock Assessment Tools II (FiSAT II). Revised Version. User's Guide. FAO Comput. Inf. Ser. Fish. No. 8. 168p.
11. Ogle DH. 2016. Introductory fisheries analysis with R. Taylor & Francis Group. A Chapman and Hall Book, USA.

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LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Be able to explain the meaning of population dynamics and their function as exploitation controllers.	1. Study contract 2. Definition of fish population dynamics; definition of population and fish stock; other sciences related to population dynamics.	• Lectures • Active Knowledge Sharing	1,2,6,7	ZAI
2	Be able to explain the biological structure of resources and dynamic indicators of fishery resources.	1. Characteristics of Fishery Resources 2. Spatial and Temporal Biological Structure of Fishery Resources 3. Indicators of Dynamics of Fisheries Resources	• Lectures • Active Knowledge Sharing	1,2,6,7	ZAI
3,4	Able to explain the structure and age determination of fish resources.	1. Life table theory 2. Age structure, 3. Determination of the age of the fish	• Lectures • Active Knowledge Sharing	1,2,6,7	ZAI
5,6	Able to explain the concept and theory of growth estimation.	1. Growth Theory, 2. Growth prediction models, 3. Growth based on length, 4. Growth based on weight, 5. Growth of fish biomass	• Lectures • Active Knowledge Sharing	1,2,3,4,5,6, 7	AMR
7	Able to explain the concept and estimation of mortality.	1. Theory and types of mortality,	• Lectures	1,2,3,4,5,6, 7	AMR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		2. Estimation of total mortality, natural mortality, and mortality due to fishing	• Active Knowledge Sharing		
MIDTERM EXAM (UTS)					
8	Able to explain the concept and estimation of recruitment.	1. Recruitment theory 2. Recruitment prediction models	• Lectures • Active Knowledge Sharing	1,2,3,4,6,7, 8	RKN
9	Be able to explain the relationship between spawners and recruitment.	1. Spawner relationship with recruitment, 2. Recruitment relationship with yield	• Lectures • Active Knowledge Sharing	1,2,3,4,6,7, 8	RKN
10-11	Able to explain the concept of heat and its estimation.	1. Cohort theory and its estimation, 2. Virtual population analysis (VPA), 3. Cohort analysis	• Lectures • Active Knowledge Sharing • Journal reviews and presentations	1,2,3,4,6,7, 8	RKN
12-14		1. Concept and estimation of fish abundance, 2. Estimation of fish abundance with MTR, 3. Abundance estimation with Swept Area and acoustic.	• Lectures • Active Knowledge Sharing	1,2,3,4,6,7, 8,9	ZAI
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Using knowledge of calculus for Excel applications in simulating fish population dynamics models.	Introduction and Review of Calculus.	• Lecture • Active Knowledge Sharing • Practice	8	AAH
2	Using knowledge of Logarithms and Natural Logarithms for Excel applications in simulating models of fish population dynamics.	Logarithms and Natural Logarithms.	• Lecture • Active Knowledge Sharing	8	AAH
3	Using R programs and basic formulas.	1. How to install R program 2. Open command, read data, print data 3. Mathematical operations	• Lecture • Active Knowledge Sharing	8,11	AAH
4	Estimating the age and age structure of fish resources.	Age Determination and Age structure Analysis.	• Lecture • Active Knowledge Sharing	6,7,8	AAH
5,6	Using the growth method and predicting the growth of fish resources.	Model and growth parameters (von Bertalanffy method, Ford Walford method, Gulland Holt).	• Lecture • Active Knowledge Sharing	6,7,810	AMR
7	Be able to explain the types and models of predicting mortality.	Mortality model and estimation (catch curve, Beverton Holt method, Pauly formula).	• Lecture • Active Knowledge Sharing	6,7,810	AMR
MIDTERM EXAM (UTS)					

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8,9	Be able to explain the role of recruitment and recruitment estimation methods.	1. Spawner relationship with recruitment, 2. Recruitment relationship with yield	Problem Based Learning (PBL)	6,7,8,10	RKN
10,11	Able to explain and use cohort and virtual population analysis models.	VPA and Cohort Analysis.	Problem Based Learning (PBL)	6,7,8,10	RKN
12-14	Able to explain and use several population size estimation models used for fishery management inputs.	Fish abundance estimation with MTR, Swept Area, and acoustics.	• Lectures • Active Knowledge Sharing	1,2,3,4,6,7,8,9	ZAI
FINAL EXAMS (UAS)					

BOGOR AGRICULTURAL UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
DEPARTMENT OF RESOURCE MANAGEMENT (MSP)
BACHELOR PROGRAM

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
Model and Simulation of Aquatic Ecosystem	MSP1333	In-Depth Prodi Courses (IPC)	2	6	07-12- 2022

Teaching Team	Coordinator of Course	Member of Teaching Team
	Dr. Ir. Rahmat Kurnia, M.Si. (RKN)	1. Prof. Dr. Ir. Mennofatria Boer (MBR)

Learning Outcome (LO)		
	LO of Study Program assigned to course	
	LO 2	Solving problems of aquatic resources, fishery resources, and aquatic environment based on the principles of carrying capacity, conservation and sustainability.
	LO of Course	
	LO of Course	After attending this course students are able to: **1. Soft skills**: Have system thinking and mastery of technology applying simple models in aquatic ecosystems. **2. Hard skills**: simulate the model and understand the behavior of the model by using Excel, Stella, and R Program software.

Description of Course	This course provides an understanding of models and simulations and their role in fisheries. Next, the basic mass balance model, algae and zooplankton growth model, fish growth model, limiting factor behavior on growth, light relationship model with primary productivity, growth model, respiration and mortality of aquatic plants, biomass dynamics model, sedimentation model, are examined. lake phytoplankton and zooplankton models, fish biomass models in closed system waters, benthic population models in rivers, sea ranching models.
Reference	1. Spain JD. 1982. Basic Microcomputer Models in Biology. Addison-Wesley Publishing Company 2. Clark CW. 1985. Bioenomic Modelling and Fisheries Management. John Wiley & Sons. 3. Jorgensen SE. 1988. Fundamentals of Ecological Modelling. Elsevier.

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LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Explain the meaning of models, simulations, and their roles in understanding aquatic ecosystems.	1. Introduction, lecture contract 2. The meaning of the model 3. The meaning of simulation	• Lectures • Active Knowledge Sharing	1	RKN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		4. The role of models and simulations in understanding aquatic ecosystems			
2	Explain the processes in aquatic ecosystems.	1. Review of processes in aquatic ecosystems 2. Review the structure of the biological model	• Lectures • Active Knowledge Sharing	1	RKN
3	Understand and describe the principles of the aquatic ecosystem model.	1. The relationship between the model and the system 2. Learning with models	• Lectures • Active Knowledge Sharing	1	RKN
4	Explain and simulate the behavior of mass balance models.	Mass balance models.	• Lectures • Active Knowledge Sharing	1,2	RKN
5,6	Explain and simulate growth models.	1. Algae and zooplankton growth model 2. Fish growth model 3. Behavior of limiting factors on growth	• Lectures • Active Knowledge Sharing • Case presentation	1,2	RKN
7	Describe and simulate models related to primary productivity.	1. Model the relationship of light to primary productivity 2. Model of growth, respiration, and mortality of aquatic plants	• Lectures • Active Knowledge Sharing • Case presentation	1,2,4	RKN
MIDTERM EXAM (UTS)					

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Explain model behavior with graphs.	Graphical interpretation	• Lectures • Active Knowledge Sharing	1,3	MBR
9,10	Describe and simulate the multicomponent Biomass dynamics model.	Biomassa dynamics model	• Lectures • Active Knowledge Sharing	1,3	MBR
11	Describe and simulate the sedimentation model.	Sedimentation model	• Lectures • Active Knowledge Sharing • Journal reviews and presentations	1,3	MBR
12-14	Understanding and simulating a simple model of aquatic ecosystems.	1. Model of lake phytoplankton and zooplankton 2. Fish biomass model in closed system waters 3. Benthic population models in rivers 4. Model of sea ranching	• Lectures • Active Knowledge Sharing	1,3	MBR
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Understand the principles of derivatives and integrals in modeling.	Derivative and integral concept review.	• Lecture • Active Knowledge Sharing • Practice		RKN
2	Using Excel in simulating the model.	1. Basic formulas in Excel (sum, average, variance, etc.) 2. Creating graphs 3. Reading chart behavior 4. Changing parameter values of a graph	• Lecture • Active Knowledge Sharing		RKN
3-5	Using R programs and basic formulas.	1. How to install R program 2. Open command, read data, print data 3. Mathematical operations	• Lecture • Active Knowledge Sharing	5	RKN
6,7	Presenting models and simulations related to aquatic ecosystems.	Journal review	• Presentation • Discussion		RKN
MIDTERM EXAM (UTS)					
8	Understanding the multicomponent model and simulating it and interpreting the behavior of the model in the system being studied.	1. Introduction to PBL 2. Determination triggers 3. Dividing of tasks	Problem Based Learning (PBL)		MBR
9-12	Explain and simulate aquatic ecosystem models according to the specified lighter.	1. Study of the problem 2. Literature study of the appropriate model	Problem Based Learning (PBL)		MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		3. Discussion per group			
13-14	Simulating models of aquatic ecosystems and communicating them to others.	Presentation and dissemination of results.	Problem Based Learning (PBL)		MBR
FINAL EXAMS (UAS)					

BOGOR AGRICULTURAL UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
DEPARTMENT OF RESOURCE MANAGEMENT (MSP)
BACHELOR PROGRAM

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
Fish Stock Assessment	MSP1334	In-Depth Prodi Courses (IPC)	3	6	07-12- 2022

	Coordinator of Course	Member of Teaching Team
Teaching Team	Prof. Dr. Ir. Mennofatria Boer (MBR)	1. Dr. Ir. Rahmat Kurnia, M.Si. (RKN) 2. Prof. Dr. Ir. Luky Adrianto, M.Sc. (LAO)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO8	Able to apply the science of managing water resources, fishery resources, conservation, environment, and areas based on the principle of carrying capacity for the sustainable use of resources.
	LO of Course	
	LO of Course	After attending this course students are able to: 1. ***Softskill*:** Have system thinking and mastery of technology in describing the processes that make up the basic models that are relevant in the assessment of fish stocks. 2. ***Hardskill***: Applying relevant basic models in fish stock assessment using Excel and R Program software.
Description of Course	Status and changes that occur in a population of fishery resources which include growth, mortality, recruitment, and various methods for estimating the abundance of fishery resources, as well as the diversity of genetic resources.	
Reference	1. Gulland, J. A. 1983. Fish Stock Assessment. A Manual of Basic Method. FAO, VOL. 1, John Wiley and Sons. 2. Sparre, P. dan S. C. Venema. 1998. Introduksi Pengkajian Stok Ikan Tropis. Buku 1:Manual. FAO-Puslitbang Perikanan, Balitbang Pertanian Indonesia. 3. Ricker, W. E. 1975. Computation and Interpretation of Biological Statistics of Fish Population. J. Fish. Res. Board Can. Bulletin 191. 4. Clark, C. 1985. Fisheries Management : Bioeconomic Approach. John Wiley and Sons	

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LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1,2	Students are able to explain and use population counting methods based on virtual population methods or cohot analysis.	Virtual Population Analysis (VPA), Pope Cohort Analysis based on age and Jones cohort analysis based on length	• Lectures • Active Knowledge Sharing	1	MBR
3,4	Students are able to explain and use predictive models commonly used in fish stock assessments.	Assumptions and searches for the Beverton Holt model (Yield per Recruit, Biomass	• Lectures	1	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		per recruit, relative Yield per recruit), Yield per recruit from length data, Thomson and Bell models based on age and length.	• Active Knowledge Sharing		
5,6	Students are able to explain techniques for estimating maximum sustainable yield (MSY=Maximum Sustainable Yield) based on the Surplus Production Model.	The Surplus Production Model: • Schaefer and Fox models • Gulland and Cadima Formulas • Munro and Thompson Scatter Diagram • Standardization of Fishing Efforts • De Riso and Schnute models.	• Lectures • Active Knowledge Sharing	1,2	MBR
7	Students are able to explain techniques for considering and tracing problems of multiple species and or multiple gears.	Multiple species or multiple gears. Application of the surplus production model in multiple species or multiple gear systems.	• Lectures • Active Knowledge Sharing	1,2,4,5	MBR
MIDTERM EXAM (UTS)					
8,9	Students are able to explain techniques for considering and tracing problems of multiple species and or multiple gears.	Multiple species or multiple gears. • biological, economic and technical interactions, • multispecies interactions	• Lectures • Active Knowledge Sharing	1,3	RKN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
10,11	Students are able to explain techniques for studying migratory fish stocks.	Migratory fish stocks • Estimation techniques for migratory fish and possible biases, • assessment of migrating stocks based on the sign method • growth coefficient estimation technique	• Lectures • Active Knowledge Sharing	1,3	RKN
12,13	Students are able to explain techniques for estimating Maximum Sustainable Potential (MEY=Maximum Economic Yield) based on the Surplus Production Model.	Bioeconomic Models • Integration of economic parameters in the Surplus Production model	• Lectures • Active Knowledge Sharing	1,3	LAO
14	Students are able to explain the principles of stock management.	Stock Management • Harvest strategy and tactics • Optimization • Making Stock Assessment and Management Work	• Lectures • Active Knowledge Sharing	1,3	LAO
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain the importance of understanding the basics of fish stock assessment and their benefits in managing fishery resources.	Introduction: • Understanding and introduction to Microsoft Excel and R tools	• Lecture • Active Knowledge Sharing	1	MBR
2	Students are able to understand and explain and use population calculation methods based on virtual population methods or cohort analysis with the help of Microsoft Excel and R.	1. Virtual Population Analysis (VPA), 2. Analysis of the Pope Cohort by age and Jones cohort analysis by length.	• Lecture • Active Knowledge Sharing • Case Presentation	1	MBR
3,4	Students are able to explain and use Microsoft Excel and R tools for the calculations needed in predictive models commonly used in fish stock assessments.	Prediction Models • The Beverton Holt model (Yield per Recruit, Biomass per recruit, relative Yield per recruit), • Yield per recruit from long data, • Thomson and Bell models by life and length.	• Lecture • Active Knowledge Sharing • Case Presentation	1	MBR
5,6	Students are able to explain and use Microsoft excel and R in calculations used in techniques for estimating maximum sustainable yield (MSY=Maximum Sustainable Yield) based on the Surplus Production Model.	The Surplus Production Model • Schaefer and Fox models • Gulland and Cadima Formulas • Munro and Thompson Scatter Diagram • Standardization of Fishing Efforts	• Lecture • Active Knowledge Sharing • Case Presentation	1,2	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		• De Riso and Schnute models.			
7	Students are able to explain and apply Microsoft excel and R to the calculations needed in techniques for considering and tracing problems of multiple species and or multiple gears.	• Multiple species or multiple gears. • Application of the surplus production model in multiple species or multiple gear systems	• Activities in the field • Active Knowledge Sharing	1,2,4	MBR
MIDTERM EXAM (UTS)					
8,9	Students are able to explain techniques for considering and tracing problems of multiple species and or multiple gears.	Multiple species or multiple gears. • biological, economic and technical interactions, • multispecies interactions	• Lecture • Active Knowledge Sharing • Case Presentation	1,3	RKN
10,11	Students are able to explain and apply Microsoft excel and R in calculating migratory fish stock assessment techniques.	Migratory fish stocks • Estimation techniques for migratory fish and possible biases, • assessment of migrating stocks based on the sign method • growth coefficient estimation technique	• Lecture • Active Knowledge Sharing • Case Presentation	1,3	RKN
12,13	Students are able to explain and use Microsoft Excel and R in calculating the techniques for estimating the Maximum Sustainable Potential (MEY=Maximum Economic Yield) based on the Surplus Production Model.	Bioeconomic Models • Integration of economic parameters in the Surplus Production model	• Lecture • Active Knowledge Sharing • Case Presentation	1,3	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
14	Students are able to explain the principles of stock management.	Stock Management • Harvest strategy and tactics • Optimization • Making Stock Assessment and Management Work	• Lecture • Active Knowledge Sharing • Case Presentation	1,3	LAO
FINAL EXAMS (UAS)					

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**BOGOR AGRICULTURAL UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **DEPARTMENT OF RESOURCE MANAGEMENT (MSP)** **BACHELOR PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
Aquatic Resources Information System	MSP1335	In-Depth Prodi Courses (IPC)	3	6	07-12- 2022

	Coordinator of Course	Member of Teaching Team
Teaching Team	Prof. Dr. Ir. Mennofatria Boer (MBR)	1. Dr. Ir. Rahmat Kurnia, M.Si. (RKN) 2. Dr. Fery Kurniawan, S.Kel., M.Si. (FRK)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO8	Able to apply procedures for compiling information systems and their use in the management of aquatic resources.
	LO of Course	
	LO of Course	After completing this course students can create and use information systems in the management of aquatic resources.
Description of Course	The role of data and information and the systems that shape it. Procedures for establishing a water resources information system (system user requirements, algorithms and programming). Spatial and temporal verification and validation of information systems for the purposes of sustainable management of aquatic resources.	
Reference	1. Charles, Anthony T. 2001. *Sustainable Fishery Systems*. London: Blackwell Science. 365 pp. 2. Djojodihardo, Harjono. 1984. *Pengantar Sistem Komputer*. Erlangga. Jakarta. 3. Stoehr, Thomas. 2002. *Managing e-bussines*. Springer Verlag. Berlin. 4. Marker, David. 2002. *Model Theory: An Introduction*. Springer-Verlag, ISBN 0-387-98760-6 5. Berry, JK. 1993. *Beyond Mapping: Concepts, Algorithms, and Issues in GIS*. USA, GIS World Inc. 6. Davis, BE. 2001. *GIS: A Visual Approach*. 2nd edition. Word Press, Canada. 7. Demers, MN. 2000. *Fundamentals of Geographical Information Systems*. 2nd edition. USA, John Wiley & Sons Inc.	
	Assessment of Learning Outcomes	**Final Assessment**

	Basis of Evaluation	Percentage (%)	Description	Quality Value	Range of Value
Learning Evaluation (Rubric)	Participatory Activities (Attendance and activeness in class)	10	Attendance in class and activeness in discussions.	A AB B BC C D E	Value ≥ 80 75 ≤ Value < 80 70 ≤ Value < 75 65 ≤ Value < 70 60 ≤ Value < 65 55 ≤ Value < 60 < 55
	Result of Project	20	Reports, papers, journal reviews.		
	Task	-			
	Quiz	-			
	Midterm exam	35	Includes lectures and practicum meeting 1-7.		
	Final exams	35	Includes lectures and practicum meeting 8-14.		

LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students can explain the basics of information systems.	Introduction: Information systems approach in the management of aquatic resources.	• Lectures • Active Knowledge Sharing	1,2	MBR
2	Students are able to explain and use predictive models commonly used in fish stock assessments.	Students can explain the system of water resources.	• Lectures • Active Knowledge Sharing	1	MBR
3	Students can explain aspects of information systems.	Analysis of information system aspects: hardware,	• Lectures • Active Knowledge Sharing	1,2	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		software, brainware, netware.			
4,5	Students can explain programming algorithms.	Algorithms and Programming: Algorithms and flowcharts; Basic (Basica, Qbasic) and advanced programming languages.	• Lectures • Active Knowledge Sharing • Case Presentation	4,5	MBR
6-8	Students can explain the use of visual basic programs.	Introduction to information systems with visual basic: Steps to create an information system with visual basic.	• Lectures • Active Knowledge Sharing • Case Presentation	4,5	RKN
MIDTERM EXAM (UTS)					
9,10	Students can explain network-based information systems.	Network-based information systems: Network architecture and its use in aquatic resource management.	• Lectures • Active Knowledge Sharing	3	RKN
11-13	Students can explain the basis of technology and the use of geographic information systems.	Mapping aquatic resources with remote sensing: Remote sensing technology; Use of Geographic Information Systems in the management of aquatic resources.	• Lectures • Active Knowledge Sharing	5,6,7	FRK

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
14	Students can explain the management of information system installations.	Information system installation management: Management of physical facilities, installations, and security.	• Lectures • Active Knowledge Sharing • Journal Review	5,6,7	FRK
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students receive material and practicum time shifts.	Introduction: Practicum material and timing; Practicum materials, procedures and practicum time rotation.	• Lecture • Active Knowledge Sharing	1,2	MBR
2	Students can make details of aquatic resource systems.	Aquatic resources system analysis: Water resources sub-system: ecology, technology, economy, social, institutional.	• Lecture • Active Knowledge Sharing	1	MBR
3	Students can create and explain detailed aspects of information systems.	Analysis of information system aspects: hardware, software, brainware, netware.	• Lecture • Active Knowledge Sharing	1,2	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
4,5	Students can create algorithms and programming flowcharts.	Algorithms and Programming: Algorithms and flowcharts; Basic (Basica, Qbasic) and advanced programming languages.	• Lecture • Active Knowledge Sharing • Case Presentation	4,5	MBR
6-8	Students can create and use visual basic programs.	Introduction to information systems with visual basic: Steps to create an information system with visual basic.	• Activities in the field • Active Knowledge Sharing • Case Presentation	4-5	RKN
MIDTERM EXAM (UTS)					
9,10	Students can explain network-based information systems.	Network-based information systems: Network architecture and its use in aquatic resource management.	• Lecture • Active Knowledge Sharing	3	RKN
11-13	Students can explain the basis of technology and the use of geographic information systems.	Mapping water resources with remote sensing: Remote sensing technology; Use of Geographic Information Systems in the management of water resources.	• Lecture • Active Knowledge Sharing	5,6,7	FRK
14	Students can explain the management of information system installations.	Information system installation management: Management of physical	• Lecture • Active Knowledge Sharing • Journal Review	5,6,7	FRK

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		facilities, installations, and security.			
FINAL EXAMS (UAS)					

BOGOR AGRICULTURAL UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
DEPARTMENT OF RESOURCE MANAGEMENT (MSP)
BACHELOR PROGRAM

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
AQUATIC RESOURCES SPATIAL SYSTEM	MSP1336	In-Depth Prodi Courses (IPC)	3	6	07-12- 2022

Teaching Team	Coordinator of Course	Member of Teaching Team
	Dr. Fery Kurniawan, S.Kel., M.Si. (FRK)	1. Dr. Ir. Gatot Yulianto (GYO)

Learning Outcome (LO)	LO of Study Program assigned to course	
	LO1	▪ Demonstrate a responsible attitude towards work in the field of expertise independently. ▪ Internalize ecological and social values, norms and ethics in identifying, analyzing, planning and evaluating aquatic resource management based on the system. ▪ Applying the system concept in solving the problem of spatial complexity of aquatic resources in programming. ▪ Appreciate the diversity of aquatic resources. ▪ Contributing to the improvement of technology and information in society, nation, state, and progress of civilization.
	LO2	▪ Develop aquatic systems, fisheries, and aquatic resources based on spatial and temporal. ▪ Applying knowledge of information systems in spatial management of aquatic resources. ▪ Analyzing water resources with integrated and sustainable oriented principles in the development of aquatic resource management based on spatial systems. ▪ Evaluate various tools and systems that can enhance technological advances for sustainable management of aquatic resources. ▪ Creating and developing aquatic resource information system algorithms temporally and spatially. ▪ Building linkages between variables in the analysis of aquatic resource systems based on the analysis of geographic information system aspects.
	LO3	Operate spatial software for aquatic resource systems.

	LO4	Creating and modifying spatial data algorithms, spatial data analysis, spatial modeling, and spatial planning of water areas.
	LO of Course	
	LO of Course	After attending this course students are able to: 1. ***Softskill*:** a. Identify and establish interrelationships between variables in the analysis of the spatial system of water resources. b. Understand and analyze aspects of spatial systems. c. Modify, build, and develop algorithms and spatial data analysis using software. d. Choose and combine methodologies according to the needs of a geographic information system for aquatic resources. e. Get to know and create spatial-based information systems. f. Recognize, understand, and analyze spatial data on aquatic resources. 2. ***Hardskill***: a. Applying, analyzing, and visualizing water resources spatial information systems. b. Designing a spatial plan for water resources management.
		▪ Identify the spatial variables in the aquatic resource system. ▪ Establish linkages between spatial variables in the analysis of aquatic resource systems. ▪ Understand spatial information systems. ▪ Analyze aspects of the spatial system. ▪ Modifying algorithms and spatial data analysis using software. ▪ Develop algorithms and spatial data analysis using software. ▪ Develop algorithms and spatial data analysis using software. ▪ Choose a methodology according to the needs of a geographic information system for aquatic resources. ▪ Combine methodologies according to the needs of geographic information systems for aquatic resources. ▪ Get to know spatial-based information systems. ▪ Creating a spatial based information system. ▪ Get to know the spatial data of aquatic resources. ▪ Understanding spatial data on aquatic resources. ▪ Analyze spatial data on aquatic water resources. ▪ Applying a spatial information system for aquatic resources. ▪ Analyzing spatial information systems for the distribution of aquatic resources. ▪ Visualize the spatial information system for the distribution of aquatic resources. ▪ Designing a spatial plan for aquatic resources management.
Description of Course	The Aquatic Resources Spatial System course studies science and technology about measuring, mapping, and visualizing aquatic resources. This science and technology is also known as geomatics. Based on existing developments, decision-making for the management	

	of aquatic resources requires accurate, up-to-date and integrated data and information. Integration of water resources data and information that is so extensive requires a complex system, so it is necessary to use information system computing. The development of the phenomenon of water resource management and information technology is so fast and dynamic, that it demands fisheries stakeholders to also react quickly. Therefore, this course also studies basic theory and application of the basic principles of spatial systems, spatial data, spatial analysis (spatial mathematics and statistics, heterogeneity, and connectivity), spatial modeling, and spatial planning (based on characteristics and status resources and area and land suitability analysis) for aquatic resources.
Reference	1. Ahmed, Z.U., Krupnik, T.J., Kamal, M., 2018. Introduction to basic GIS and spatial analysis using QGIS: Applications in Bangladesh. Cereal Systems Initiative for South Asia (CSISA) and the International Maize and Wheat Improvement Center, CIMMYT. Dhaka, Bangladesh. 2. Fletcher, R., Fortin, M-J., 2018. Spatial Ecology and Conservation Modeling: Applications with R. Springer. https://doi.org/10.1007/978-3-030-01989-1. 3. Guissan, A., Thuiller, W., Zimmermann, N.E., 2017. Habitat Suitability and Distribution Models: With Applications in R. Cambridge University Press. https://doi.org/10.1017/9781139028271. 4. Lauria, V., Gristina, M., Fiorentino, F., Attrill, M.J., Garofalo, G., 2020. Spatial management units as an ecosystem-based approach for managing bottom-towed fisheries in the Central Mediterranean Sea. Frontier in Marine Science, 7:233., https://doi.org/10.3389/fmars.2020.00233. 5. Metternicht, G., 2018. Land Use and Spatial Planning: Enabling Sustainable Management of Land Resources. Springer. https://doi.org/10.1007/978-3-319-71861-3. 6. Scholten, T., Hartmann, T., Spit, T., 2020. The spatial component of integrative water resources management: differentiating integration of land and water governance. International Journal of Water Resources Development, 36:5, 800-817, https://doi.org/10.1080/07900627.2019.1566055. 7. Thakur, J.K., Singh, S.K., Ramanathan, A., Prasad, M.B.K., Gossel, W. (Eds.), 2011. Geospatial Techniques for Managing Environmental Resources. Springer. 8. Zhou, X-Y., 2019. Spatial explicit management for the water sustainability of coupled human and natural systems. Environmental Pollution, 251, 292-301, https://doi.org/10.1016/j.envpol.2019.05.020.

Learning Evaluation (Rubric)

Assessment of Learning Outcomes			Final Assessment	
Basis of Evaluation	**Percentage (%)**	**Description**	**Quality Value**	**Range of Value**
Participatory Activities	5	Assessment of attitudes, skills, and active participation is assessed during the learning and discussion process, both individually and in groups.	A AB B BC C D	Value ≥ 80 75 ≤ Value < 80 70 ≤ Value < 75 65 ≤ Value < 70 60 ≤ Value < 65 55 ≤ Value < 60

	Result of Project	-	Students in groups and/or individually get assignments to repeat and apply the material/studies that have been received. Assessment evaluation is carried out using two methods, for groups assessed through presentations in class based on presentation skills, collaboration, and how to answer/respond to questions/comments, while individually assessed based on reports made.	E	< 55
	Practicum Exam	15			
	Practicum Report	10			
	Cognitive/Knowledge	-			
	Task	5	Students, both individually/groups, carry out structured assignments to increase students' knowledge and understanding of material/study material related to the material from each supporting lecturer.		
	Quiz	5	Students individually work on questions to evaluate students' knowledge and understanding of study materials/materials based on learning topic groups.		
	Midterm exam	30	Students individually work on exam questions to evaluate student knowledge and understanding of the		

			material/study material at meetings 1 to 7.		
	Final exams	30	Students individually work on exam questions to evaluate student knowledge and understanding of the material/study material at meetings 8 to 14.		

LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand the basic principles of spatial systems, namely: - Understand learning objectives - Explain the meaning of spatial systems - Describe the spatial function	1) Introduction to lectures: introduction and lecture contracts 2) Introduction: - understanding of spatial systems - software in spatial analysis	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		FRK
2	Students are able to understand water resources in a spatial system perspective, namely: - Illustrates water resources spatially - Associating spatial systems with water resources	1) Spatial distribution of water resources 2) Application of spatial systems in the management of water resources - Ecosystem	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge		FRK

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		- Fisheries	• Sample case		
3	Students are able to build data and apply spatial algorithms: Spatial quantification 1, namely: - Understand types and spatial data - Generate spatial data	1) Types of spatial data (vector and raster) 2) Spatial data algorithm	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		FRK
4	Students are able to analyze spatially for space utilization: Spatial quantification 2, namely: - Determines the spatial scale - Analyze suitability for space utilization - Analyze space utilization priorities	1) Type of spatial scale 2) Parameters used 3) Giving scores and weights of each parameter used 4) Priority in decision making	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		FRK
5	Students are able to make spatial variable weights: Spatial quantification 3, namely: - Determine the weight based on expert justification - Determine the weight of the regression model - Determine the weight using the arifmetric approach	1) Weighting using expert justification 2) Weighting using regression models 3) Weighting using arifmetric	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		FRK
6	Students are able to analyze patterns and spatial changes, namely: - Analyze spatial patterns and changes	1) Patterns and spatial changes: - resource zoning	• Face to Face/ Online/ Hybrid • Lectures		FRK

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
	- Determine the factors that influence spatial patterns and changes	- habitat quality - land-use/cover 2) Factors influencing patterns and changes	• Discussion/ Methods of exchanging knowledge • Sample case		
7	Students are able to understand and explain the application of molecular biology in genetic conservation and biodiversity.	1) Application of spatial algebra 2) Application of spatial statistics 3) Assessment of spatial heterogeneity 4) Assessment of spatial connectivity	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		FRK
MIDTERM EXAM (UTS)					
8	Students are able to understand the basic principles of spatial planning, namely: - Describe the basic concept of planning - Describe the planning components	1) The basic concept of planning, both in terms of resources and area 2) Planning components	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		GYO
9	Students are able to understand the function and position of spatial planning of aquatic resources in spatial planning, namely: - Explain the function of spatial planning - Discuss the position of spatial planning	1) Spatial planning function 2) The position of spatial planning	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of		GYO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
			exchanging knowledge • Sample case		
10	Students are able to apply spatial planning processes, namely: - Describe the technocratic planning process - Describe the technocratic planning process	1) Technocratic planning process 2) Participatory planning process	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		GYO
11	Students are able to plan water resources spatially (1), namely: - Build a conservation area - Arrange conservation area functions	1) Spatial planning for conservation areas 2) The function of conservation areas in spatial planning	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		GYO
12	Students are able to plan water resources spatially (2), namely: - Build a public use area - Arrange the functions of the public utilization area	1) Spatial planning for public use 2) General utilization function in spatial planning	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		GYO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
13	Students are able to formulate spatial planning for water areas (1), namely: - Understand the function of the structure and pattern of space - Planning the allocation of structure and spatial patterns	1) Allocation of spatial structure 2) Allocation of spatial patterns	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		GYO
14	Students are able to formulate spatial planning for water areas (2), namely: - Making plans and strategies for the allocation of water resources	1) Planning and strategy for spatial allocation of water resources (activities, programs, etc.) 2) Cover	• Face to Face/ Online/ Hybrid • Lectures • Discussion/ Methods of exchanging knowledge • Sample case		GYO
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to recognize the tools used to understand the spatial system of water resources	1) Introduction to the practicum of the spatial system of water resources 2) Practicum contract 3) Software installation 4) Introduction to spatial software	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		FRK
2	Students are able to generate, manage, and visualize spatial data on aquatic resources	1) Generating spatial data 2) Spatial data management 3) Visualize data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		FRK
3	Students are able to interpolate and reclassify spatial data on aquatic resources	1) Spatial data interpolation using IDW (Inverse Distance Weighted) 2) Reclassification of spatial data 3) Visualize data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		FRK
4	Students are able to analyze spatially for the use of activity thematic space (1)	1) Analysis of land suitability for the use of money:	• Face to Face/ Online/ Hybrid		FRK

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		ecotourism, fisheries, and others 2) Visualize data and results spatially	• Lectures • Sample case • Hands-on practice and simulation using hardware and software		
5	Students are able to analyze spatially for the use of activity thematic spaces (2)	1) Building spatial vector data 2) Analysis of vector data for land suitability 3) Visualizing data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		FRK
6	Students are able to analyze spatially for the utilization of activity thematic space (3)	1) Build spatial raster data 2) Raster data analysis for land suitability 3) Visualize data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		FRK
7	Students are able to analyze heterogeneity and spatial connectivity	1) Analysis of heterogeneity and connectivity using FragStat 2) Visualizing data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation		FRK

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
			using hardware and software		
MIDTERM EXAM (UTS)					
8	Students are able to arrange parameter weights in the spatial system of aquatic resources (1)	1) Spatial Multi Criteria Evaluation 2) Mechanism of Weighting Using AHP 3) Visualize data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		GYO
9	Students are able to arrange parameter weights in the spatial system of aquatic resources (2)	1) Using an application to compile weights 2) Analysis using case examples 3) Visualizing data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		GYO
10	Students are able to analyze spatially statistically	1) Density analysis: for example the emergence of megafauna 2) Visualize data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		GYO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	Students are able to plan space allocation based on zoning (1)	1) Common utilization zone 2) Visualize data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		GYO
12	Students are able to plan space allocation based on zoning (2)	1) Common utilization zoning: Self-simulation 2) Visualize data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		GYO
13	Students are able to analyze spatial autocorrelation	1) Autocorrelation analysis using Global Moran's Index 2) Visualizing data and results spatially	• Face to Face/ Online/ Hybrid • Lectures • Sample case • Hands-on practice and simulation using hardware and software		GYO
14	Students are able to evaluate and internalize in general the interactions between populations and ecosystems	1) Practicum evaluation 2) Closing	• Face to Face/ Online/ Hybrid • Lectures • Sample case		GYO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
			• Hands-on practice and simulation using hardware and software		
FINAL EXAMS (UAS)					

BOGOR AGRICULTURAL UNIVERSITY
FACULTY OF FISHERIES AND MARINE SCIENCES
DEPARTMENT OF RESOURCE MANAGEMENT (MSP)
BACHELOR PROGRAM

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
Services and Valuation of Aquatic Ecosystem	MSP1337	Academic Core Courses (ACC)	3	6	07-12- 2022

Teaching Team	Coordinator of Course	Member of Teaching Team
	Prof. Dr. Ir. Luky Adrianto, M.Sc. (LAO)	1. Dr. Ir. Gatot Yulianto, M.Si. (GYO)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO2	Decide on a management model for resources, ecosystems, environment and water areas based on the principles of carrying capacity, conservation and sustainability.
	LO of Course	
	LO of Course	After attending this course students are able to: 1. ***Softskill*:** Able to identify aquatic ecosystem services and use basic valuation techniques. 2. ***Hardskill***: -
Description of Course	This course contains knowledge of basic theories and techniques for valuing aquatic ecosystem services. This course provides a comprehensive understanding of the typology of aquatic ecosystem services and their characteristics which include provisioning services, cultural services, regulatory services, and supporting services. Furthermore, this Constitutional Court also presents the basic theory and techniques of valuation according to each type of ecosystem service with case studies for aquatic ecosystems.	
Reference	1. Adrianto, L. 2006. Pengantar Penilaian Ekonomi Sumberdaya Pesisir dan Lautan. PKSPL-IPB. Bogor, Indonesia 2. Barbier, E., M. Acreman, and D. Knowler. 1997. Economic Valuation of Wetland. IUCN. 3. Reading scientific papers/articles in journals that are relevant to the lecture topic.	

	Assessment of Learning Outcomes			Final Assessment	
	Basis of Evaluation	**Percentage (%)**	**Description**	**Quality Value**	**Range of Value**
Learning Evaluation (Rubric)	Participatory Activities (Attendance and activeness in class)	20	Percentage of attendance and activeness in class	A AB B BC C D E	Value ≥ 80 75 ≤ Value < 80 70 ≤ Value < 75 65 ≤ Value < 70 60 ≤ Value < 65 55 ≤ Value < 60 < 55
	Result of Project	20	Practicum Assessment		
	Task	-			
	Quiz	-			
	Midterm exam	30	Covers lecture material 1-7		
	Final exams	30	Covers lecture material 8-14		

LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand aquatic ecosystems, aquatic ecosystem services and the importance of evaluating aquatic ecosystem services.	1. Characteristics of aquatic ecosystems in the context of ecosystem services 2. Typology of aquatic ecosystem services	• Lectures • Active Knowledge Sharing	2	GYO
2	Students are able to understand and explore the meaning of economic value and the classification of economic value of ecosystem services/environmental services.	1. Definition of economic value 2. Classification of the economic value of ecosystem services	• Lectures • Active Knowledge Sharing	2	GYO
3	Students are able to understand the value of market- and non-market-based ecosystem services.	1. Market economic value 2. Non-market economic value	• Lectures • Active Knowledge Sharing	1	GYO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
4	Students are able to understand the method of valuing aquatic ecosystem services.	1. Direct assessment method 2. Indirect assessment method	• Lectures • Active Knowledge Sharing	1,2	GYO
5	Students are able to understand and estimate the value of cultural ecosystem services.	1. Typology of cultural ecosystem services 2. Cultural ecosystem service valuation approach 3. Case studies	• Lectures • Active Knowledge Sharing	1,2	GYO
6	Students are able to understand and estimate the economic value of existence ecosystem services.	1. Definition of the existence value of ecosystem services 2. Existence ecosystem service valuation approaches and models	• Lectures • Active Knowledge Sharing	5	GYO
7	Students are able to understand and estimate the economic value of losses from degradation of aquatic ecosystems/environments.	1. Problems of aquatic ecosystem/environment degradation 2. Approach and method of economic assessment of aquatic environmental degradation	• Lectures • Active Knowledge Sharing	1,2	GYO
MIDTERM EXAM (UTS)					

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Students are able to understand and explain the valuation approach of aquatic ecosystem services based on ecological-economic models.	1. Introduction to ecological-economic theory for the valuation of aquatic ecosystem services 2. An ecological economics approach to the valuation of aquatic ecosystem services	• Lectures • Active Knowledge Sharing	1	LAO
9	Students are able to understand and estimate mangrove ecosystem services - production market approach.	1. Production approach in mangrove ecosystems valuation 2. Survey methodology for evaluating mangrove ecosystem services using a market approach	• Lectures • Active Knowledge Sharing	1,2	LAO
10	Students are able to understand and estimate the economic value of mangrove ecosystem services - non-market approach.	1. Typology of non-market mangrove ecosystem services 2. Methods and approaches to valuing non-market mangrove ecosystem services 3. Case studies	• Lectures • Active Knowledge Sharing	1,2,3	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
11	Students are able to understand and estimate the economic value of seagrass ecosystem services - production approach.	1. Typology of seagrass ecosystem services 2. Methods and approaches to valuing seagrass ecosystem services - production approach	• Lectures • Active Knowledge Sharing	1,2,3	LAO
12	Students are able to understand and estimate the economic value of seagrass ecosystem services - non-market approach.	1. Typology of non-market value of seagrass ecosystem services - carbon regulation services 2. Approach and discourse on the carbon value of seagrass ecosystem services	• Lectures • Active Knowledge Sharing	1,2,3	LAO
13	Students are able to understand and explain the framework for evaluating aquatic ecosystem services using the benefit transfer approach (1).	1. Theory and concept of benefit transfer in the valuation of aquatic ecosystem services (Lecturer 13) 2. Assumptions that need to be fulfilled in the use of the benefit transfer method in the valuation of aquatic ecosystem services	• Lectures • Active Knowledge Sharing	1,2,3	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
14	Framework for assessing aquatic ecosystem services using the benefit transfer approach (2).	1. Benefit transfer methodology approach in valuing aquatic ecosystem services 2. Several examples of benefit transfer techniques in the valuation of aquatic ecosystem services	• Lectures • Active Knowledge Sharing	1,2,3	LAO
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand aquatic ecosystems, aquatic ecosystem services and the importance of evaluating aquatic ecosystem services.	1. Characteristics of aquatic ecosystems in the context of ecosystem services 2. Typology of aquatic ecosystem services	• Lecture • Active Knowledge Sharing	2	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
2	Students are able to understand and explore the meaning of economic value and the classification of economic value of ecosystem services/environmental services.	1. Definition of economic value 2. Classification of the economic value of ecosystem services	• Activities in the field • Active Knowledge Sharing	2	LAO
3	Students are able to understand the value of market- and non-market-based ecosystem services.	1. Market economic value 2. Non-market economic value	• Activities in the laboratory • Active Knowledge Sharing	1	LAO
4	Students are able to understand the method of valuing aquatic ecosystem services.	1. Direct assessment method 2. Indirect assessment method	• Activities in the laboratory • Active Knowledge Sharing	1,2	LAO
5	Students are able to understand and estimate the value of cultural ecosystem services.	1. Typology of cultural ecosystem services 2. Cultural ecosystem service valuation approach 3. Case studies	• Activities in the laboratory • Active Knowledge Sharing	1,2	LAO
6	Students are able to understand and estimate the economic value of existence ecosystem services.	1. Definition of the existence value of ecosystem services 2. Existence ecosystem service valuation approaches and models	• Activities in the laboratory • Active Knowledge Sharing	5	LAO
7	Students are able to understand and estimate the economic value of losses from degradation of aquatic ecosystems/environments.	1. Problems of aquatic ecosystem/environment degradation	• Activities in the laboratory	1,2	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		2. Approach and method of economic assessment of aquatic environmental degradation	• Active Knowledge Sharing		
MIDTERM EXAM (UTS)					
8	Students are able to understand and explain the valuation approach of aquatic ecosystem services based on ecological-economic models.	1. Introduction to ecological-economic theory for the valuation of aquatic ecosystem services 2. An ecological economics approach to the valuation of aquatic ecosystem services	• Activities in the laboratory • Active Knowledge Sharing	1	LAO
9	Students are able to understand and estimate mangrove ecosystem services - production market approach.	1. Production approach in mangrove ecosystems valuation 2. Survey methodology for evaluating mangrove ecosystem services using a market approach	• Activities in the laboratory • Active Knowledge Sharing	1,2	LAO
10	Students are able to understand and estimate the economic value of mangrove ecosystem services - non-market approach.	1. Typology of non-market mangrove ecosystem services 2. Methods and approaches to valuing non-market mangrove ecosystem services	• Activities in the laboratory • Active Knowledge Sharing	1,2,3	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		3. Case studies			
11	Students are able to understand and estimate the economic value of seagrass ecosystem services - production approach.	1. Typology of seagrass ecosystem services 2. Methods and approaches to valuing seagrass ecosystem services - production approach	• Activities in the laboratory • Active Knowledge Sharing	1,2,3	LAO
12	Students are able to understand and estimate the economic value of seagrass ecosystem services - non-market approach.	1. Typology of non-market value of seagrass ecosystem services - carbon regulation services 2. Approach and discourse on the carbon value of seagrass ecosystem services	• Activities in the laboratory • Active Knowledge Sharing	1,2,3	LAO
13	Students are able to understand and explain the framework for evaluating aquatic ecosystem services using the benefit transfer approach (1).	1. Theory and concept of benefit transfer in the valuation of aquatic ecosystem services (Lecturer 13) 2. Assumptions that need to be fulfilled in the use of the benefit transfer method in the valuation of aquatic ecosystem services	• Activities in the laboratory • Active Knowledge Sharing	1,2,3	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
14	Framework for assessing aquatic ecosystem services using the benefit transfer approach (2).	1. Benefit transfer methodology approach in valuing aquatic ecosystem services 2. Several examples of benefit transfer techniques in the valuation of aquatic ecosystem services	• Activities in the laboratory • Active Knowledge Sharing	1,2,3	LAO
FINAL EXAMS (UAS)					

INSTITUT PERTANIAN BOGOR
PROGRAM STUDI S1
MANAJEMEN SUMBERDAYA PERAIRAN (MSP)

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World

MSP | Departemen Manajemen Sumberdaya Perairan
Fakultas Perikanan dan Ilmu Kelautan (FPIK)

RENCANA PEMBELAJARAN SEMESTER-*SEMESTER LEARNING PLAN*

MATA KULIAH (MK) *Course*	**KODE** *Code*	**RUMPUN MK** *Course Cluster*	**BOBOT (sks)** *Credits*	**SEMESTER**	**TANGGAL PENYUSUNAN** *Preparation Date*
Seminar (***Seminar***)	MSP1402	**Tugas Tahun Terkhir-Wajib** ***Final Year's Project-Mandatory***	1 ***1.44 ESCT***	8	

Pengasuh (*Lecturer*)	**Koordinator MK**	**Tim Pengajar**
	Pembimbing Skripsi (Ketua)-***Coordinator of Supervisor***	Pembimbing Skripsi (Anggota)-***Member of Supervisor***

Capaian Pembelajaran (CP) ***Learning Outcome*** **(LO)**		
	CPL-PRODI yang dibebankan pada MK – *LO of Study Program*	
	LO5	Menerapkan ilmu pengelolaan sumberdaya perairan, sumberdaya perikanan, konservasi, lingkungan, dan kawasan berdasarkan prinsip daya dukung untuk keberlanjutan pemanfaatan sumberdaya ***Apply the science of management of aquatic resources, fisheries resources, conservation, environment, and areas based on the principle of carrying capacity for sustainable use of resources***
	Capaian Pembelajaran Mata Kuliah (CPMK)-LO of Course	
	CPMK LO-C	Setelah menyelesaikan seminar, mahasiswa akan mampu melakukan penyajian ilmiah secara lisan di hadapan berbagai forum seminar ilmiah, melalui penyajian ringkasan seminar, tayangan presentasi, presentasi oral yang ditujukan kepada peserta seminar, baik yang berasal dari PS MSP maupun dari PS lain, yang diawasi dan dinilai oleh para Pembimbing Tugas Akhir dan Dosen Perwakilan PS - ***After completing the seminar, students will be able to make oral scientific presentations in front of various scientific seminar forums, through the presentation of seminar summaries, presentation impressions, oral presentations addressed to***

		seminar participants, both from MSP Study Program and from other Study Programs, which are supervised and assessed by Final Project Supervisors and Study Program Representative Lecturers
Prasyarat - *Prerequisite*	1. mahasiswa aktif program sarjana (S1) - ***active undergraduate students (S1)*** 2. Mahasiswa telah mencantumkan mata kuliah skripsi dan seminar dalam KRS pada semester berjalan - ***Students have listed thesis and seminar courses in KRS in the current semester*** 3. Mahasiswa telah menyelesaikan penelitian dan penyusunan draf skripsi - ***Students have completed research and thesis drafting*** 4. Mahasiswa telah berkonsultasi dengan dosen pembimbing tugas akhir, masing-masing sekurang-kurangnya lima kali, dibuktikan dengan pengisian buku kendali akademik (bagian konsultasi tugas akhir) - ***Students have consulted with the final project supervisor, each at least five times, as evidenced by filling out the academic control book (final project consultation section)*** 5. Mahasiswa telah mengikuti atau menghadiri seminar mahasiswa sedikitnya 10 kali di Program Studi yang bersangkutan dan tiga kali di masing-masing Program Studi lain yang ada di lingkungan FPIK-IPB, yang ditandai dengan bukti kehadiran pada Kartu Seminar - ***Students have attended or attended student seminars at least 10 times in the relevant Study Program and three times in each of the other Study Programs within FPIK-IPB, which is marked by proof of attendance on the Seminar Card*** 6. Mahasiswa menyiapkan berkas-berkas yang harus disertakan pada saat pendaftaran seminar untuk diperiksa oleh bagian akademik departemen (FRM belum dibuat) yang meliputi: a. Menyiapkan fotokopi SPP semester berjalan. b. Menyiapkan fotokopi tanda bukti penyerahan proposal ke departemen. c. Melengkapi buku kendali akademik. d. Menyiapkan kartu seminar yang telah memenuhi ketentuan. e. Menyiapkan Kartu Studi Mahasiswa (KSM), untuk ditandatangani oleh pemimpin seminar. f. Menyiapkan draf skripsi yang disetujui oleh pembimbing, ditandai dengan paraf pembimbing utama. g. Menyiapkan ringkasan seminar, maksimal empat halaman (dua lembar bolak-balik), yang telah disetujui dan diparaf oleh dosen pembimbing utama. ***Students prepare files that must be included during seminar registration to be examined by the academic department (FRM has not been created) which include:*** ***a. Prepare a photocopy of the current semester's tuition fee.***	

	b. Prepare a photocopy of proof of submission of the proposal to the department. ***c. Complete the academic control book.*** ***d. Prepare seminar cards that have met the requirements.*** ***e. Prepare a Student Study Card (KSM), to be signed by the seminar leader.*** ***f. Prepare a draft thesis approved by the supervisor, marked by the main supervisor's paraf.*** ***g. Prepare a seminar summary, a maximum of four pages (two alternating sheets), which has been approved and prepared by the main supervisor***.
Deskripsi MK ***Course Description***	Suatu bentuk penyajian ilmiah secara lisan, hasil pelaksanaan tugas akhir oleh mahasiswa di hadapan forum seminar. Kegiatan Seminar meliputi: a. Seminar dilaksanakan di lingkungan Fakultas Perikanan dan Ilmu Kelautan IPB yang dihadiri oleh minimal satu dosen pembimbing tugas akhir, pemimpin seminar, dan sekurang-kurangnya 1/3 jumlah mahasiswa angkatan penyaji seminar b. Mahasiswa melaksanakan seminar di ruang seminar di lingkungan FPIK c. Mahasiswa penyaji seminar diwajibkan mengenakan jas almamater IPB; peserta seminar berpakaian rapi dan sopan d. Seminar dilaksanakan selama maksimal 60 menit dengan rincian 20 menit presentasi, 30 menit sesi tanya jawab, dan 10 menit ulasan oleh dosen pembimbing dan atau pemimpin seminar e. Peserta seminar wajib mengisi dan menandatangani daftar hadir yang sudah disediakan. Berdasarkan kehadiran mahasiswa ini, dosen pembimbing memberikan paraf pada kartu seminar. f. Penilaian seminar dilakukan oleh dosen pembimbing yang hadir dan pemimpin seminar ***A form of oral scientific presentation, the result of the implementation of the final project by students in front of the seminar forum***. ***Seminar activities include:*** ***a. The seminar was held within the Faculty of Fisheries and Marine Sciences IPB which was attended by at least one final project supervisor, seminar leader, and at least 1/3 of the number of students of the seminar presenting batch*** ***b. Students conduct seminars in seminar rooms within Faculty of Fisheries and Marine Science***

<table>
<tr><td></td><td colspan="5">c. Students presenting seminars are required to wear IPB alma mater suits; Seminar participants dressed neatly and modestly
d. The seminar is held for a maximum of 60 minutes with details of 20 minutes of presentation, 30 minutes of question and answer session, and 10 minutes of review by supervisors and / or seminar leaders
e. Seminar participants are required to fill out and sign the attendance list that has been provided. Based on the presence of this student, the supervisor gives paraf on the seminar card
f. Seminar assessment is carried out by supervisors who are present and seminar leaders</td></tr>
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References</td><td colspan="5"></td></tr>
<tr><td rowspan="3">Evaluasi Pembelajaran (Rubrik)
(Rubric)</td><td colspan="3">Penilaian Hasil Belajar (Learning Outcomes Assessment)</td><td colspan="2">Penilaian Akhir (Final Assessment)</td></tr>
<tr><td>Basis Evaluasi (Evaluation Base)</td><td>Bobot (%) (Proportion)</td><td>Deskripsi (Description)</td><td>Nilai Mutu (Grade)</td><td>Rentang Nilai (Range of Values)</td></tr>
<tr><td>Nilai akhir setiap mahasiswa akan ditentukan berdasarkan performa ringkasan seminar dan performa saat presentasi, serta sesuai dengan kinerja dalam penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para Pembimbing) yang digabung dalam satu formular penilaian saat seminar - The final score of each student will be determined based on the performance of the seminar summary</td><td></td><td>Dilaksanakan setelah mahasiswa menyelesaikan penelitian sesuai dengan yang direncanakan - Starting from after students complete a research with a duration adjusted to the planned activities.</td><td>A
AB
B
BC
C
D
E</td><td>Nilai ≥ 80
75 ≤ Nilai < 80
70 ≤ Nilai < 75
65 ≤ Nilai < 70
60 ≤ Nilai < 65
55 ≤ Nilai < 60
< 55</td></tr>
</table>

	and performance during the presentation, as well as in accordance with the performance in preparation, implementation, and reporting of the thesis (for Supervisors) combined in one assessment formular during the seminar				
	Hasil Projek (***Project Outcomes***) a. Ketua Pembimbing	33	Nilai akhir setiap mahasiswa akan ditentukan berdasarkan performa ringkasan seminar dan performa saat presentasi, serta sesuai dengan kinerja dalam penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para Pembimbing) yang digabung dalam satu formulir penilaian saat seminar-***The final score of each student will be***		

			***determined based on the performance of the seminar summary and performance during the presentation, as well as in accordance with the performance in preparation, implementation, and reporting of the thesis (for Supervisors) combined in one assessment formular during the seminar*.**		
	b. Anggota Pembimbing	33	Nilai akhir setiap mahasiswa akan ditentukan berdasarkan performa ringkasan seminar dan performa saat presentasi, serta sesuai dengan kinerja dalam penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para Pembimbing) yang		

			digabung dalam satu formulir penilaian saat seminar-***The final score of each student will be determined based on the performance of the seminar summary and performance during the presentation, as well as in accordance with the performance in preparation, implementation, and reporting of the thesis (for Supervisors) combined in one assessment formular during the seminar*.**		
	c. Penguji Perwakilan PS	33	Nilai akhir setiap mahasiswa akan ditentukan berdasarkan performa ringkasan seminar dan performa saat presentasi, serta sesuai dengan kinerja dalam		

			penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para Pembimbing) yang digabung dalam satu formulir penilaian saat seminar-***The final score of each student will be determined based on the performance of the seminar summary and performance during the presentation, as well as in accordance with the performance in preparation, implementation, and reporting of the thesis (for Supervisors) combined in one assessment formular during the seminar.***		

RENCANA PELAKSANAAN KULIAH (*LECTURE IMPLEMENTATION PLAN*)

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran**
(1)	**(2)**	**(3)**	**(4)**
1	Setelah menyelesaikan seminar, mahasiswa akan mampu melakukan penyajian ilmiah secara lisan di hadapan berbagai forum seminar ilmiah. ***After completing the seminar, students will be able to make oral scientific presentations in front of various scientific seminar forums***	1. Deskripsi dan lingkup serta definisi sains, penelitian, dan karya ilmiah (***Description and scope and definition of science, research and scientific work***)	Presentasi oral – ***Oral presentation***

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**INSTITUT PERTANIAN BOGOR PROGRAM STUDI S1 MANAJEMEN SUMBERDAYA PERAIRAN (MSP)**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

RENCANA PEMBELAJARAN SEMESTER-*SEMESTER LEARNING PLAN*

MATA KULIAH (MK) ***Course***	**KODE** ***Code***	**RUMPUN MK** ***Course Cluster***	**BOBOT (sks)** ***Credits***	**SEMESTER**	**TANGGAL PENYUSUNAN** ***Preparation Date***
Seminar (***Seminar***)	MSP1402	**Tugas Tahun Terkhir-Wajib** ***Final Year's Project-Mandatory***	1 ***1.44 ESCT***	8	

Pengasuh **(*Lecturer*)**	**Koordinator MK**	**Tim Pengajar**
	Koordinator Komisi Pendidikan ***Study Program Coordinator***	Pembimbing Skripsi - ***Supervisors***

Capaian Pembelajaran (CP) ***Learning Outcome* (LO)**		
	CPL-PRODI yang dibebankan pada MK – *LO of Study Program*	
	LO5	Menerapkan ilmu pengelolaan sumberdaya perairan, sumberdaya perikanan, konservasi, lingkungan, dan kawasan berdasarkan prinsip daya dukung untuk keberlanjutan pemanfaatan sumberdaya ***Apply the science of management of aquatic resources, fisheries resources, conservation, environment, and areas based on the principle of carrying capacity for sustainable use of resources***
	Capaian Pembelajaran Mata Kuliah (CPMK)-LO of Course	
	CPMK LO-C	Setelah menyelesaikan skripsi, mahasiswa akan mampu menerapkan ilmu pengelolaan sumberdaya perairan melalui suatu penelitian dan menyiapkan tulisan atau karya ilmiah melalui penelitian, baik dengan pendekatan survey post-facto, eksperimental, maupun studi pustaka diperluas - ***After completing the thesis, students will be able to apply the science of aquatic resources management through research and prepare papers or scientific papers through research, both with a post-facto survey approach, experimental, and expanded literature studies.***

Prasyarat - *Prerequisite*	1. mahasiswa program sarjana (S1) 2. telah menyelesaikan perkuliahan sekurang¬-kurangnya 105 SKS 3. IPK ≥ 2.00 sampai semester 5 4. Menuntaskan substansi 5. Menuntaskan aksiologi, 6. Menuntaskan Formulir Tiga Serangkai Menuntaskan Proposal ***1. undergraduate students (S1)*** ***2. have completed lectures of at least 105 credits*** ***3. GPA ≥ 2.00 until semester 5*** ***4. Complete the substance*** ***5. Complete the axiology,*** ***6. Complete the Tri-Form*** ***Completing the Proposal***
Deskripsi MK ***Course Description***	Penyiapan laporan penelitian dalam rangka penyelesaian skripsi dalam rangka berlatih menerapkan ilmu pengelolaan sumberdaya perairan melalui suatu penelitian dan penulisan karya ilmiah.hinga disahkan oleh departemen. Kegiatan Skripsi meliputi: a) Mahasiswa mengajukan topik skripsi kepada komisi pendidikan b) Komisi pendidikan menetapkan ketua dan anggota pembimbing yang selanjutnya diusulkan ke departemen untuk disahkan oleh dekan. c) Mahasiswa menyusun proposal skripsi dengan arahan dosen pembimbing. d) Proposal skripsi yang sudah disetujui dan ditandatangani pembimbing diajukan ke komisi pendidikan untuk disahkan sebagai acuan dalam melaksanakan penelitian. e) Departemen/fakultas dapat memberikan surat tertentu terkait dengan pelaksanaan penelitian, apabila diperlukan. f) Mahasiswa melaksanakan kegiatan skripsi dalam pemantauan pembimbing. g) Mahasiswa menyusun draf skripsi dengan mengacu pada Panduan Penulisan Karya Ilmiah IPB. h) Draf skripsi yang telah disetujui pembimbing, selanjutnya diseminarkan.

<table>
<tr><td></td><td colspan="5">Preparation of research reports in the context of completing a thesis in order to practice applying the science of aquatic resources management through research and writing scientific papers.until authorized by the department.
Thesis activities include:
a) Students submit thesis topics to the education commission
b) The education commission shall appoint the chairman and advisory members who are subsequently proposed to the department for approval by the dean.
c) Students prepare a thesis proposal with the direction of the supervisor.
d) Thesis proposals that have been approved and signed by the supervisor are submitted to the education commission to be ratified as a reference in carrying out research.
e) Departments/faculties can provide certain letters related to the implementation of research, if necessary.
f) Students carry out thesis activities in monitoring supervisors.
g) Students prepare a thesis draft by referring to the IPB Scientific Paper Writing Guidelines.
h) Draft thesis that has been approved by the supervisor, then seminared</td></tr>
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</table>

	yang digabung dalam satu formular penilaian saat sidang sarjana- ***The final grade of each student will be determined based on the performance of the report and performance during the proceedings, and in accordance with the performance in the preparation, implementation, and reporting of the thesis (for Supervisors) combined in one assessment formular during the undergraduate session***		***the planned activities.***		
	Hasil Projek (***Project Outcomes***) a. Ketua Pembimbing	35	Nilai akhir setiap mahasiswa akan ditentukan berdasarkan performa laporan dan performa saat siding, serta sesuai dengan kinerja dalam penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para		

			Pembimbing) yang digabung dalam satu formulir penilaian saat sidang sarjana - ***The final grade of each student will be determined based on the performance of the report and performance during the proceedings, and in accordance with the performance in the preparation, implementation, and reporting of the thesis (for Supervisors) combined in one assessment form during the undergraduate session***		
	b. Anggota Pembimbing	30	Nilai akhir setiap mahasiswa akan ditentukan berdasarkan performa ringkasan seminar dan performa saat presentasi, serta sesuai dengan		

			kinerja dalam penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para Pembimbing) yang digabung dalam satu formulir penilaian saat seminar-***The final grade of each student will be determined based on the performance of the report and performance during the proceedings, and in accordance with the performance in the preparation, implementation, and reporting of the thesis (for Supervisors) combined in one assessment form during the undergraduate session*****.**		
	c. Penguji Perwakilan PS	15	Nilai akhir setiap mahasiswa akan ditentukan berdasarkan		

			performa ringkasan seminar dan performa saat presentasi, serta sesuai dengan kinerja dalam penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para Pembimbing) yang digabung dalam satu formulir penilaian saat seminar-***The final grade of each student will be determined based on the performance of the report and performance during the proceedings, and in accordance with the performance in the preparation, implementation, and reporting of the thesis (for Supervisors) combined in one assessment form during the***		

			***undergraduate session*.**		
	d. Dosen penguji tamu - ***Guest examiner lecturer***	20	Nilai akhir setiap mahasiswa akan ditentukan berdasarkan performa ringkasan seminar dan performa saat presentasi, serta sesuai dengan kinerja dalam penyiapan, pelaksanaa, dan pelaporan skripsi (bagi para Pembimbing) yang digabung dalam satu formulir penilaian saat seminar-***The final grade of each student will be determined based on the performance of the report and performance during the proceedings, and in accordance with the performance in the preparation, implementation, and reporting of the***		

			***thesis (for Supervisors) combined in one assessment form during the undergraduate session*.**		

RENCANA PELAKSANAAN KULIAH (*LECTURE IMPLEMENTATION PLAN*)

Minggu (*Week*)	**Kemampuan akhir yang diharapkan (*Expected final capability*)**	**Topik & Sub Topik (*Topics & Sub Topics*)**	**Metode Pembelajaran**
(1)	**(2)**	**(3)**	**(4)**
1	Setelah menyelesaikan seminar, mahasiswa akan mampu melakukan penyajian ilmiah secara lisan di hadapan berbagai forum seminar ilmiah. ***After completing the seminar, students will be able to make oral scientific presentations in front of various scientific seminar forums***	1. Deskripsi dan lingkup serta definisi sains, penelitian, dan karya ilmiah (***Description and scope and definition of science, research and scientific work***)	Mini research

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY FACULTY OF FISHERIES AND MARINE SCIENCES AQUATIC RESOUCES MANAGEMENT BACHELOR DEGREE PROGRAM**	ARM Department of Aquatic Resources Management Faculty of Fisheries and Marine Sciences IPB University — Bogor Indonesia —

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Resources Policy	MSP 413	*In-depth Course*	2(2-0)	7	7-12- 2022

	Course Coordinator	Team Lecturer
Lecturer	Dr.Ir. Gatot Yulianto, MSi (GYO)	Dr.Ir. Taryono, MSi (TAR) Dr. Zulhamsyah Imran, MSc (ZIM)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	5	1. Examine the interrelation of variables from resources, ecosystems, environments, and areas in an integrated water management system 2. Decide on management models of resources, ecosystems, environment, and marine areas based on the principles of carrying capacity, conservation, and sustainability 3. Decide on policy choices for the management of resources, ecosystems, environment, and marine areas based on the principles of carrying capacity, conservation, and sustainability
	COURSE LEARNING OUTCOME	

	LO	After attending this lecture, students are able to: 1. Explain the supporting regulations for water management policies at both national and international levels 2. explain the concepts of resource management policy and the aquatic environment 3. formulate the causes of aquatic resource and environmental policy problems; 4. Formulate solutions to resource and aquatic environment policy problems with a policy analysis approach as information material in the policy-making process.
Course Description	This course explains national and international regulations and policies on aquatic resources management that have been established by the Government of Indonesia and International Institutions. Furthermore, we will discuss policy issues, water resource management issues, government failures, and market failures that cause policy interventions to be needed. At the end of this lecture, the institutional conception of aquatic resources management, management institutional analysis and management policy analysis as well as several concepts of resource policy and aquatic resources management institutions needed to achieve the sustainability of aquatic resources and environment.	
References	1. Adrianto L. 2011. *Konstruksi Lokal Pengelolaan Sumberdaya Perikanan di Indonesia*. IPB Press. Bogor 2. Charles AT. 2001. *Sustainable Fishery System*. Oxford: Blackwell Science. 3. Danin S. 2005. *Pengantar Studi Penelitian Kebijakan*. Edisi I, Cet 3. Jakarta: Bumi Aksara. 4. Djunaedi SO. 2011. Sumberdaya Perairan - Potensi, Masalah dan Pengelolaan. Bandung: Widya Padjajaran. 5. Dunn WN. 2003. *Pengantar Analisis Kebijakan Publik*. Edisi Kedua. Cetakan Kelima Tim Fakultas ISIPOL Universitas Gadjah Mada, Penerjemah; Yogyakarta: Gadjah Mada University Press. 6. Fauzi A. 2004. *Ekonomi Sumberdaya Alam dan Lingkungan*. Teori dan Aplikasi. Gramedia. Jakarta 7. Fauzi, A. 2005. *Kebijakan Perikanan dan Kelautan*. Isu, Sintesis dan Gagasan. Bogor: Grafika Mardiyuana. 8. Nugroho R. 2017. *Public Policy*. Edisi Keenam. PT Elex Media Komputindo. Jakarta. 898p. 9. Muhammad S. 2011. *Kebijakan Pembangunan Perikanan dan Kelautan*: *Pendekatan Sistem*. UB Press. Malang 10. Parson W. 2014. *Public Policy: Pengantar Teori dan Praktik Analisis Kebijakan*. Terjemahan. Edisi Pertama. Cetakan ke-5. Kencana Pernadamedia Group. Jakarta. 685p. 11. Suharto E. 2008. *Analisis Kebijakan Publik*. Alfabeta. Bandung. 12. Supriadi, H dan Alimuddin. 2011. Hukum Perikanan di Indonesia.. Jakarta: Sinar Grafika 13. Wahab SA. 2008. *Pengantar Analisis Kebijakan Publik*. Cetakan Kedua. UMM Press. Malang. 14. Winarno B. 2016. *Kebijakan Publik Era Globalisasi*. CAPS (Center of Academic Publishing Service). Yogyakarta. 592p. 15. Ostrom E. 1990. *Governing the commons. The evolution of institutions for collective action.* New York, USA : Cambridge University Press.	

<table>
<tr><td></td><td colspan="5">16. Ostrom E. 2011. Background on the Institutional Analysis and Development Framework. The Policy Studies Journal, Vol. 39, No. 1. pp 7 - 27
17. ana D, Sarwono, Rozikin M. 2013. Kebijakan pengelolaan wilayah pesisir berbasis sustainable development di Kabupaten Sampang (studi pada Bappeda Kabupaten Sampang). Jurnal Administrasi Publik (JAP), Vol.1. No.3
18. Sanjeevi P, Pande A, Sivakumar K. 2014. Status reports of Coastal and Marine Protected Areas in India. Wildlife Institute India, Chandrabani, Dehradun, Uttarakhand - 248001
19. Clark, JR. 1996. Coastal Zone Management: Handbook. Lewis Publisher
20. Cicin-Sain, B. & Knecht, R. 1998. Integrated coastal and ocean management: concepts and practices. Washington D.C.: Island Press.</td></tr>
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<tr><td>Assignment</td><td>20</td><td>Group tasks. Assignments are presented and then graded</td><td>B</td><td>70 ≤ Score < 75</td></tr>
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<tr><td>Mid Test</td><td>30</td><td>Questions prepared by each Teacher.</td><td>C</td><td>60 ≤ Score < 65</td></tr>
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<tr><td></td><td>100</td><td></td><td>E</td><td>< 55</td></tr>
</table>

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain the understanding of aquatic resources and the importance of aquatic resources and environment policies	Understanding Aquatic Resources and the Importance of Policy	Classroom	1, 6,7	GYO
2	Students are able to explain the meaning of public policy and policy	Understanding policy and public policy	Classroom	8, 10, 13	GYO
3	Students are able to explain the characteristics of *resources* based on the *concept of* regime / type of resource *(resource regime)*	Resource characteristics based on the concept of regime	Classroom	8, 10, 13	GYO
4	Students are able to explain the regime of aquatic resources management rights	Aquatic resources management rights regime	Classroom	15, 16	TAR
5	Students are able to explain the form of management of resource management	Forms of management of resource management	Classroom	15,16	TAR
6	Students are able to explain the development of aquatic resources management	Development of aquatic resources management	Classroom	1, 15,16	TAR
7	Students are able to explain the concept of sustainable development	The concept of sustainable development	Classroom	1, 15,16	TAR

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
MIDTERM EXAM					
8	Students are able to explain the WP3K management policy framework	WP3K management policy framework	Classroom	9, 12, 17, 19, 20	ZIM
9	Students are able to explain the WP3K space utilization policy framework	WP3K space utilization policy framework	Classroom	17, 19, 20	ZIM
10	Students are able to explain the policy framework for conservation of aquatic resources	Aquatic resources conservation policy framework	Classroom	17, 18	ZIM
11	Students are able to explain policy analysis	Policy analysis	Classroom	8, 10, 13	GYO
12	Students are able to explain policy issues	Policy Issues	Classroom	8, 10, 13	GYO
13	Students are able to explain WPP Based Policy an exercise Lab "Policy Problems and Solutions"	explain WPP Based Policy of an exercise Lab	Classroom	Presentation Materials	GYO
14	Students are able to analyze solutions and alternative policy decisions	Alternative policy decisions	Classroom	8, 10, 13	GYO
FINAL EXAM					

Bogor, 7 Desmber 2022

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY FACULTY OF FISHERIES AND MARINE SCIENCES AQUATIC RESOUCES MANAGEMENT BACHELOR DEGREE PROGRAM**	ARM — Department of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences, IPB University — Bogor Indonesia

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Resources Management	414	*Capstone*	3	7	07-12-2022

Lecturer	**Lecturer Coordinator**	**Team Lecturer**
	Dr. Taryono, S.Pi, M.Si. (TRK)	1. Dr. Ir. Sigid Hariyadi, M.Sc. (SGH) 2. Prof. Dr. Ir. Bambang Widigdo (BBW)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO	THE: Apply the science of resource management, ecosystems, environment, and aquatic areas based on the principles of carrying capacity, conservation, and sustainability Sub LO : Formulate management models of resources, ecosystems, environment, and aquatic areas based on the principles of carrying capacity, conservation, and sustainability
	COURSE LEARNING OUTCOME	

	LO	After attending this lecture, students are able to: Soft skills: 1. Able to plan systemic management of aquatic resources by paying attention to complex elements 2. Able to communicate, work together and develop leadership to decide management planning decisions. 3. Able to develop initiatives, creative and adaptive thinking on aquatic resources management issues Hardskill: 1. Analyzing DO and TAN 2. Measuring Perarian Fertility Index (TSI and TRIX) a. Water quality measurement
Course Description	This course provides students with an understanding of planning for optimal and sustainable utilization of aquatic resources for the welfare of the community. Understand the potential of aquatic resources; rules and scope of aquatic resources management based on typology, component dynamics and status of aquatic ecosystems; as well as institutional aspects *(rules of the game* and *player of the game) of* aquatic resources management.	
References	1. Buku Ajar PENGELOLAAN SUMBERDAYA PERAIRAN. Tim Penyusun, Divisi Proling Dept. MSP-FPIK, IPB. 2. Ballet J, Sirven N, Requiers-Desjardins M. 2007. Social Capital and Natural Resource Management A Critical Perspective. *The Journal of Environment & Development.* 16: 355-374 3. Berkes F. 2005. Commons Theory for Marine Resource Management in a Complex World. In *Indigenous Use and Management of Marine Resources*. Eds : Kishigami N, Savelle J.M. National Museum of Ethnology. Osaka. 4. Beveridge MCM. 2004. CAGE AQUACULTURE. 3nd ed. Blackwell Publishing Ltd. Oxford, UK. 5. Bodin O and Crona BI. 2009. The role of social networks in natural resource governance: What relational patterns make a difference?. *Global Environmental Change*. 19 : 366–374 6. Dasgupta P, Serageldin I. 2001. Social Capital: A Multifaceted Perspective. The World Bank. Wahsington DC. 7. Jorgensen, SE and Vollenweider RA. 1989 (1991). PRINCIPLES OF LAKE MANAGEMENT, Guidelines of Lake managemen Volume 1. International Lake Environment Comittee (ILEC), United Nations Environment Programme (UNEP).	

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<tr><td></td><td>

8. Poff NL, Brinson MM, Day JW. 2003. Aquatic ecosystems and Global climate change. the Pew Center on Global Climate Change.
9. PEMSEA. 2015. Integrated Coastal Management (ICM) Code. PEMSEA. Quezon City.
10. Penczak T, Suszycka E, Molinski M. 1982. Production, consumption and energy transformation by fish populations in small lowland river [Poland; chemical and physical characteristics of the river]. University of Lodz, Lodz (Poland). Inst. Biologii Srodowiskowej.
11. Ruddle K and Satria A. 2010. Managing Coastal and Inland Waters: Pre-existing Aquatic Management Systems in Southeast Asia. Springer. New York.
12. Sven-Olof R and Walter R (ed). 1989. The control of eutrophication of lakes and reservoir. Man and the biosphere series, Volume I. UNESCO, Paris and The Parthenon Publishing Group. 314 p.
13. Beveridge MCM. 2004. Cage Aquaculture, 3rd Edition. Wiley-Blackwell
14. Bryson JM. 2004. What To Do When Stakeholders Matter: A Guide to Stakeholder Identification and Analysis Techniques. A paper presented at the London School of Economics and Political Science 10 February 2003.
15. Carlson RE. A trophic state index for lakes. *Limnology and Oceanography*. 22(2):361-369
16. Vollenweider RA, Giovanardi F, Montanari G, Rinaldi A. Characterization of The Trophic Conditions of Marine Coastal Waters With Special Reference to The Nw Adriatic Sea: Proposal for A Trophic Scale, Turbidity and Generalized Water Quality Index. *Environmetrics*. 9: 329-357.
17. Widigdo B, Pariwono J. 2003. Daya dukung perairan di pantai utara Jawa Barat untuk budidaya udang (Studi kasus di Kabupaten Subang, Teluk Jakarta dan Serang). Jurnal Ilmu-ilmu Perairan dan Perikanan Indonesia.

</td></tr>
<tr><td>Learning Evaluation (Assessment Rubric)</td><td>
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<tr><td colspan="3">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Grade</td><td>Description</td><td>Grade</td><td>Description</td><td>Grade</td></tr>
<tr><td>Participatory Activities (Class attendance and activity)</td><td>5</td><td>Activeness in opinion, asking and answering questions</td><td rowspan="6">A
AB
B
BC
C
D
E</td><td rowspan="6">Score ≥ 80
75 ≤ Score < 80
70 ≤ Score < 75
65 ≤ Score < 70
60 ≤ Score < 65
55 ≤ Score < 60
< 55</td></tr>
<tr><td>Project Outcomes</td><td></td><td></td></tr>
<tr><td>Project Outcomes</td><td>10</td><td>Short papers discussing specific topics or cases</td></tr>
<tr><td>Assignment</td><td>5</td><td>Quick questions before college</td></tr>
<tr><td>Midterm Exam</td><td>30</td><td>Scheduled evaluation</td></tr>
</table>
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	Final Exam	30	Scheduled evaluation		
	Practicum	20	Sustainability of practicum activities		

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Outlining the principles, concepts, objectives and rules of aquatic resources management	Principles of sustainable management of aquatic resources. Closed and open water management.	• Talk • SGD	Ruddle and Satria, 2009	TRK
2.		Objectives and principles of sustainable management of aquatic resources. Closed and open water management.	•	PEMSEA, 2015	TRK
3.	Examine variables, status and potential of resources, ecosystems, environment, and water areas	Understanding of various types of aquatic resources, status and potential of waters (quantity and quality). Determination of the status of waters and potential for fisheries development.	• Talk • SGD	Jorgensen and Vollenweider. 1991	TRK
4		Eutrophication and Restoration/rehabilitation. Symptoms, causation of eutrophication, and control of eutrophication. Examples of restoration/rehabilitation activities in Indonesia. Reduction of nutrient input load. Methods of ecosystem intervention.	• Talk • Contextual Learning	Ryding and Rast, 1989	SGH
5		The concepts of mass equilibrium and the cycle of matter are related to the type and function of aquatic ecosystems. Water quality management related to inputs from various activities. Nutrient load calculation..	• Talk • Contextual Learning	Penczak, Suszycka, Molinski. 1982	SGH

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
6	Analyzing the carrying capacity of waters	Open water and extensive carrying capacity with primary (natural) production approach and closed water carrying capacity	• Talk • SGD	Jorgensen and Vollenweider. 1991	SGH
7		Closed water carrying capacity (DO and TAN approaches)	• Talk • SGD		SGH
MIDTERM EXAM					
8		Climate Change: mitigation and adaptation of the fisheries sector to climate change through an ecological approach	• Talk • SGD	Poff, Brinson, Day 2003	BWO
9		Carrying capacity of coastal waters (pond fisheries)	• Talk • SGD	Widigdo B dan Pariwono J 2003	BWO
10		Dynamics and management of water quality of closed aquatic resources (management and monitoring)	• SGD	Widigdo B dan Pariwono J 2003	BWO
11	Formulate institutions for aquatic resources management	Management Planning Approach and Stages: Single Approach and Multiple Approach	• Talk • SGD	Jorgensen and Vollenweider. 1991	TRK
12		Institutions for the management of aquatic resources	• Talk • SGD	Ballet et al. 2007, Berkes 2005.	TRK
13		Social capital for aquatic resources management	• Talk • SGD	Dasgupta dan Serageldin, 2001; Bodin dan Crona, 2009,	TRK

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
14		Application of social capital analysis for aquatic resources management	• Talk • CS • CL	Dasgupta dan Serageldin, 2001; Bodin dan Crona, 2009	TRK
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Explain the typology of waters and the potential of aquatic resources from various types of aquatic ecosystems	Typology of waters and potential aquatic resources	• CL (6) • CI (8)		NTP, AAY
2	Formulate problems related to aquatic resources management	1. Stages of assessment related to aquatic resources management 1. Determination of problem formulation related to aquatic resources management	• CL (6) • CI (8)		NTP, AAY
3	Formulate a method of calculating fertility index and determine the fertility status of waters based on index	Aquatic Fertility Index (TSI, TRIX)	• CL (6) • CI (8)	Carlson RE 1977, Vollenweider et al. 1998	NTP, AAY
4	Determining the carrying capacity of closed waters for natural fisheries and floating net caramba activities	The carrying capacity of natural fisheries and floating net caramba activities in closed waters	• CL (6) • CI (8)	Beveridge MCM 2004	NTP, AAY
5	Determining the carrying capacity of open water (coastal) for aquaculture activities	The carrying capacity of aquaculture activities in coastal waters	• CL (6) • CI (8)	Widigdo B dan Pariwono J 2003	NTP, AAY
6	Understand and explain stakeholder analysis methods	Stakeholder analysis	• CL (6) • CI (8)	Bryson, 2004.	TRK, SGH
7	Create a questionnaire	Creation of questionnaires	• CL (6) • CI (8)		TRK, SGH
MIDTERM EXAM					
8	Understand the purpose and prepare for the field trip	Introduction and preparation of the field trip	• CL (6) • CI (8)		NTP, AAY

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
9	Apply data collection methods through various approaches related to aquatic resources management	Fieldtrip	• CL (6) • CI (8)		NTP, AAY
10	Apply data collection methods through various approaches related to aquatic resources management	Fieldtrip	• CL (6) • CI (8)		IPA/DYW
11	Apply data collection methods through various approaches related to aquatic resources management	Fieldtrip	• CL (6) • CI (8)		IPA/DYW
12	Able to process the collected data and create laporan	Data processing	• CL (6) • CI (8)		IPA/DYW
13	Able to process the collected data and make reports	Data processing	• CL (6) • CI (8)		IPA/DYW
14	Understand the problems that need to be studied and design a plan for aquatic resources management	Presentation of fieldtrip final report	• CL (6) • CI (8)		IPA/DYW
FINAL EXAM					

Bogor, 7 Desember 2022

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY FACULTY OF FISHERIES AND MARINE SCIENCES AQUATIC RESOUCES MANAGEMENT BACHELOR DEGREE PROGRAM**	ARM — Department of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences, IPB University — Bogor Indonesia —

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Integrated Coastal Area Management (PKPT)	MSP415	*In-depth Course*	2(2-0)	7	7-12-2022

	Course Coordinator	Team Lecturer
Lecturer	Dr.Ir. Gatot Yulianto, M.Si (GYO)	1. Prof. Dr.Ir. Bambang Widigdo, MSc (BBW) 2. Dr. Zulhamsyah Imran, S.Pi, M.Si (ZIM)

LEARNING OUTCOME (LO)	**COURSE LEARNING OUTCOME**	
	LO	1. Examine the interrelation of variables from resources, ecosystems, environments, and areas in an integrated water management system 2. Decide on management models of resources, ecosystems, environment, and marine areas based on the principles of carrying capacity, conservation, and sustainability
	LEARNING OUTCOME (LO)	

	LO	After attending this lecture, students are able to 1. Explain the characteristics of coastal area problems and the concept of the carrying capacity of coastal areas 2. Explain the importance of coastal areas in terms of biophysical and socio-economic aspects 3. Explain the basic concepts of integrated coastal area management. 4. Formulate coastal area management strategies
Course Description	This course explains the potential and issues of coastal area development, coastal ecosystem characteristics, coastal dynamics, coastal spatial principles through a chemical biophysical approach and socio-economic and cultural characteristics of the concept of integrated and sustainable coastal area management	
References	1. Dahuri R, Rais J, Ginting SP, Sitepu MJ. 2008. *Pengelolaan Sumberdaya Wilayah Pesisir dan Lautan Secara Terpadu.* Cet 4. Jakarta: Pradya Paramita. 2. Djunaedi OS. 2011. *Sumberdaya Perairan. Potensi, Masalah dan Pengelolaan*. Bandung: Widya Pandjadjaran. 3. Mitchell B, Setiawan B, Rahmi DH. 2010. *Pengelolaan Sumberdaya Alam dan Lingkungan*.Gadjah Mada University Press. Yogyakarta 4. Undang-undang Republik Indonesia Nomor 27 tahun 2007 tentang Pengelolaan Wilayah Pesisir dan Pulau-pulau Kecil 5. Undang-Undang Republik Indonesia Nomor 1 tahun 2014 tentang Perubahan atas Undang-Undang nomor 27 tahun 2007 tentang Pengelolaan Wilayah Pesisir dan Pulau-Pulau Kecil 6. Peraturan Menteri Kelautan dan Perikanan Republik Indonesia Nomor 23/permen-kp/2016 tentang Perencanaan Pengelolaan Wilayah Pesisir dan Pulau-pulau Kecil 7. Barbier EB. 2000. The value of wetlands: lanscape and institutional perspektif. Valuing the environment as input: review of aplications to mangrove-fishery linkages. Special Issue. The Values of Wetlands: Landscape and institutional perspectives. *Ecol. Econ*. 35:47-61. 8. Harahab N. 2010. Penilaian Ekonomi Ekosistem Hutan Mangrove dan Aplikasinya dalam Perencanaan Wilayah Pesisir. Yogyakarta: Graha Ilmu. 9. Freeman RE & McVea J. 2018. A Stakeholder Approach to Strategic Managemen. Working Paper No. 01-02. The Handbook of Strategic Management, Oxford: Blackwell Publishing. 10. Cristanto J. 2010. Pengantar Pengelolaan Berkelanjutan Sumberdaya Wilayah Pesisir. Yogyakarta (19). 11. Pomeroy RS. 1994. Community Management and Common Property of Coastal Fisheries in Asia and the Pacific: Concepts, Methods and Experiences. ICLARM	

<table>
<tr><td></td><td colspan="5">12. Hidayani S dan Sariah. 2017. Resiliensi Terumbu Karang Dalam Perspektif Ekologi Sebagai Instrumen Konservasi. Jurnal Biologi Tropis, Juli-Desember 2017: Volume 17 (2)
13. Clark JR. 1996. Coastal Zone Management: Handbook. Lewis Publisher
14. Cicin-sain B & Knecht R. 1998. Integrated coastal and ocean management: concepts and practices. Washington D.C.: Island Press.</td></tr>
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LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain the definition and concept of coastal area management	Definition and concept of coastal area management	Offline course	1, 4,5,6	GYO
2	Students are able to explain the potential and problems of coastal area development	Potential and Problems of Coastal Area Development	Offline course	1,2	GYO
3	Students are able to explain the Concept of Coastal Governance	Coastal Governance Concept	Offline course	1,4,5	ZIM
4	Students are able to explain the legal basis of Integrated Coastal Area Management (PKPT)	Legal Basis of Integrated Coastal Area Management (PKPT)	Offline course	4,5,6	ZIM
5	Students are able to explain the basic principles and concepts of Integrated Coastal Area Management (PKPT)	Prinsip dan konsep dasar Pengelolaan Kawasan Pesisir Terpadu (PKPT)	Offline course	1,4,5	ZIM
6	Students are able to explain the resilience of coastal areas	Coastal Area Resiliancy	Offline course	1, 4, 5, 17	ZIM
7	Students are able to explain the functions and services of coastal area ecosystems	Ecosystem Services of coastal ecosystems	Offline course	7,8	GYO
MIDTERM EXAM					
8	Students are able to explain the concept of spatial planning and the carrying capacity of coastal areas for fisheries and other activities	Spatial concept and carrying capacity of coastal areas for	Offline course	1, 10	BBG

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		activities Fisheries and other activities			
9	Students are able to explain coastal spatial concepts related to changes in mangrove landscapes	The concept of coastal spatial planning is related to changes in mangrove landscapes	Offline course	1, 10	BBG
10	Students are able to explain the carrying capacity of the coast for aquaculture activities	Coastal carrying capacity for aquaculture activities	Offline course	1, 10	BBG
11	Students are able to explain the socio-cultural aspects of coastal communities	Socio-cultural aspects of coastal communities	Offline course	1, 11	GYO
12	Students are able to analyze coastal area management stakeholders	Stakeholder Analysis of coastal area management	Offline course	1, 4, 5, 6	GYO
13	Students are able to explain the concept of strategic planning of coastal areas	Concept of Coastal Area Planning	Offline course	1, 8	GYO
14	Students are able to explain the concept of strategic planning for coastal areas (Advanced)	Concept of Coastal Area Planning	Offline course	1, 4, 5, 6	GYO
FINAL EXAM					

Bogor, 7 December 2022

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**IPB UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **AQUATIC RESOUCES MANAGEMENT** **BACHELOR DEGREE PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan — Fakultas Perikanan dan Ilmu Kelautan (FPIK)

SEMESTER LEARNING PLAN

COURSE	CODE	COURSE TYPE	CREDIT	SEMESTER	DATE
Aquatic Ecotourism Management	MSP1421	In depth Prodi Courses (IPC)	3(2-1)	Odd	07 December 2022

Lecturer	**Course Coordinator**	**Lecturer Team**
	Prof. Dr. Ir. Fredinan Yulianda, M.Sc. (FRY)	1. Dr. Ir. Gatot Yulianto, M.Si. (GYO) 2. Ir. Agustinus M Samosir, M.Phill. (AMS) 3. Dr. Ayu Ervinia, S.Pi., M.Sc. (AYE)

LEARNING OUTCOME (LO)	**STUDY PROGRAM LEARNING OUTCOME**	
	LO-5	Apply the science of resource management, ecosystems, environment, and aquatic areas based on the principles of carrying capacity, conservation, and sustainability. **Sub-LO 5.1** Examine the interrelation of variables from resources, ecosystems, environments, and areas in an integrated water management system
	COURSE LEARNING OUTCOME	
	LO	After attending this lecture, students are able to: 1. Softskill: After attending this course, students are able to carry out the utilization of resources and aquatic areas for the development of ecotourism and environmental services based on the characteristics and suitability of natural aquatic resources, patterns and carrying capacity of tourism utilization that prioritizes the potential and sustainability of aquatic resources. 2. Hardskill: a. Able to determine resources and ecosystems that can be developed for aquatic ecotourism

<table>
<tr><td></td><td></td><td>b. Able to determine the problems of aquatic ecotourism development
c. Able to calculate the carrying capacity of aquatic ecotourism
d. Able to develop ecotourism management strategies</td></tr>
<tr><td>Course Description</td><td colspan="2">Utilization of resources and aquatic areas for the development of aquatic ecotourism based on characteristics, suitability, utilization patterns, and carrying capacity by prioritizing the potential and sustainability of aquatic resources.</td></tr>
<tr><td>References</td><td colspan="2">1. Beeton S. 1998 Ecotourism: A Practical Guide for Rural Communities, Colingwood: A.C.T.: Landlinks
2. Cicin-Sain B and Knceht RW. 1998. Integrated Coastal and Ocean Management (Concepts and Practices). Island Press. Washington D.C.
3. Gary KM and Carroll CR. 1994. Principles of Conservation Biology. Sinauer Ass. Inc. Pub. Massachusetts. USA.
4. Lindberg K and Hawkins DE. Ekotourisme (Petunjuk untuk Perencana dan Pengelola). 1995. Terjemahan dalam Bahasa Indonesia. The ecotourism society. North Bennington, Vermont.
5. Salm RV, Clark JR, and Siirila E. 2000. Marine and Coastal Protected Areas: A Guide for Planners and Manager. 3rd edition. IUCN.
6. Cater C and Cater E. 2007. Marine ecotourism : between the devil and the deep blue sea. Printed and bound in the UK by Biddles Ltd, King’s Lynn. 317p.
7. Buckley R. 2004. Environmental impacts of ecotourism. CABI Publishing. 403p.
8. Garrod B and Wilson JC. 2003. Marine Ecotourism: Issues and Experiences. Printed and bound in Great Britain by the Cromwell Press. 280
9. Yulianda F. 2019. Ekowisata Perairan: Suatu konsep kesesuaian dan daya dukung Wisata Bahari dan Wisata Air Tawar. IPB Press.</td></tr>
<tr><td rowspan="9">Learning Evaluation (Assessment Rubric)</td><td colspan="3">Learning Outcomes Assessment</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Component</td><td>Proportion (%)</td><td>Description</td><td>Grade</td><td>Score</td></tr>
<tr><td>Participatory Activities (Class attendance and activity)</td><td>20</td><td>Students actively ask and answer during lecture discussion sessions</td><td rowspan="8">A
AB
B
BC
C
D
E</td><td rowspan="8">Nilai ≥ 80
75 ≤ Nilai < 80
70 ≤ Nilai < 75
65 ≤ Nilai < 70
60 ≤ Nilai < 65
55 ≤ Nilai < 60
< 55</td></tr>
<tr><td>Project Results (Practicum Exam)</td><td>30</td><td>Results of a comprehensive study of cases of aquatic resources conservation problems</td></tr>
<tr><td>Assignment</td><td>10</td><td>Case study of each course topic</td></tr>
<tr><td>Quiz</td><td>5</td><td>Questions from the lecture material at the meeting</td></tr>
<tr><td>Midterm Exam</td><td>15</td><td>Test learning outcomes week 1-7</td></tr>
<tr><td>Final Exam</td><td>20</td><td>Test learning outcomes week 8-14</td></tr>
</table>

LECTURE IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain the understanding and scope of ecotourism, as well as the types of tourism industries	1. Limitations and understanding of aquatic ecotourism 2. Types of tourism industry 3. Scope of ecotourism activities	Introduction, Perception, Discussion	1, 3, 4	FRY
2	Students are able to explain the concept of ecotourism in the perspective of natural resources and their utilization	1. The concept of ecotourism 2. Natural resources and forms of ecotourism utilization	Introduction, Perception, Discussion	7, 8, 9	FRY
3	Students are able to explain the characteristics of potential aquatic resources and typology of potential aquatic areas for ecotourism utilization	1. Characteristics of potential aquatic ecotourism resources 2. Characteristics of aquatic ecotourism environmental areas (coastal, sea, lake, reservoir and river)	Introduction, Perception, Discussion	3, 5, 8	FRY
4	Students are able to analyze the suitability of ecotourism resources	1. Ecotourism resource suitability parameters 2. Analysis of suitability space for ecotourism development	Introduction, Case Study, Display	6, 8, 9	FRY
5	Students are able to calculate the carrying capacity of ecotourism utilization areas	1. Definition of carrying capacity 2. Considered carrying capacity parameters 3. Analysis of the carrying capacity of ecotourism	Introduction, Case study, Display	6, 8, 9	FRY
6	Students are able to describe the problem of utilizing aquatic ecotourism resources	1. Threats to aquatic resources in the interest of ecotourism 2. Conflict of interest in the use of aquatic resources	Introduction, Case Study, Discussion	5, 7	GYO

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
7	Students are able to elaborate socioeconomic issues that affect ecotourism	1. Socio-economic threats and problems in ecotourism activities 2. Synergy of social and economic factors with the concept of ecotourism	Introduction, Case Study, Discussion	1, 5, 7	GYO
MIDTERM EXAM					
8	Students are able to explain policies related to aquatic ecotourism management	1. Ecotourism policy in the utilization of aquatic resources 2. Other sector policies affecting ecotourism activities	Introduction, Case Study, Discussion	1, 5, 7	GYO
9	Students are able to explain human resource development policies in ecotourism management.	1. The role of human resources in sustainable ecotourism management 2. Community empowerment in ecotourism management	Introduction, Case Study, Discussion	1, 2, 6, 8	AMS
10	Students are able to compile plans for freshwater tourism development	1. Classification and characteristics of river and lake tourism 2. Planning for river and lake tourism management	Introduction, Perception, Discussion	4, 7	AMS
11	Planning for the development of beach and sea tourism	1. Classification and characteristics of beach and sea tourism 2. Beach and sea tour planning	Introduction, Perception, Discussion	6, 8	AMS
12	Students are able to analyze ecotourism management strategies	1. Analysis of ecotourism strategy planning 2. Sustainable ecotourism management program	Introduction, Case Study, Discussion	6, 8	AYE

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
13	Students are able to arrange ecotourism management in conservation areas	1. Utilization of ecotourism in conservation areas 2. Conservation area management strategy for ecotourism development	Introduction, Case Study, Discussion	2, 6, 8	AYE
14	Students are able to compile ecotourism development in regional spatial planning	1. The concept of ecotourism in regional spatial planning 2. Ecotourism integration with other sectors	Introduction, Case Study, Discussion	2, 6, 8	FRY
FINAL EXAM					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Week
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to explain the scope of ecotourism, as well as the types of tourism industries practically	1. Definition and scope of ecotourism 2. Tourism category	Introduction, public perception, discussion	1, 3, 4	FRY
2	Students are able to apply the concept of ecotourism in the perspective of natural resources and their use in simulations	1. Ecotourism concept & philosophy 2. Application in the utilization of ecotourism	Introduction, case study, simulation, discussion	7, 8, 9	FRY
3	Students are able to explain practically the characteristics of potential aquatic resources and typology of potential aquatic areas for the use of ecotourism	1. Characteristics of potential aquatic ecotourism resources 2. Characteristics of aquatic ecotourism environmental areas (coastal, sea, lake, reservoir and river)	Introduction, case study, simulation, discussion	3, 5, 8	FRY
4	Students are able to conduct practical analysis of the suitability of ecotourism resources	1. Ecotourism resource suitability parameters 2. Analysis of suitability space for ecotourism development	Introduction, case study, simulation, discussion	6, 8, 9	FRY
5	Students are able to calculate the carrying capacity of ecotourism utilization areas practically	1. Carrying capacity parameters 2. Analysis of the carrying capacity of ecotourism	Introduction, case study, simulation, discussion	6, 8, 9	FRY
6	Students are able to describe practically the problems of utilizing aquatic ecotourism resources	1. Ecotourism threats 2. Conflict of interest in the use of aquatic resources	Introduction, case study, simulation, discussion	5, 7	GYO
7	Students are able to elaborate practically on socioeconomic issues that affect ecotourism	1. Socio-economic threats and problems in ecotourism activities	Introduction, case study, simulation, discussion	1, 5, 7	GYO

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Week
(1)	(2)	(3)	(4)	(5)	(6)
		2. Synergy of social and economic factors with the concept of ecotourism			
MIDTERM EXAM					
8	Students are able to explain practically policies related to aquatic ecotourism management	1. Ecotourism policy in the utilization of aquatic resources 2. Other sector policies affecting ecotourism activities	Introduction, case study, simulation, discussion	1, 5, 7	GYO
9	Students are able to explain practically human resource development policies in ecotourism management	1. The role of human resources in sustainable ecotourism management 2. Community empowerment in ecotourism management	Introduction, case study, simulation, discussion	1, 2, 6, 8	AMS
10	Students are able to compile a practical freshwater tourism development plan	1. Classification and characteristics of river and lake tourism 2. Planning for river and lake tourism management	Introduction, case study, simulation, discussion	4, 7	AMS
11	Planning the development of beach and sea tourism practically	1. Classification and characteristics of beach and sea tourism 2. Beach and sea tour planning	Introduction, case study, simulation, discussion	6, 8	AMS
12	Students are able to practically analyze ecotourism management strategies	1. Analysis of ecotourism strategy planning 2. Sustainable ecotourism management program	Introduction, case study, simulation, discussion	6, 8	AYE

Week	Expected Outcome	Topic & Sub Topics	Learning Methods	References	Week
(1)	(2)	(3)	(4)	(5)	(6)
13	Students are able to arrange ecotourism management in conservation areas practically	1. Utilization of ecotourism in conservation areas 2. Conservation area management strategy for ecotourism development	Introduction, case study, simulation, discussion	2, 6, 8	AYE
14	Students are practically able to compile ecotourism development for fisheries development	1. Contribution of conservation and ecotourism 2. Ecotourism development for fisheries development	Introduction, case study, simulation, discussion	2, 6, 8	FRY
FINAL EXAM					

Bogor, 7 December 2022
Course Coordinator of MSP1421 Aquatic Ecotourism Management

Prof. Dr. Ir. Fredinan Yulianda, M.Sc.

IPB University — Bogor Indonesia — Inspiring Innovation with Integrity in Agriculture, Ocean and Biosciences for a Sustainable World	**BOGOR AGRICULTURAL UNIVERSITY** **FACULTY OF FISHERIES AND MARINE SCIENCES** **DEPARTMENT OF RESOURCE MANAGEMENT (MSP)** **BACHELOR PROGRAM**	MSP | Departemen Manajemen Sumberdaya Perairan Fakultas Perikanan dan Ilmu Kelautan (FPIK)

ONE SEMESTER LEARNING PLANNING (RPSS)

COURSE (MK)	CODE	GROUP OF COURSE	CREDITS (SKS)	SEMESTER	COMPILATION DATE
Fisheries Resources Management	MSP1431	Academic Core Courses (ACC)	3	7	07-12- 2022

Teaching Team	Coordinator of Course	Member of Teaching Team
	Prof. Dr. Ir. Luky Adrianto, M.Sc. (LAO)	1. Prof. Dr. Ir. Mennofatria Boer (MBR)

Learning Outcome (LO)	**LO of Study Program assigned to course**	
	LO2	Decide on a management model for resources, ecosystems, environment and water areas based on the principles of carrying capacity, conservation and sustainability.
	LO of Course	
	LO of Course	After attending this course students are able to: 1. ***Softskill*:** Able to think systemically in identifying, mapping and making decisions on fisheries resource management scenarios. 2. ***Hardskill***: a. Having the technical ability to operate software for making decisions on fisheries resource management, b. Be able to map participatory fisheries resource management issues.
Description of Course	This course contains knowledge, techniques and analysis of fisheries resource management which starts with understanding fisheries as a system, namely natural systems, human systems, and management systems. Furthermore, the definitions, elements, components of fisheries resource management are given as an integral part of the concept of sustainable fisheries. Finally, fisheries management models such as sole-owner, territorial use rights in fisheries (TURFs), fisheries co-management and international fisheries management instruments are provided complete with examples and case studies.	

<table>
<tr><td>Reference</td><td colspan="5">1. Charles, A.T. 2001. Sustainable Fishery Systems. Blackwell, UK
2. Folke, C., et.al. Managing Small Scale Fisheries. IDRC, Canada
3. Wudianto, et.al. 2020. Buku Terminologi Ilmu dan Pengelolaan Perikanan. Kementerian Kelautan dan Perikanan
4. Adrianto, L.,et.al. 1999. Konstruksi Lokal Pengelolaan Perikanan di Indonesia. Pusat Kajian Sumberdaya Pesisir dan Lautan IPB
5. Pameroy, R.S and R. Rivera-Guieb. 2006. Fishery Co-Management : Practical Handbook.</td></tr>
<tr><td rowspan="8">Learning Evaluation (Rubric)</td><td colspan="3">Assessment of Learning Outcomes</td><td colspan="2">Final Assessment</td></tr>
<tr><td>Basis of Evaluation</td><td>Percentage (%)</td><td>Description</td><td>Quality Value</td><td>Range of Value</td></tr>
<tr><td>Participatory Activities (Attendance and activeness in class)</td><td>10</td><td>Percentage of attendance and activeness in class</td><td rowspan="7">A
AB
B
BC
C
D
E</td><td rowspan="7">Value ≥ 80
75 ≤ Value < 80
70 ≤ Value < 75
65 ≤ Value < 70
60 ≤ Value < 65
55 ≤ Value < 60
< 55</td></tr>
<tr><td>Result of Project</td><td>20</td><td>Practicum Assessment</td></tr>
<tr><td>Task</td><td>-</td><td>-</td></tr>
<tr><td>Quiz</td><td>-</td><td>-</td></tr>
<tr><td>Midterm exam</td><td>35</td><td>Covers lecture material 1-7</td></tr>
<tr><td>Final exams</td><td>35</td><td>Covers lecture material 8-14</td></tr>
</table>

LECTURE IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand contextually the importance of fisheries resource management.	1. General and main problems in managing fishery resources 2. Dynamics of fisheries resources 3. The importance of fisheries resource management	• Lectures • Active Knowledge Sharing	1	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		4. Introduction to fisheries resource management			
2	Students are able to explore the typology of fisheries resource management problems.	1. Typology of system-based fisheries problems 2. Types of fisheries problems in the context of natural systems 3. Types of fisheries problems in the context of human systems 4. Types of fisheries problems in the context of management systems	• Lectures • Active Knowledge Sharing	1	MBR
3	Students are able to understand the scientific basis in the management of fisheries resources.		• Lectures • Active Knowledge Sharing		MBR
4	Students are able to understand the basic framework and techniques for managing fisheries biological resources (1).		• Lectures • Active Knowledge Sharing		MBR
5	Students are able to understand the basic framework and techniques for managing fisheries biological resources (2).		• Lectures • Active Knowledge Sharing		MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
6	Students are able to understand fisheries management in a systems perspective.	1. The basic framework of the fishery system 2. Natural Systems in the Context of Fisheries Management 3. Human Systems in the Context of Fisheries Management 4. Governance System in the Context of Fisheries Management	• Lectures • Active Knowledge Sharing	1	LAO
7	Students are able to understand the importance of uncertainty in fisheries management.	1. Definition of uncertainty in the management of fisheries resources 2. Typology of uncertainty in the management of fishery resources 3. Human Systems in the Context of Fisheries Management 4. Governance System in the Context of Fisheries Management	• Lectures • Active Knowledge Sharing	1	LAO
MIDTERM EXAM (UTS)					

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
8	Students are able to understand the definitions and principles of fisheries resource management	1. Definition and scope of fisheries resource management 2. Principles of fisheries resource management	• Lectures • Active Knowledge Sharing	1,2	LAO
9	Students are able to understand the dimensions of fisheries management.	Dimensions of fisheries management.	• Lectures • Active Knowledge Sharing	2,3,4	LAO
10	Students are able to understand rights-based fisheries management.	1. Typology of rights in fisheries management 2. Definition and concept of right based fisheries management (RBFM) 3. Right-based fisheries management (RBFM) model	• Lectures • Active Knowledge Sharing	2,3,4	LAO
11	Students are able to understand fisheries collaborative management instruments (fisheries co-management, FCM).	1. Fisheries Co-Management concept and definition 2. Benefits and Costs of Fisheries Co-Management 3. Fisheries Co-Management Model	• Lectures • Active Knowledge Sharing	5	LAO
12	Students are able to understand international fisheries management instruments (1)	1. Typology of transboundary fisheries	• Lectures • Active Knowledge Sharing	3	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		2. The principle of transboundary fisheries management			
13	Students are able to understand international fisheries management instruments (2).	Cross Border Fisheries – Tuna Fisheries Management	• Lectures • Active Knowledge Sharing	3	LAO
14	Students are able to understand fisheries management empirically – a case study of Management of Fisheries Access Areas (PAAP) in Southeast Sulawesi.	1. PAAP approach 2. PAAP pillar 3. 3. PAAP mechanism	• Lectures • Active Knowledge Sharing	3,4	LAO
FINAL EXAMS (UAS)					

PRACTICUM IMPLEMENTATION PLAN

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
1	Students are able to understand contextually the importance of fisheries resource management.	1. General and main problem of fishery resource management 2. Dynamics of fisheries resources 3. The importance of fisheries resource management	Discussion/Case Study	1	MBR

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		4. Introduction to fisheries resource management			
2	Students are able to explore the typology of fisheries resource management problems	1. Typology of system-based fisheries problems 2. Types of fisheries problems in the context of natural systems 3. Types of fisheries problems in the context of human systems 4. Types of fisheries problems in the context of management systems	Discussion/Case Study	1	MBR
3	Students are able to understand the scientific basis in the management of fisheries resources.		Discussion/Case Study		MBR
4	Students are able to understand the basic framework and techniques for managing fisheries biological resources (1).		Discussion/Case Study		NAB
5	Students are able to understand the basic framework and techniques for managing fisheries biological resources (2).		Discussion/Case Study		NAB
6	Students are able to understand fisheries management in a systems perspective.	1. The basic framework of the fishery system 2. Natural Systems in the Context of Fisheries Management	Discussion/Case Study	1	NAB

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
		3. Human Systems in the Context of Fisheries Management 4. Governance System in the Context of Fisheries Management			
7	Students are able to understand the importance of uncertainty in fisheries management.	1. Definition of uncertainty in the management of fisheries resources 2. Typology of uncertainty in the management of fishery resources 3. Human Systems in the Context of Fisheries Management 4. Governance System in the Context of Fisheries Management	Discussion/Case Study	1	NAB
MIDTERM EXAM (UTS)					
8	Students are able to understand the definitions and principles of fisheries resource management.	1. Definition and scope of fisheries resource management 2. Principles of fisheries resource management	Discussion/Case Study	1,2	LAO
9	Students are able to understand the dimensions of fisheries management.	Dimensions of fisheries management.	Discussion/Case Study	2,3,4	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
10	Students are able to understand rights-based fisheries management.	1. Typology of rights in fisheries management 2. Definition and concept of right based fisheries management (RBFM) 3. Right-based fisheries management (RBFM) model	Discussion/Case Study	2,3,4	LAO
11	Students are able to understand fisheries collaborative management instruments (fisheries co-management, FCM).	1. Fisheries Co-Management concept and definition 2. Benefits and Costs of Fisheries Co-Management 3. Fisheries Co-Management Model	Discussion/Case Study	5	LAO
12	Students are able to understand international fisheries management instruments (1).	1. Typology of transboundary fisheries 2. The principle of transboundary fisheries management	Discussion/Case Study	3	LAO
13	Students are able to understand international fisheries management instruments (2).	Cross Border Fisheries – Tuna Fisheries Management	Discussion/Case Study	3	LAO
14	Students are able to understand fisheries management empirically – a case study of Management of Fisheries Access Areas (PAAP) in Southeast Sulawesi	1. PAAP approach 2. PAAP Pillars 3. PAAP mechanism	Discussion/Case Study	3,4	LAO

Week	Expected Final Ability	Topic & Sub Topic	Face-to-Face/Online Learning Methods	Reference Source	Lecturer
(1)	(2)	(3)	(4)	(5)	(6)
FINAL EXAMS (UAS)					