Co-funded by the Erasmus+ Programme of the European Union

IPB University — Bogor Indonesia —

UN4DRR

University Network for Disaster Risk Reduction and Management in Indian Ocean Rim / UN4DRR

Proposed Modules and Courses

Erasmus+ Project Ref: 609592-EPP-1-2019-1-BE-EPPKA2-CBHE-JP

3.1 Defining Learning Outcomes of New or Updated Curricula in IOR HEIs

IPB University

March 2021

Summary

UN4DRR project for modernization of curriculum has advanced knowledge about developing curricula in disaster risk reduction management. There are 5 modules from this program which are delivered by 9 courses led by the study program of Natural Resources and Environmental Management Science (NREMS), Graduate School, IPB University. The five's modules i.e. Disaster Risk Management, Disaster Management, Technology in Disaster: Geographic Information Systems, Technology in Disaster: Remote Sensing, and Research in Disaster Management have supported the implementation of our new curriculum in the K2020 program. By involving some courses in this program, the learning objectives, as well as outcomes of those courses, can be more deep and be expected to be well understood in student mentoring.

The nine courses from our program study are Spatial Research Methodology, Climate Change and Disaster Risk Management, Ecological Risk Analysis, Global Environmental Change and Disaster Management, Physical Resources for Regional Planning, Spatial Modeling for Natural Resources Management, Spatial Planning and Environmental Information Systems, Natural Resources and Sustainable Development, and Sustainable Land and Water Resources Management. All the courses promote and develop the awareness as well as the skill of the students in Disaster Risk Reduction; Management of Risk; Prevention of Disasters; Management of Disasters; Integrated GIS and RS; Risk Mapping, Simulations and Assessment of Disasters; Environmental Issues; Sustainable Development; Support National Policies; Innovation, Research, and Development.

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1. Proposed Modules and Courses

Disaster Risk Management3d	Disaster Management	Technology in Disaster: Geographic Information Systems	Technology in Disaster: Remote Sensing	Research in Disaster Management
Climate Change and Disaster Risk Management	Global Environmental Change and Disaster Management	Spatial Modeling for Natural Resource Management	Physical Resources for Regional Planning	Spatial Planning and Environmental Information System
Ecological Risk Analysis			Spatial Research Methodology	Natural Resources and Sustainable Development
				Sustainable Land and Water Resources Management

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University Network for (4) Disaster Risk Reduction and Management in Indian Ocean Rim / UN4DRR

Courses and Learning Objectives

Learning Objectives

5 Modules / 9 Courses	ECTS	Disaster Risk Reduction	Management of Risk	Prevention of Disasters	Management of Disasters (Natural and Man Made)	Integrate GIS and RS	Risk mapping, Simulations and Assessment of Disasters	Environmental Issues	Green Economy / Sustainable Development	Support National and European Policies	Innovation, Research, Development
Disaster Risk Management	9										
Climate Change and Disaster Risk Management (PSL 625)	3	V	V		V	V	V			V	V
Ecological Risk Analisys (PSL 674)	3	V	V		V	V	V	V		V	V
Disaster Management	3										
Global Environmental Change and Disaster Management (PSL 661)	3		V	V	V					V	V
Spatial Modeling for Natural Resource Management (PSL 608)	3					V	V				V

5 Modules / 9 Courses	ECTS	Disaster Risk Reduction	Management of Risk	Prevention of Disasters	Management of Disasters (Natural and Man Made)	Integrate GIS and RS	Risk mapping, Simulations and Assessment of Disasters	Environmental Issues	Green Economy / Sustainable Development	Support National and European Policies	Innovation, Research, Development
Technology in Disaster: Remote Sensing	3										
Physical Resources for Regional Planning (TSL 507)	3					V	V				V
Spatial Research Methodology (PWL 601)	3					V	V				V
Research in Disaster Management	9										
Spatial Planning and Environmental Insformation Systems (PSL 642)	3				V	V					V
Natural Resource and Sustainable Development (PSL676)	3				V						V
Sustainable Land and Water Resources Management (PSL671)	3							V			V

2. Courses and Learning Objectives

2.1. Spatial Research Methodology

At the end of the course, the students should be able to

- Develop students scientific writing techniques in the field of regional planning
- Demonstrate knowledge about the ways of writing a thesis section
- Apply research ethics in their research.
- Develop the techniques of writing research proposals
- Apply spatial and non-spatial sampling techniques
- Formulate pre-proposals that are ready to be submitted to the supervisory commission

2.2. Climate Change and Disaster Risk Management

At the end of the course, the students should be able to

- Examine the state -of the art research in climate change and disaster risk management and design an intervention based on risk analysis of climate change and disaster
- Select and elaborate in detail various analytical models related to risk level assessment of disaster and to design on the major challenges in terms of climate change in Indonesia
- Formulate risk assessment for climate related disaster in Indonesia

2.3. Ecological Risk Analysis

At the end of the course, the students should be able to

- Examine the concepts of ecological risk and human health risk
- Analyze the principles and characteristics of ecological risks as well as human health risks analysis (ERA/HHERA), environmental pollution, and ecological damage to the watershed unit area (DAS).
- Evaluate the working mechanism of ERA / HHRA, teams involved in ERA / HHRA, hazard exposures to ERA and HHRA, tiers or levels at ERA / HHRA
- Evaluate the impact, risk management, risk communication, and designing ERA and HHRA activities

2.4. Global Environmental Change and Disaster Management

At the end of the course, the students should be able to

- Thoroughly discuss the changes in the global environment at various times and their implications for the order of human life as well as the social and economic dimensions
- Provide with deep knowledge of the resilience and sustainability in conditions of an ever-increasing population and global social conditions
- Cover in detail all aspects of disaster recovery management through disaster impact recovery, rehabilitation, and reconstruction models

2.5. Physical Resources for Regional Planning

At the end of the course, the students should be able to

- Prepare the students to understand the importance of land resources and regional bio-geophysics in land use planning
- Integrate ecosystem resources and environmental support capacity in regional planning
- Propose the concept of land evaluation and land and environmental support capacity in land use planning
- Formulate the use of natural resources for regional planning analysis
- Anticipate disaster risks due to hydrometeorology, geology and epidemics based on spatial planning concepts
- Develop appropriate disaster management plans.

2.6. Spatial Modeling for Natural Resources Management

At the end of the course, the students should be able to

- Provide an overview of many different advanced GIS and remote sensing techniques in spatial modelling to study environmental issues
- Analyses in detail of all aspects of the GIS/RS and its relationship with the other sciences (disciplines) and spatial approach to understand environmental problems.
- Develop spatial models to solve an environmentally based problem with real-world applications.

2.7. Spatial Planning and Environmental Information Systems

At the end of the course, the students should be able to

- Introduce issues of urban and regional spatial planning as well as environmental aspect
- Examine the concepts of spatial planning
- Evaluate environmental studies and environmental support capacity
- Examine the concept of database management information systems
- Apply data mining techniques for natural resource management purposes

2.8. Natural Resources and Sustainable Development

At the end of the course, the students should be able to

- The basics of sustainable natural resource and environmental management, including the principles of sustainability and the development of sustainable development
- Living and non-living natural resources are addressed in the context of the basic capital of development
- The carrying capacity of the environment and policies that need to be taken
- Sustainable natural resource management for development
- Agro-ecosystem, marine resources, human ecosystem, and information technology-based natural resource management
- Sustainable natural resource management for adequate food and energy, as well as the impact of development on the sustainability of natural resources and the environment
- Disaster management of natural resources and environment in Indonesia

2.9. Sustainable Land and Water Resources Management

At the end of the course, the students should be able to

- Combine the issues of soil, land and water scarcity as well as land use for development
- Adapt the concepts of land use planning of the FAO system into sustainable land and water planning and management
- Integrate land and water management for sustainable utilization
- Integrate land and water management at the scale of watershed as functional analysis
- Develop disaster and risk management as well as environmental carrying capacity in strategic environmental studies
- Develop and formulate integrated land and water resources management
- Develop decision-making techniques in land and water resources management
- Integrate the concept of disaster risk management in land and water management

3. Module and Course Outlines

3.1. Spatial Research Methodology

Course Outline

Course Code	**Course Title**	**ECTS Credits**
PWL 601	**Spatial Research Methodology**	3.0
Prerequisites	**Department**	**Semester**
-	Regional Planning Study Program, IPB Univ.	2
Type of Course **Mandatory**	**Field**	**Language of Instruction**
Level of Course	**Lecturer(s)**	**Year of Study**
Master (S2)	Prof. Widiatmaka, Dr Khursatul Munibah, Dr Andrea Ema Pravitasari	1
Mode of Delivery	**Work Placement**	**Corequisites**
online and offline, student presentation		

Course Venue Dramaga Campus, Bogor	**Course Day and Time** Wednesday, 08.00 AM-01.00 PM	**Telephone** 0251 629360
Office Dramaga Campus, Bogor	**Email** widiatmaka@apps.ipb.ac.id	**Student Consultation Hours** Wednesday, 04.00-06.00 PM

Course Objectives:

The main objectives of the course are to:

- Develop understanding of the students in scientific writing techniques in the field of regional planning
- Prepare knowledge of the students about the ways of writing a thesis section
- Construct understanding of the students about research ethics
- Develop the techniques of writing research proposals
- Prepare the students with a sense of spatial and non-spatial sampling techniques
- Formulate pre-proposals that are ready to be submitted by students to the supervisory commission

Learning Outcomes:

After completion of the course students are expected to be able to:

- Compile the scientific writing technique in spatial regional planning
- Evaluate spatial methodology which appropriate to specific condition of regional planning
- Develop an operational, good and correct research proposals
- Develop research proposals that are ready to be submitted to the supervisory commission
- Formulate competitive research proposal

Course Content:

This course discusses:

- Steps and Stages of Research in the Regional Planning Science Study Program
- Fundamental research concepts, research philosophy, research ethics, concepts, and rules
- The structure of the thesis and thesis proposal
- The relationship between the components in the design of the thesis and the construction of the proposal
- Method of composing Background, Objectives, Problem Formulation, Thinking Framework, Hypothesis, Methodology, including important things that must be written in each section, followed by a discussion of literature review and language
- Spatial and non-spatial sampling designs: Sampling theory and technique and examples of their application in several studies
- Spatial and non-spatial data analysis techniques: types and types of data, data scale
- Types of research: quantitative and qualitative research (differences in characteristics)
- Data analysis, data processing techniques according to the research approach, examples of data analysis techniques in quantitative research (descriptive and inferential statistics), examples of data analysis techniques in qualitative research,
- Publication techniques in scientific journals: journal selection techniques, international scientific journal level, national scientific journal level, journal submission stages to accepted, instruction for author, submission, how to improve based on the reviewer's comment.
- A presentation of research proposals by students.

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Student-led Presentations

Assessment:

Assessment Type	**Weight (Percentage)**
Exam (Midterm examination)	20%
Individual proposal presentation	20%
Final thesis proposal, ready to be submitted to advisors	60%

Attendance:

Students are required to attend at least 80% attendance at this course

Course Requirements:

-

Grading Scale:

Letter Grade	**Meaning**	**Numerical Grades 0-100**	**Grade Points 0-4**
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5
B	Good	70 ≤ X < 75	3.0

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
BC	Fairly Good	65 ≤ X < 70	2.5
C	Fair	55 ≤ X < 65	2.0
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Guidelines in Writing Scientific Papers (in Indonesian)	[IPB] Institut Pertanian Bogor	[IPB] Institut Pertanian Bogor	2019	978-623-256-142-7
Research Methods for Postgraduates, Third Edition	Tony Greenfield	John Willey & Sons, Ltd	2016	9781118762998
Essentials of Research Design and Methodology	Geoffrey Marczyk, David DeMatteo, David Festinger	John Wiley & Sons,Inc.	2005	0-471-47053-8

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Student plagiarism in an online world : problems and solutions	Tim Roberts	Information Science Reference (an imprint of IGI Global)	20077	978-1-59904-803-1

Research Methodology: Methods and Techniques	C.R. Kothari	New Age Publications (Academic), Year:	2009	9788122415223

Weekly Schedule:

Week	Topic	Assigned Readings
1.	Course contract, 12 steps and stages of research in the Regional Planning Study Program: description and explanation starting from entering the study program to graduation, through the stages: theoretical lectures, preparation of proposals, colloquium, publication to examinations. Includes terms and conditions of implementation	Institut Pertanian Bogor (2019)
2	Basic research concepts, research philosophy, research ethics, formal research concepts and rules of higher education, bachelor to doctoral research positions, and plagiarism	Greenfield (2016)
3	Thesis structure, thesis proposal structure, linkages between components in the thesis structure and proposal structure	Institut Pertanian Bogor (2019)
4	Contents and ways of preparing the background, objectives, problem formulation, frame of mind, hypothesis, methodology. Essential points to write in each section	Greenfield (2016)
5	Literature and language review	Institut Pertanian Bogor (2019)
6-7	Spatial and non-spatial sampling design: Sampling theory and technique and examples of its application in several studies	Marczyk et al. (2005)
8-9	Spatial and non-spatial data analysis techniques: types and types of data, data scale, types of research: quantitative and qualitative research (differences in characteristics), data analysis, data processing techniques according to research approaches, examples of data analysis techniques in quantitative research (descriptive and inferential statistics),	Greenfield (2016); Marczyk et al. (2005); Institut Pertanian Bogor (2019)

	examples of data analysis techniques in qualitative research	
10	Publication techniques in scientific journals: journal selection techniques, international scientific journal level, national scientific journal level, journal submission stages until accepted, instruction for author, submission, how to improve reviewer's comment based	Greenfield, 2016 and Marczyk et al. (2005)
11-14	Presentation of research proposals by students (4 students per week), corrections, and comments by caregivers (3 people). Conducted for 4 (four) to 5 (five) weeks	Greenfield (2016) and Marczyk et al. (2005)

3.2. Climate Change and Disaster Risk Management

Course Outline

Course Code	**Course Title**	**ECTS Credits**
PSL 625	**Climate Change and Disaster Risk Management**	3
Prerequisites	**Department**	**Semester**
-	NREMS Study Program, IPB Univ.	2
Type of Course	**Field**	**Language of Instruction**
Mandatory	Risk Management	Bahasa Indonesia
Level of Course	**Lecturer(s)**	**Year of Study**
Magister (S2) Doctoral (S3)	Dr Perdinan, Dr Boedi Tjahjono, Dr Yudi Setiawan	1
Mode of Delivery	**Work Placement**	**Corequisites**
Lectures and discussions		-

Course Venue **NREM Baranangsiang**	**Course Day and Time** Friday : 13.00 - 13.50 ; 15.00 - 17.00 Saturday : 08.00 - 08.50 ; 09.00 - 12.00	**Telephone**
Office **NREM Baranangsiang**	**Email** **Perdinan@apps.ipb.ac.id**	**Student Consultation Hours** Monday - Saturday : 09.00 - 17.00

Course Objectives:

The main objectives of the course are to:

- Examining state -of the art research in climate change and disaster risk management and design an intervention based on risk analysis of climate change and disaster
- Select and elaborate in detail various analytical models related to risk level assessment of disaster and to design on the major challenges in terms of climate change in Indonesia
- Formulate risk assessment for climate related disaster in Indonesia

Learning Outcomes:

After completion of the course students are expected to be able to:

- Evaluate climate change and disaster risk management dimensions
- Analyze the design of action interventions based on risk analysis of climate change and disaster
- Compare various analytical models related to risk level assessment as presented through case study
- Formulate action options to utilize climate and land data/information in climate change adaptation and disaster risk management
- Produce risk assessment for climate related disaster

Course Content:

This course discusses:

- The concept of climate change and disaster risk management based on the factors that shape disaster events (with a focus on climate-related disasters) in the context of the synergy of climate change adaptation and disaster risk reduction
- The international framework, basic concepts, regulations, and practical tools through the use of analytical models (temporal and spatial) for risk level assessment
- Validation the results of risk assessments, used as a basis for developing action interventions
- Case studies of climate change and disaster risk in Indonesia to enrich risk management systems

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Student-led Presentations

Assessment:

Assessment Type	Weight (Percentage)
Weekly Practical Works	40%
Midterm Exam	30%
Final Term Exam	30%

Attendance:

100%

Course Requirements:

-

Grading Scale:

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5
B	Good	70 ≤ X < 75	3.0
BC	Fairly Good	65 ≤ X < 70	2.5
C	Fair	55 ≤ X < 65	2.0
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Climate Variability and Climate Change Impacts on Land Surface, Hydrological Processes and Water Management	Yongqiang Zhang, Hongxia Li and Paolo Reggiani (Eds.)	MDPI	2019	978-3-03921-508-9
Climate System Dynamics and Modelling	Hugues Goosse	Cambridge University Press	2015	9781107445833
The Global Climate System	Howard A. Bridgman and John E. Oliver	Cambridge University Press	2012	9780511817984

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Climate Modelling	Elisabeth A. Lloyd and Eric Winsberg	Springer	2018	978-3-319-65058-6
Climate Change, Disaster Risk and Human Security	Juan M. Pulhin, Makoto Inoue, and Rajib Shaw	Springer	2021	978-981-15-8852-5
Climate scenario development and applications for local/regional climate change impact assessments: An overview for the non-climate scientist. Part II: Considerations when using climate change scenarios	Winkler JA, Guentchev GS, Liszewska M, Perdinan and Tan P-N.	Geography Compass 5: 301-328.	2011	1749-8198

Remote Sensing and GIS Technologies for Monitoring and Prediction of Disasters	Shailesh Nayak and Sisi Zlatanova	Springer	2008	978-3-540-79259-8
Natural Disaster and Coastal Geomorphology	Shigeko Haruyama and Toshihiko Sugai	Springer	2016	978-3-319-33814-9
Natural Disaster Risk Management	Ulrich Ranke	Springer	2016	978-3-319-20675-2

Weekly Schedule:

Week	Topic	Assigned Readings
1.	Climate Change and Disaster Mindset. The scope of climate change and its definition of disaster and its types conform to international frameworks (i.e., Paris Agreement, IPCC, Sendai Framework) and regulations (i.e., PERMEN KLHK, PERKA BNPB) in Indonesia. Outline explanation of courses and assignments, percentage of exam scores, and practicum.	Climate Change, Disaster Risk and Human Security
2.	The concept of climate change and disaster risk management in the context of Climate Change Adaptation and Disaster Risk Reduction; Synergy of climate-related disaster risk management: climate information services in disaster risk management	Climate Change, Disaster Risk and Human Security
3.	• Understanding loss and damage in climate change and disaster • Climate vulnerability, risks, and impacts • Analytical tools are available nationwide ●Vulnerability analysis based on socio-economic conditions ●Analysis of disaster events	Climate Change, Disaster Risk and Human Security
4.	● Impact of climate events, information on various climate phenomena, and their potential impacts. ● Analysis of climate-related extreme events and disaster events ● The approach to assessing the vulnerability, risk, and impact of climate change	Climate System Dynamics and Modelling

5.	• The concept of a Climate Smart system in the framework of a climate disaster resilience community • Case studies on the design of interventions to address the impacts of climate change	The Global Climate System
6.	• The concept of using geospatial techniques in disaster risk assessment • Techniques/methods for identifying spatial variations in disaster impacts	Remote Sensing and GIS Technologies for Monitoring and Prediction of Disasters
7.	• Use of instrumentation tools (e.g., measuring instruments, drones) in the process of validating disaster events	Remote Sensing and GIS Technologies for Monitoring and Prediction of Disasters
8.	• Concept of climate impacts on the forestry sector/forest fires • Climate impact analysis - land fires	Remote Sensing and GIS Technologies for Monitoring and Prediction of Disasters
9.	• Land-based disaster risk analysis techniques/methods • Analysis of factors contributing to forest and land fires	Remote Sensing and GIS Technologies for Monitoring and Prediction of Disasters
10.	• Concept of climate impacts on geomorphology • Geomorphological analysis and mapping of disaster events	Natural Disaster and Coastal Geomorphology (Chapter 1)
11.	• Drought disaster assessment concept • Various types of drought disasters • The main contributing factors for drought disaster	Natural Disaster Risk Management
12.	• Factors for flood disaster Comparative evaluation of climate and land impacts on water resources	Natural Disaster Risk Management
13.	• Land management framework for disaster risk reduction • Standard land management requirements for disaster risk reduction	Natural Disaster Risk Management
14.	Seminar: • Presentation and discussion of the results of a case study on climate change and disaster risk analysis	Group Discussion

	• Students' exposure to learning outcomes by taking case studies focusing on the impact of climate change or disaster events	

3.3. Ecological Risk Analysis

Course Outline

Course Code	**Course Title**	**ECTS Credits**
PSL 674	**Ecological Risk Analysis**	3
Prerequisites	**Department**	**Semester**
-	NREMS Study Program, IPB Univ.	2
Type of Course	**Field**	**Language of Instruction**
Elective		
Level of Course	**Lecturer(s)**	**Year of Study**
	Prof. Lina Karlinasari, Prof. Hadi S Alikodra, Prof. Anas M Fauzi, Prof. Sri Budiarti, Dr. Nyoto Santoso	1
Mode of Delivery	**Work Placement**	**Corequisites**

Course Venue	**Course Day and Time**	**Telephone**
Office **NREM Baranangsiang**	**Email**	**Student Consultation Hours**

Course Objectives:

The main objectives of the course are to:

- Examine the concepts of ecological risk and human health risk
- Analyze the principles and characteristics of ecological risks as well as human health risks analysis (ERA/HHERA), environmental pollution, and ecological damage to the watershed unit area (DAS).

- Evaluate the working mechanism of ERA / HHRA, teams involved in ERA / HHRA, hazard exposures to ERA and HHRA, tiers or levels at ERA / HHRA
- Evaluate the impact, risk management, risk communication, and designing ERA and HHRA activities

Learning Outcomes:

After completion of the course students are expected to be able to:

- Describe the concept of ecological risk analysis human health risk analysis
- Implement ecological risk analysis and human health risk analysis to plan and implement Environmental and Sustainability Management.
- Critically assess of ecological risk analysis (ERA) and human health risk analysis (HHRA)
- Evaluate environmental pollution and ecological damage
- Apply the mechanism of ERA / HHRA, determine teams to be involved as well as tiers or levels at ERA / HHRA
- Recommend the ERA/ HHRA in planning and implementation environmental and sustainability Management.

Course Content:

This course discusses:

- The concept of Ecological Risk Analysis, which consists of ecological risk analysis (ERA) and human health risk analysis (HHRA) due to the impact of activities including disaster, that are currently or have been taking place in an environment.
- The complaints from society on the decreasing of environment quality which then need to be proven through assessment and evaluation.
- The principles and characteristics of ecological risks, human health risks, environmental pollution, and ecological damage to areas with the scope of watershed units
- The ERA / HHRA working mechanisms, teams involved in ERA / HHRA, hazard exposure to ERA and HHRA, tiers or levels at ERA / HHRA,
- The impact evaluation, risk management, risk communication, and planning of ERA and HHRA activities

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Student-led Presentations

Assessment:

Assessment Type	Weight (Percentage)
Exam (Midterm examination)	20%
Critical literature review	20%
Working group to analysis field case for ERA	60%

Attendance:

Students are required to attend at least 80% attendance at this course

Course Requirements:

-

Grading Scale:

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5
B	Good	70 ≤ X < 75	3.0
BC	Fairly Good	65 ≤ X < 70	2.5
C	Fair	55 ≤ X < 65	2.0

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Ecological Risk Assessment. 2nd Edition	Glenn W Suter II	CRC Press	2006	9781420012569
A Framework for Ecological Risk Assessment: Technical Appendices	CCME	Canadian Council of Ministers of the Environment	1997	-
Population-Level Ecological Risk Assessment	Lawrence W. Barnthouse Wayne R. Munns, Jr. Mary T. Sorensen	Taylor and Francis	2008	978-1-880611-93-7
Essential of Environmental Health. 3rd edition	Robert H Friis	John & Bartlett Learning	2019	-
Human Halteh and Ecological Risk Assessment, Application of Alternative Waste Technologies Materials to Agricultural Land	NSW EPA	EnRisk	2019	-

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
New era Conservation of natural resources and the environment: placement the philosophy for the sustainability of the people sustainability of the people	Alikodra, H.S.	IPB Press, Bogor	2020	9786232564145
A Framework for Ecological Risk Assessment: General Guidance	CCME	Canadian Council of Ministers of the Environment	1996	-
Should We Risk It: Exploring Environmental, Health, and Technological Problems Solving	Kammen, Daniel M, D. M. Hassenzahi.	Princeton Univ. Press, Princeton.	2001	978-0691074573
Generic Ecological Assessment Endpoints (GEAEs) For Ecological Risk Assessment	Risk Assessment Forum U.S. Environmental Protection Agency Washington, DC 20460	EPA/100/F15/005	2016	https://www.epa.gov/sites/production/files/2016-08/documents/geae_2nd_edition.pdf
Guidelines for Environmental Risk Assessment and Management. *Risk Management*	Gormley, Á., Pollard, S., & Rocks, S		2011	http://www.defra.gov.uk/publications/files/pb13670-green-leaves-iii-1111071.pdf

Coastal and estuarine risk assess	Michael C. Newman Morris H. Roberts, Jr. Robert C. Hale	Lewis Publisher	2002	1-56670-556-8
Human Health and Ecological Risk Assessment Technical Support Document	Hammond Reef Gold Project	-	2013	-

Weekly Schedule:

Week	Topic	Assigned Readings
1	Understanding the concepts and benefits of ERA / HHRA	• Ecological Risk Assessment • New era Conservation of natural resources and the environment: placement the philosophy for the sustainability of the people
2	ERA triggers, ERA framework, TIERS ERA, organizational structure, recruitment of personnel to the final ERA product	• Ecological Risk Assessment • A Framework for Ecological Risk Assessment: General Guidance
3	*ERA Screening Assessment and Dose-Response*	• A Framework for Ecological Risk Assessment: General Guidance • A Framework for Ecological Risk Assessment: Technical Appendices
4	*Detailed Qualitative ERA*	• A Framework for Ecological Risk Assessment: Technical Appendices • Guidelines for Environmental Risk Assessment and Management. *Risk Management*

5-6	Ecology, Ecosystems, and Landscapes from Mountains to Seabed	• Generic Ecological Assessment Endpoints (GEAEs) For Ecological Risk Assessment • Coastal and estuarine risk assess
7	Regional - population level	Population-Level Ecological Risk Assessment
8-9	ERA reports and communications, as well as Risk management	• A Framework for Ecological Risk Assessment: General Guidance • A Framework for Ecological Risk Assessment: Technical Appendices
10	Characteristics of health problems due to environmental change and damage	Essential of Environmental Health
11-12	HHRA: definition and evaluation of health impacts consisting of hazard identification, toxicology vs. ecotoxicology, human risk assessment, process stages, and key factor risk assessment, human toxicology	• Essential of Environmental Health • Human Halteh and Ecological Risk Assessment, Application of Alternative Waste Technologies Materials to Agricultural Land
13	Risk Management: risk assessment vs. risk management, risk evaluation, risk treatment, risk-based screening level	Human Halteh and Ecological Risk Assessment, Application of Alternative Waste Technologies Materials to Agricultural Land
14	ERA / HHRA design	Discussion

3.4. Global Environmental Change and Disaster Management\

Course Outline

Course Code	Course Title	ECTS Credits
PSL 661	**Global Environmental Change and Disaster Management**	3
Prerequisites	**Department**	**Semester**
-	NREMS Study Program, IPB Univ.	2
Type of Course	**Field**	**Language of Instruction**
Mandatory		
Level of Course	**Lecturer(s)**	**Year of Study**
Master	**Dr Lailan Syaufina, Dr Tania June, Prof. Euis Sunarti, Dr. Suria Darma Tarigan**	**1**
Mode of Delivery	**Work Placement**	**Corequisites**

Course Venue	Course Day and Time	Telephone
Office	**Email**	**Student Consultation**
NREM Baranangsiang		**Hours**

Course Objectives:

The main objectives of the course are to:

- Thoroughly discuss the changes in the global environment at various times and their implications for the order of human life as well as the social and economic dimensions
- Provide with deep knowledge of the resilience and sustainability in conditions of an ever-increasing population and global social conditions
- Cover in detail all aspects of disaster recovery management through disaster impact recovery, rehabilitation, and reconstruction models

Learning Outcomes:

After completion of the course students are expected to be able to:

- Formulate changes in the global environment from various times and their implications for the order of human life

- Evaluate the social and economic dimensions of the changing global environment
- Analyze resilience and sustainability in conditions of an ever-increasing population and global social conditions
- Compare types of disasters, disaster risk, disaster management, and best practices for natural disaster mitigation
- Design disaster recovery and reconstruction management models

Course Content:

This course discusses:

- Changes in the global environment in the Anthropocene / Anthropocene era and their implications for the order of human life: causes and consequences
- Earth-Atmospheric System, Global Change, and Biosphere discussion include biogeophysical and biogeochemical processes that contribute to climatic conditions at various scales
- Socio-economic dimensions of global environmental change including environmental change's political and ethical aspects, the relationship between human and ecological systems
- A concept and management framework that is resilient and sustainable in an ever-increasing population and global social conditions. Besides, it also discusses the response to the impact of global environmental changes.
- Integrated earth system governance includes climate, forests, agriculture, coastal and marine sectors—types of disasters and disaster risk, disaster management, and best practices for natural disaster mitigation
- Explanations and discussions on lessons learned about mitigating natural disasters in Indonesia and other countries.
- Social aspects of disasters
- Disaster recovery management described through models for disaster impact recovery, rehabilitation, and reconstruction
- Best practices for social disaster mitigation and the lessons learned on social disaster mitigation in Indonesia and other countries.

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Student-led Presentations

Assessment:

Assessment Type	Weight (Percentage)
Mid-term exam	35%
Final-term exam	35%
Structured tasks	30%

Attendance:

Minimum 80%

Course Requirements:

-

Grading Scale:

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5
B	Good	70 ≤ X < 75	3.0
BC	Fairly Good	65 ≤ X < 70	2.5
C	Fair	55 ≤ X < 65	2.0
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Integrating Disaster Science and management	Pijush Samui, Dookie Kim, and Chandan Ghosh (eds.)	Elsevier	2018	978-0-12=812056-9
Geomorphology and Global Environmental Change.	Slaymaker, O., Spencer, T. and Embleton-Hamman, C.	Cambridge University Press	2009.	
The Anthropocene: Are humans now overwhelming the great forces of nature?.	Steffen W., Crutzen P. J. and McNeill J. R.	Royal Swedish Academy of Sciences. (http://www.ambio.kva.se)	2007	Ambio Vol. 36, No. 8: 614-621.

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Evaluation of Disaster Mitigation in Indonesia (*in* Bahasa Indonesia)	Euis Sunarti et al.	IPB Press	2013	978-979-493-859-1
Socio-economic development based on society robustness in coping disaster (*in* Bahasa Indonesia)	Euis Sunarti	IPB Press	2015	978-979-493-861-4

Socio-psycho recovery of Tasikmalaya 's earthquake victims September 2009 (*in* Bahasa Indonesia)	Euis Sunarti et al.	Research Action report	2010	
Economic recovery of Tasikmalaya 's earthquake victims September 2009 (*in* Bahasa Indonesia)	Euis Sunarti et al.	Research Action report	2011	
Impact of Sunda Strait Tsunami on Socio-Economic Vulnerability and SDGs achievements (*in* Bahasa Indonesia)	Euis Sunarti	Research Action report	2020	
Knowledge and Management on Disaster (*in* Bahasa Indonesia)	Mareta N	LIPI	2014	
Practical Guidelines on Disaster Management (*in* Bahasa Indonesia).	Ramli S	Dian Rakyat	2010	
Economics and Sustainability Social-Ecological Perspectives	Bruckmeier K	Palgrave Macmillan	2020	978-3-030-56626-5

IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*	R.K. Pachauri and L.A. Meyer (eds.)	IPCC, Geneva, Switzerland, 151 pp.	2014	

Weekly Schedule:

Week	Topic	Assigned Readings
1.	Global Environmental Change: Anthropocene / Anthropocene Age and its implications for the order of human life. The causes and consequences of a rapidly increasing population, energy use, global warming, water and air pollution, and the destruction of biodiversity; Understanding of the terminology of the concept of sustainability, ecological footprint, biodiversity, environmental services/ecosystem services, and the complexity of the earth system.	Steffen W., Crutzen P. J. and McNeill J. R.
2-4	Biogeophysical and biogeochemical processes that contribute to climatic conditions at various scales; An understanding of the interdependence between significant cycles in the earth system (air, water, carbon, nitrogen, phosphorus); How ecologists explore the response of the biosphere to global change through field studies, use of remote sensing and modeling with examples from research results in the tropics; Analysis of the role of the biosphere in global and local environmental changes: how the biosphere is affected by environmental changes and how changes in the biosphere system affect global change.	Slaymaker, O., Spencer, T. and Embleton-Hamman, C.
5	Economic, political, and ethical dimensions of environmental change. The relationship between human and ecological systems and how human complexity, diversity, stratification, and management can contribute to and respond to critical environmental parameters' challenges. It introduces the concept and management framework that is resilient and sustainable in the condition of an increasing population and global social conditions.	Bruckmeier K

6-7	Energy systems and climate change mitigation; Trend of technology availability, economic level, human behaviour, social change and governance in avoiding or minimizing the negative impacts of climate change and the environment; Appropriate and sustainable response / Sustainable to the effects of global change (extreme conditions, disasters); Adaptation Program. Anthropocene management is collective, participatory, and involves all stakeholders, integrated earth system governance covering the fields of climate, forest, agriculture, and coastal and marine.	R.K. Pachauri and L.A. Meyer (eds.)
8	Types of disasters and disaster risks: Description and discussion of the kinds of natural and non-natural disasters, hazards/threats, disaster risks, vulnerabilities, and capacities	Samui et al. (2018), Mareta N
9-10	Disaster management, disaster management cycle, disaster risk management, covering prevention, mitigation, preparedness, and early warning; Emergency Management, including emergency response and emergency assistance	Samui et al. (2018), Ramli S (2010)
11	Best practices for Natural Disaster Mitigation. Explanations and discussions on lessons learned about mitigating natural disasters in Indonesia and other countries.	Samui et al. (2018)
12	Society and disaster. Explanation and discussion of disaster-prone communities, their characteristics, and handling; people are aware of disasters, their characteristics, and development	Sunarti et al (2013) Sunarti (2015)
13	Disaster recovery management. Explanation and discussion of models for disaster impact recovery, rehabilitation, and reconstruction.	Ramli S (2010) Sunarti (2020)
14	Best practices for social disaster mitigation. Explanation and discussion of lessons learned on social disaster mitigation in Indonesia and other countries	Sunarti et al (2010); Sunarti et al (2011)

3.5. Physical Resources for Regional Planning

Course Outline

Course Code	Course Title	ECTS Credits
TSL 507	**Physical Resources for Regional Planning**	3
Prerequisites	**Department**	**Semester**
-	Regional Planning, IPB Univ.	1
Type of Course	**Field**	**Language of Instruction**
Mandatory		
Level of Course	**Lecturer(s)**	**Year of Study**
Magister (S2)	Prof. Widiatmaka, Prof Kukuh Murtilaksono, Dr Heru Pulunggono	1
Mode of Delivery	**Work Placement**	**Corequisites**
online and offline Lecture; student presentation		

Course Venue	Course Day and Time	Telephone
W18 L V, Dept of Soil Science, Dramaga Campus	Monday, 08.00 AM-01.00 PM	0251 8629360
Office	**Email**	**Student Consultation Hours**
Dramaga Campus	widiatmaka@apps.ipb.ac.id	Monday, 03.00-05.00 PM

Course Objectives:

The main objectives of the course are to:

- Prepare the students to understand the importance of land resources and regional bio-geophysics in land use planning
- Integrate ecosystem resources and environmental support capacity in regional planning
- Propose the concept of land evaluation and land and environmental support capacity in land use planning
- Formulate the use of natural resources for regional planning analysis
- Anticipate disaster risks due to hydrometeorology, geology and epidemics based on spatial planning concepts
- Develop appropriate disaster management plans.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Appraise the area's bio-geophysical resources
- Propose the land for area analysis purposes
- Manage the support capacity of land and the environment
- Plan the spatial patterns and structures
- Adapt disaster mitigation due to hydrometeorology, geology, epidemics based on the concept of spatial planning

Course Content:

This course discusses:

- Various aspects of physical resources which become the basis for regional planning.
- Soil and land aspects in the context of introducing soil properties and spatial distribution of the soil.
- Physical resources, including geology and rocks, climate, topography, land cover/land use, bathymetry, coastal resources, and relatively available data in Indonesia, land systems, and land units from Regional Physical Planning Project (RePProT) map.
- Specific ecosystem aspects covering peatland and karst ecosystems.
- Land evaluation, based on FAO and multi-criteria evaluation.
- Environmental support capacity based on support capacity for spatial planning and ecological footprint
- Physical resources related to land administration, spatial planning
- Disaster mitigation in various physical resources condition

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Student Presentations

Assessment:

Assessment Type	Weight (Percentage)
Midterm Exam (UTS)	35%
Final Exam (UAS)	35%
Academic paper / Case Study Analysis: A real case has taken from a source of journal/e-articles.	20%
Critical literature review of the application of information system or data mining techniques on natural resource and environmental management	10%

Attendance:

Students are required to attend at least 80% attendance at this course

Course Requirements:

-

Grading Scale:

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
B	Good	70 ≤ X < 75	3.0
BC	Fairly Good	65 ≤ X < 70	2.5
C	Fair	55 ≤ X < 65	2.0
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings

Title	Author(s)	Publisher	Year	ISBN
Land Evaluation and Land Use Planning	Sarwono Hardjowigeno and Widiatmaka	Gadjahmada University Press	2015	1420.44.09.07
Analysis of Physical Resources for Land Use and Regional Planning	Widiatmaka	NREMS Study Programs	2014	978-602-17593-2-5
Manual of Methods for Soil and Land Evaluation	E.A.C. Costantini	Science Publishers	2009	9781578085712
Soil Science	Sarwono Hardjowigeno	MSP	1987	9794550183, 9789794550182

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Risk Management of Natural Disaster	Claudia G. Flores Gonzáles	KIT Scientific Publishing	2010	3866440057
Risk-sensitive land use planning towards reduced seismic disaster vulnerability; the case of Marikina City, Metro Manila, Philippines	Marqueza L Reyes	Kassel University Press	2004	3-89958-106-7
Engineering Risk in Natural Resources Management	Lucien Duckstein, Eric Parent (auth.), L. Duckstein, E. Parent (eds.)	Springer Netherlands	1994	978-90-481-4441-9,978-94-015-8271-1
Integrated Watershed Management	H. Gregersen, P. Ffolliott, K. Brookes	CABI	2007	1845932811,9781845932817,9781845934217
Tropical Peatland Ecosystems	Mitsuru Osaki, Nobuyuki Tsuji (eds.)	Springer Japan	2016	978-4-431-55680-0

Weekly Schedule:

Week	Topic	Assigned Readings
1-2	Land and soil (i) Definition and importance of land and soil; (ii) Morphological Characteristics of Soil, (iii) Physical and Chemical Properties of Soil; (iv) Soil Classification; (v) Soil Survey, (vi) Geographical distribution of main soil types; (vii) Availability of land resource data (BBSDLP) and types of data	Hardjowigeno (1987); Hardjowigeno & Widiatmaka (2015
3-4	Regional Bio-geophysical Resources: (i) Geology and Rocks: introduction of rock types, geological formations, linkages of geological formations as distinctive characteristics of the regional resources above; (ii) Climate: baseline data, climate classification, use for area analysis, (iii) Topography: primary data sources, derived topographic data (DEM), the importance of topography as an area characteristic, (iv) Land cover/land use: information and data from remote sensing, land cover/use classification, land cover/use links for area planning; (v) Bathymetry and Coastal / Marine Resources: bathymetry data sources, types of marine resource data (depth, brightness), use for marine land suitability analysis (vi) land systems and land units (RePPProT).	Hardjowigeno (1987); Hardjowigeno & Widiatmaka (2015
5	Special Ecosystem Physical Resources: (i) Peat ecosystem, peat soil characteristics, peatland constraints; peat soil management; (ii) karst ecosystem: characteristics, distribution, characteristics of the resources on it; (iii) Watershed concept: delineation, critical watersheds, watershed management in Indonesia	Osaki & Tsuji (2016); Gregersen, Pfoolliott, Brookes (2007)
6-9	Land Evaluation for Area Analysis: (i) Land Evaluation Concept FAO (1976) (Land Utilization Type, Land Requirement); (ii) direct and indirect land evaluation; (iii) basic qualitative and quantitative land evaluation; (iv) actual and potential land evaluation; (v) evaluation of land suitability with matching criteria: methodology, criteria used; (v) land evaluation based on multicriteria land evaluation: AHP, ANP, methodology; (vi) land evaluation for agriculture and forestry; (vii) Evaluation of land for engineering (settlements, buildings, waste disposal sites); (viii) land evaluation for tourism (ix) evaluation of land for ponds and the coastal environment; (x) Land evaluation applications for area analysis.	Hardjowigeno & Widiatmaka (2015); Costantini (2009)

10-11	Supporting Capacity of Land and Environment: (i) Concept of support capacity; (ii) land capacity-based, water resources-based, and land balance-based carrying capacity; (iii) basic concepts and methodology of the ecological footprint (ecological footprint)	Costantini (2009)
12	Impact of disaster on natural resources and its implications to management	Duckstein et al. (1994)
13	Introduction to Spatial Planning: (i) Spatial patterns and spatial structures; (ii) classification of the designation of forest and water areas (protection to cultivation); (iii) available land concept, methodology	Hardjowigeno & Widiatmaka (2015), Gregersen et al. (2007)
14	Disaster Mitigation: (i) origin of disaster vulnerability in Indonesia; (ii) types of disaster (hydrometeorological, geological, epidemic); (iii) hazard concept, vulnerability, risk; (iv) social preparedness; (v) basic concepts of dealing with disasters	Gonzalez et al. (2010)

3.6. Spatial Modeling for Natural Resource Management

Course Outline

Course Code	**Course Title**	**ECTS Credits**
PSL 608	**Spatial Modeling for Natural Resource Management**	3
Prerequisites	**Department**	**Semester**
-	NREMS Study Program, IPB Univ.	2
Type of Course	**Field**	**Language of Instruction**
Mandatory		Bahasa Indonesia
Level of Course	**Lecturer(s)**	**Year of Study**
Magister (S2)	Dr. Yudi Setiawan, Dr. Syartinilia, Prof. Lilik B. Prasetyo, Dr. Alinda F.	1
Mode of Delivery	**Work Placement**	**Corequisites**
Lectures, discussions and small project		

Course Venue	**Course Day and Time**	**Telephone**
NREM Baranangsiang	Monday: 08.00-08.50; 08.50-11.50 Saturday: 17.17.50; 18.30-21.30	

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UN4DRR

Office	Email	Student Consultation Hours
NREM Baranangsiang	setiawan.yudi@apps.ipb.ac.id	Monday - Saturday : 09.00 - 17.00

Course Objectives:

The course focuses on integrated approach of the use of GIS, remote sensing technologies and spatial modelling to study environmental issues (ecosystem and habitat changes), disaster management (natural and human-induced disasters), natural resource and human impact (biodiversity and environmental pollution). The main objectives of the course are:

- Provide an overview of many different advanced GIS and remote sensing techniques in spatial modelling to study environmental issues
- Analysis in detail of all aspects of the GIS/RS and its relationship with the other sciences (disciplines) and spatial approach to understand environmental problems.
- Developing spatial models to solve an environmentally based problem with real-world applications.

Learning Outcomes:

After successful completion of the course students are expected to be able to:

- Explain the characteristics of spatial data, both vector and raster data, including tabular data and its development process
- Analyze the use of spectral and digital number values, remote sensing platforms and important sensors (Synthetic Aperture Radar and Optical multi/hyperspectral images) for natural resource monitoring and environmental assessment.
- Access and process satellite imagery, including pre-processing, classification methods and raster-based data management
- Apply spatial modeling using several statistical analysis methods
- Apply validation measurements and accuracy assessment
- Assess and solve quantitative problems relevant to natural resources, geohazards and environmental change.
- Critically compare and evaluate various spatial modeling in natural resource and environmental management
- Critically analyze and discuss a range of natural and human induced change scenarios and their socio-economic implications

Course Content:

The course is focused on:

- Providing insight into various tools available in GIS, remote sensing and spatial modeling for the management of natural resources and environment

- Development of spatial data either vector or raster based, drone and satellite-based spatial data acquisition, processing and analysis
- Selecting models and their applications related to environmental and natural resource management; such as: disaster mitigation, climate change, biodiversity and ecosystems, and changes in environmental quality.

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Project/problems-based analysis
- Academic paper discussion
- Student-led presentations

Assessment:

Assessment Type	Weight (Percentage)
Mini project proposal (15%) and oral presentation 1 (15%)	30%
Quiz (2) (5% each quiz)	10%
Final report (25%) and oral presentation 2 (15%)	40%
Participation ((attendance, discussion, activities, etc)	10%

Attendance:

Students are required to attend at least 80% attendance at this course

Course Requirements:

-

Grading Scale:

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5
B	Good	70 ≤ X < 75	3.0
BC	Fairly Good	65 ≤ X < 70	2.5
C	Fair	55 ≤ X < 65	2.0
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
ArcGIS for Environmental and Water Issues	William Bajjali.	Springer 353 pages	2018	2510-1315
Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems	Gottfried Konecny	Taylor & Francis London, 248 pages	2003	0-415-23794-7
Remote Sensing of the Environment: An Earth Resource Perspective	John R. Jensen	PEARSON, Upper Saddle River, NJ, 583 pages	2007	0-13-188950-8
Remote Sensing Handbook Volume 1: Remotely Sensed	Prasad S. Thenkabail	CRC Press 712 pages	2016	978-1-4822-1787-2

Data Characterization, Classification and Accuracies				
Environmental Modeling with GIS and Remote Sensing	Andrew Skidmore	Taylor & Francis 286 pages	2002	9780-4152-41700

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN

Weekly Schedule:

Week	Topic	Assigned Readings
1.	Definition, history and scope of application of Geographical Information Systems (GIS), remote sensing and spatial modelling in natural resource and environmental management	ArcGIS for Environmental and Water Issues (Chapter 1);
2	GIS components, sources and characteristics of spatial data (vector and raster data), software / hardware	Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems (Chapter 4)
3	Development of spatial data and spatial references; including data input, features and data structures and attribute data management and spatial orientation	ArcGIS for Environmental and Water Issues (Chapter 2-4);
4	Introduction to remote sensing (Remote Sensing); band and spectral value (digital number / DN), remote sensing vehicle/platform (satellite, aircraft, UAV / drone, and spectro-radiometer); sensors (multispectral, thermal, hyperspectral and RGB), spatial, temporal, and spectral resolution	Remote Sensing Handbook Volume 1: Remotely Sensed Data Characterization, Classification and Accuracies (Section 1 dan 2)
5	Image data pre-processing; geometry correction, atmospheric correction, topographic correction, image data enhancing, and image data reconstruction	Remote Sensing Handbook Volume 1: Remotely Sensed Data Characterization, Classification and Accuracies (Section 3 and 4)

6	Image data analysis and processing; selection of the most suitable band combination, band decomposition in object recognition, and classification techniques (visual and digital)	Remote Sensing Handbook Volume 1: Remotely Sensed Data Characterization, Classification and Accuracies (Section 5)
7	Vector / raster based spatial data management; conversion of raster data to vector and vice versa), introduction of several spatial models based on raster data and vector data on a global scale	Remote Sensing Handbook Volume 1: Remotely Sensed Data Characterization, Classification and Accuracies (Section 6 an 7)
8	Tabular data analysis, raster-based spatial analysis (local, focal, and global operation), and vector-based spatial analysis (extract, overlay, proximity, eliminate, dissolve)	ArcGIS for Environmental and Water Issues (Chapter 8, 9)
9	Model definition and spatial modelling (cartographic, predictive and simulation); method of scoring and weighting (subjective, AHP), surface analysis (slope, aspect, hill-shade, interpolation techniques (spline, IDW, kriging)	ArcGIS for Environmental and Water Issues (Chapter 10, 13)
10	Spatial modeling based on statistical analysis, such as: logistic regression, clustering and Principal Component Analysis (PCA)	Environmental Modeling with GIS and Remote Sensing
11-14	Several applications of spatial modeling (cartographic, predictive, simulative) in the natural resource and environmental management (e.g. disaster mitigation, climate change, biodiversity and ecosystems; and changes in environmental quality and environmental services)	Remote Sensing of the Environment: An Earth Resource Perspective (Chapter 6-13) -WEBINAR and Group discussion

3.7. Spatial Planning and Environmental Information Systems

Course Outline

Course Code	Course Title	ECTS Credits
PSL 642	**Spatial Planning and Environmental Information Systems**	3
Prerequisites	**Department**	**Semester**
-	NREMS Study Program, IPB Univ.	2
Type of Course **Mandatory**	**Field**	**Language of Instruction**
Level of Course	**Lecturer(s)** Dr Ernan Rustiadi, Dr Andrea Emma Pravitasari, Dr Ruchyat Deni Djakapermana, Prof. Imas S Sitanggang	**Year of Study**
Mode of Delivery	**Work Placement**	**Corequisites**

Course Venue	Course Day and Time	Telephone
Office **NREM Baranangsiang**	**Email**	**Student Consultation Hours**

Course Objectives:

The main objectives of the course are to:

- Introduce issues of urban and regional spatial planning as well as environmental aspect
- Examine the concepts of spatial planning
- Evaluate environmental studies and environmental support capacity
- Examine the concept of database management information systems
- Apply data mining techniques for natural resource management purposes

Learning Outcomes:

After completion of the course students are expected to be able to:

- Analyze and develop the concept of urban and regional spatial planning
- Categorize the area and support capacity of the land in the management of natural resources and the environment
- Identify governance problems in spatial use
- Evaluate the concepts and types of information systems needed in managing natural resources and the environment
- Design a data mining system for the management of natural resources and the environment

Course Content:

This course discusses:

- The concept of spatial planning and environmental information systems in natural resource management, environment, and development
- Basic concepts of space, land management, territory, and zoning for the management of natural resources and the environment
- Spatial planning and the global agenda; location theory, New Urban Agenda (NUA) and SDG's assignment
- Guidance and control to spatial implementation
- Classical and contemporary land use theory, and land rent theory
- Environmental support capacity study for spatial planning
- Institutional aspects and the commons; natural resource governance in Indonesia
- Problems and implementation of space use in Indonesia
- System and organization of spatial planning administration and its arrangement in Indonesia
- An overview of the concepts and types of information systems, as well as information systems for the management of natural resources and the environment
- Database management system
- Introduction to the application of basic data mining techniques in natural resource and environmental management.

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Student-led Presentations

Assessment:

Assessment Type	Weight (Percentage)
Midterm Exam (UTS)	35%
Final Exam (UAS)	35%
Academic paper / Case Study Analysis: A real case taken from a source of newspaper/magazine/journal/e-articles.	10
Critical literature review of the application of information system or data mining techniques on natural resource and environmental management	10%

Attendance:

Students are required to attend at least 80% attendance at this course

Course Requirements:

-

Grading Scale:

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5
B	Good	70 ≤ X < 75	3.0
BC	Fairly Good	65 ≤ X < 70	2.5

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
C	Fair	55 ≤ X < 65	2.0
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Urban Land Economics	Jack Harvey	Mac Millan Press Ltd. Hound mills. Basingstoke , Hampsire RG 216 sx and London.	1996	978-0-333-65439-2
Regional Planning and Development (Perencanaan dan Pengembangan Wilayah).	Ernan Rustiadi, Sunsun Saefulhakim, Dyah Retno Panuju	Crespent Press dan Yayasan Obor Indonesia. Jakarta.	2009	978-602- 433-308-9
Regional Planning	John Glassson and Tim Marshall	Routledge	2007	978-0-203-93893-5
Data Mining: Concept and Techniques. Ed ke-3.	Han J, Kamber M, Pei J.	Morgan Kaufmann	2012	9780123814791

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Land resources Economics. The economics of Real Estate.	Raleigh Barlowe	Third Edition. Prentice Hall, Inc. Englewood Cliffs, New Jersey. USA.	1978.	978-0-135-22541-7
Handbooks of Regional and Urban Economic. Vol. I: Regional Economic.	Peter Nijkamp, Edwin S. Mills, P. C. Cheshire, J. Vernon Henderson, Jacques-François Thisse, Gilles Duranton, William C. Strange	Elsevier, North-Holland	1986	978-0-444-87969-1
Guidelines for Land-Use Planning. FAO Development Series 1.	FAO.	FAO, Rome, Italy	1993	92-5-103282-3
Understanding Sustainable Development	John Blewitt	Earthscan, London, UK	2008	978-1-84407-455-6
Carrying Capacity in Regional Environmental Development	A.B. Bishop, H.H. Fullerton, A.B. Crawford, M.D. Chambers, and M. McKee	University of Michigan	1974	3-9015-09522-7958
Location in Space. Theoritical Perspectives in Economic Geography.	Dicken, Peter and P. E. Lloyd.	Harper & Row	1990	978-006-041-677-5
New Urban Agenda	United Nations Conference on Housing and Sustainable Urban	United Nations Habitat III Secretariat	2017	978-92-1-132731-1

	Development (Habitat III)			
Sustainable Development Goals	United Nations Development Programme (UNDP)	United Nations Development Programme (UNDP)	2015	
Management Information Systems: Managing the Digital Firm, 16th Edition	Kenneth C. Laudon	Pearson	2020	978-0135191798
Modern Database Management 12th Edition	Jeffrey Hoffer, Ramesh Venkataraman, Heikki Topi	Pearson	2018	978-0133544619

Weekly Schedule:

Week	Topic	Assigned Readings
1.	Spatial planning: issues of urban and regional planning, spatial patterns and spatial structures. Use of space as part of the development process	Regional Planning and Development (Perencanaan dan Pengembangan Wilayah). Regional Planning
2.	Location theory, land rent, and spatial analysis: classical land use theory, land rent theory, land management	Urban Land Economics Land resources Economics. The economics of Real Estate.
3.	Location theory, land rent, and spatial analysis: classical land use theory, land theory study of the environment and the support capacity of the environment and sea: evaluation of the support capacity in the area and understanding of support capacity, concepts of support capacity, components of determining support capacity, ecological footprint, evaluation of land capability based on class, category, and land use. Environmental impact studies, strategic environmental studies	Location in Space. Theoritical Perspectives in Economic Geography. Urban Land Economics

4.	Institutional aspects and the commons: spatial planning and environmental and natural resource management issues	Handbooks of Regional and Urban Economic. Vol. I: Regional Economic.
5.	Natural resource governance in Indonesia (spatial planning, forestry, and agriculture): (1) Asian monsoons, Indonesian geology, planning school, the political landscape of government institutions in spatial planning and land in Indonesia; (2) unfinished nation-building in Indonesia, spatial and land use issues in Indonesia, scarcity of land and food, the reality of forest area use and utilization, forestry management principles	Guidelines for Land-Use Planning. FAO Development Series 1.
6.	Problems and implementation of spatial use in Indonesia: spatial planning management objectives, performance targets of organizers, and spatial planning management as a system	Regional Planning and Development (Perencanaan dan Pengembangan Wilayah).
7.	System and organization of spatial planning and regulation in Indonesia and global: New Urban Agenda (NUA) and SDG's, spatial planning management system. Spatial planning, spatial planning guidance, spatial planning implementation and control	- New Urban Agenda - Sustainable Development Goals
8.	Support capacity of the environment and spatial planning: environmental considerations in spatial planning, the concept of support capacity, and the support capacity evaluation approach	Carrying Capacity in Regional Environmental Development
9-10	Overview of information systems: concepts and components of information systems, types of information systems, information systems for the management of natural resources and the environment	Case study: information systems development on natural resource and environmental management
11	Database management system: definition of a database, database design and implementation, case study of natural resource and environmental database design	Case study: information systems development on natural resource and environmental management
12-14	Data mining: understanding data mining, techniques in data pre-processing, data mining systems, introduction to basic techniques in data mining, application of basic data mining techniques in managing natural resources and the environment	Application of data mining techniques on natural resource and environmental management

3.8. Natural Resources and Sustainable Development

Course Outline

Course Code	Course Title	ECTS Credits
PSL 676	**Natural Resources and Sustainable Development**	3
Prerequisites	**Department**	**Semester**
-	NREMS Study Program, IPB Univ.	2
Type of Course	**Field**	**Language of Instruction**
Mandatory		
Level of Course	**Lecturer(s)**	**Year of Study**
Master	Prof. Widiatmaka, Prof. Lina Karlinasari, Prof. Cecep Kusmana, Prof. Surjono Hadi Sutjahyo	1
Mode of Delivery	**Work Placement**	**Corequisites**

Course Venue	Course Day and Time Monday, 13.00-17.00	Telephone
Office **NREM Baranangsiang**	**Email** widiatmaka@apps.ipb.ac.id	**Student Consultation Hours** Tuesday, 09.00-11.00

Course Objectives:

The main objectives of the course are to:

- Evaluate the principles and evolution of the concept of sustainable development
- Evaluate natural resources as capital resource for sustainable development
- Design the management of natural resources in various fields for sustainable development
- Integrate the impact of development on the sustainability of natural resources

Learning Outcomes:

After completion of the course students are expected to be able to:

- Assemble the principles and evolution of the concept of sustainable development
- Formulate the living and non-living natural resources discussed in the context of capital of development
- Integrate sustainable natural resource management for development in the fields of agro-ecosystem, marine resources, human ecosystems, and information technology-based natural resource management
- Integrate sustainable natural resource management for development in the fields of · food and energy
- Integrate the disaster in the management of natural resources and environment

Course Content:

This course discusses:

- The basics of sustainable natural resource and environmental management, including the principles of sustainability and the development of sustainable development
- Living and non-living natural resources are addressed in the context of the basic capital of development
- The carrying capacity of the environment and policies that need to be taken
- Sustainable natural resource management for development
- Agro-ecosystem, marine resources, human ecosystem, and information technology-based natural resource management
- Sustainable natural resource management for adequate food and energy, as well as the impact of development on the sustainability of natural resources and the environment
- Disaster management of natural resources and environment in Indonesia

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Student-led Presentations

Assessment:

Assessment Type	**Weight (Percentage)**
Midterm Exam (UTS)	35%

Final Exam (UAS)	35%
Academic paper / Case Study Analysis: A real case has taken from a source of newspaper/magazine/journal/e-articles.	20%
Critical literature review of the application of information system or data mining techniques on natural resource and environmental management	10%

Attendance:

Students are required to attend at least 80% attendance at this course

Course Requirements:

-

Grading Scale:

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5
B	Good	70 ≤ X < 75	3.0
BC	Fairly Good	65 ≤ X < 70	2.5
C	Fair	55 ≤ X < 65	2.0
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Sustainability Science	BJM de Vries	Cambridge University Press	2012	9780521184700
Sustainability: what Everyone need to know	Paul B. Thomson and Patricia Noris	Oxford University Press	2021	9780190883263

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
The Capacity Crisis in Disaster Risk Management	Asmita Tiwari	Springer	2015	978-3-319-09405-2
Sustainable Forestry Handbook, 2nd Edition	Sophie Higman, James Mayers, Stephen Bass, Neil Judd and Ruth Nussbaum	Earthscan	2005	1-84407-118-9
EXERGY: Energy, Environment and Sustainable Development	Ibrahim Dincer, Marc A. Rosen	Elsevier Science	2007	0080445292,9780080445298,9780080531359
Climate-Resilient Development:	Astrid Carrapatoso, Edith Kürzinger	Routledge	2013	0415820782,9780415820783

Participatory solutions from developing countries				

Weekly Schedule:

Week	Topic	Assigned Readings
1.	Introduction. Definition of natural resources and the environment, management of natural resources and the environment, the scope of management of natural resources and the environment	De Vries (2012); Thomson & Norris (2021)
2.	The principle of sustainability of natural resources and the environment and the development of the concept of sustainable development	De Vries (2012); Thomson & Norris (2021)
3.	Living natural resources are the basic capital for development, and non-living natural resources are the basic assets for development	De Vries (2012); Thomson & Norris (2021)
4.	Environmental Support Capacity and Estimating Impact on the Environment;	De Vries (2012); Thomson & Norris (2021)
5.	Disaster Risk Management and Sustainable Development;	Uito & Shaw (2016)
6.	Food Security, Climate Change Adaptation, and Disaster Risk, Sustainable natural resource management based on agro-ecosystem	Uito & Shaw (2016)
7.	Sustainable management of marine natural resource; Climate Change and Integrated Approach to Water Resource Management	Uito & Shaw (2016)
8.	Sustainable management of human ecosystem natural resources; Rethinking the Capacity Development Model; Capacity for Managing Disasters	Tiwari (2015); De Vries et al. (2012)
9.	Sustainable management of natural resources based on the information technology;	De Vries (2012); Thomson & Norris (2021)
10.	Integrated management of natural resources and the environment	De Vries (2012); Thomson & Norris (2021)

11.	The impact of development on natural resources and the environment; Human Health as Precondition for Achieving Sustainable Development	Uito & Shaw (2016)
12.	Sustainable natural resource management for sustainable forestry	Higman et al. (2005); Cohen (2014)
13.	Sustainable natural resource management for the sustainability of energy sufficiency	Dincer and Rossen (2007)
14.	Sustainable natural resource management in the rural environment: climate resilient development, participatory solutions in developing country	Carrapatoso and Kürzinger (2013)

3.9. **Sustainable Land and Water Resources Management**

Course Outline

Course Code	**Course Title**	**ECTS Credits**
PSL 671	**Sustainable Land and Water Resources Management**	3
Prerequisites	**Department**	**Semester**
-	NREMS Study Program, IPB Univ.	2
Type of Course **Elective**	**Field**	**Language of Instruction**
Level of Course	**Lecturer(s)**	**Year of Study**
Master	Prof. Widiatmaka, Dr Dyah Tjahyandari, Dr Yanuar J. Purwanto, Dr Kaswanto	1
Mode of Delivery	**Work Placement**	**Corequisites**

Course Venue	**Course Day and Time** Tuesday, 03.00-04.40 PM	**Telephone**
Office **NREM Baranangsiang**	**Email** **widiatmaka@apps.ipb.ac.id**	**Student Consultation Hours** Tuesday 05.00-06.00 PM

Course Objectives:

This course explores the concept of sustainable development as it is applied in land and water resources management. The main objectives of the course are to:

- Combine the issues of soil, land and water scarcity as well as land use for development
- Adapt the concepts of land use planning of the FAO system into sustainable land and water planning and management
- Integrate land and water management for sustainable utilization
- Integrate land and water management at the scale of watershed as functional analysis
- Develop disaster and risk management as well as environmental carrying capacity in strategic environmental studies
- Develop and formulate integrated land and water resources management
- Develop decision-making techniques in land and water resources management
- Integrate the concept of disaster risk management in land and water management

Learning Outcomes:

After completion of the course students are expected to be able to:

- Assemble concepts and principles of land and water resources management
- Design sustainable land and water resources management as part of sustainable development
- Develop minimizing disaster risk concept in land and water resources management
- Design conservation approach in land and water resources management
- Design feasibility concepts in land and water resources management

Course Content:

This course discusses:

- The concept of soil, land and water management in the environment.
- The concept of sustainable development that is applied in land and water resources management
- Understanding of limited land use for development, implemented in land evaluation and land carrying capacity
- Land and water resources management for various purposes (agriculture, industry, tourism, engineering).
- Mitigation of land resource disasters and hydrometeorological disasters, land degradation
- Land and water resources management techniques and minimizing risk in land and water management.
- Environmental carrying capacity and strategic environmental studies with emphasize on land and water

- Integrated water resources management: conservation of water resources and control
- Watershed as a water resource development unit

Learning Activities and Teaching Methods:

- Faculty Lectures and Guest-Lectures Seminars
- Directed and Background Reading
- Case Study Analysis
- Academic Paper Discussion
- Student-led Presentations

Assessment:

Assessment Type	**Weight (Percentage)**
Midterm Exam (UTS)	35%
Final Exam (UAS)	35%
Academic paper / Case Study Analysis: A real case has taken from a source of newspaper/magazine/journal/e-articles.	15%
Critical literature review of the application of information system or data mining techniques on natural resource and environmental management	15%

Attendance:

Students are required to attend at least 80% attendance at this course

Course Requirements: -

Grading Scale:

Letter Grade	Meaning	Numerical Grades 0-100	Grade Points 0-4
A	Excellent	X ≥ 80	4.0
AB	Very Good	75 ≤ X < 80	3.5
B	Good	70 ≤ X < 75	3.0
BC	Fairly Good	65 ≤ X < 70	2.5
C	Fair	55 ≤ X < 65	2.0
D	Conditional Past	45 ≤ X < 55	1.0
E	Fail	X < 45	0.0

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
The Nature and Properties of Soils	Raymond R. Weil, Nyle C. Brady	Pearson Education Limited	2016	1292162236,9781292162232
Manual of Methods for Soil and Land Evaluation	E.A. Costantini	Taylor & Francis	2009	978-1-57808-571-2
Integrated Land and Water Management for Food and Environmental Security	F. W. T. Penning de Vries, H. Acquay, D. Molden, S. J. Scherr, C. Valentin and O. Cofie	Internat Water Manag Institute; Forest Trends; Global Env. Facilities; Comprehe	2003	92-9090-543-3

		nsive Assessme nt Secretariat		
Engineering Risk in Natural Resources Management, with Special Refferences to Hydrosystems under Change of Physical and Climatic Environment	L. Duckstein and E. Parent	Springer-Science+Business Media, B.V.	1993	978-90-481-4441-9
Identifying Emerging Issues in Disaster Risk Reduction, Migration, Climate Change and Sustainable Development	Karen Sudmeier-Rieux • Manuela Ferna ´ndez Ivanna M. Penna • Michel Jaboyedoff J.C. Gaillard	Springer	2017	978-3-319-33878-1
River Basin Management Planning in Indonesia: Policy and Practice	Asian Development Bank	Asian Development Bank	2016	978-92-9257-387-4

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Land Use Planning for Sustainable Development	Jane Silberstein, Chris Maser	CRC Press	2013	978-1-4665-8118-0,978-1-4665-8114-2
Progress on Integrated Water Resources Management	Karen Brandon	UN Water - UNEP		978-92-807-3710-3

Multi-method Modeling Framework for Support of Integrated Water Resources Management	Vladimir V. Nikolic & Slobodan P. Simonovic	Springer, Environ. Process	2015	DOI 10.1007/s40710-015-0082-6

Weekly Schedule:

Week	Topic	Assigned Readings
1	Soil and land resources characteristics: Physical and chemical characteristics of land resources, morphology and land units, land use and land cover, characteristics of sustainable land resource management, land units	Weil and Brady (2016)
2	Evaluation of Land Suitability and Land Capability: Land suitability of the FAO method, Land Capability, Land Aspects in Spatial Planning	Costantini (2009)
3	Land Carrying Capacity: The concept of land carrying capacity, methods of determining land carrying capacity, Application of land carrying capacity in sustainable development	Costantini (2009) and Silberstein & Masser (2013)
4	Mitigation of land resource disasters and hydrometeorological disasters	Duckstein & Parent (1993), Sudmeier-Rieux et al. (2017)
5	Disaster and land degradation: Process of Land Degradation, Improvement of land degradation, Land conversion	Duckstein & Parent (1993), Sudmeier-Rieux et al. (2017)
6	Spatial-based Land Use: Land Use Planning, Critical Land Rehabilitation, Land Resources in spatial planning	Silberstein & Masser (2013)
7	Land disaster mitigation and land resource conservation: Chemical, biological and biological land conservation; area of land conservation	Duckstein & Parent (1993), Sudmeier-Rieux et al. (2017)

8	Water resources management: hydrological systems and water resources ecosystems; water resources management policy in Indonesia	ADB (2016)
9	Integrated water resources management: conservation of water resources and control of destructive forces; water utilization and water management based on partnerships	De Vries (2016)
10	Watershed as a water resource development unit: Definition and characteristics of watersheds; Utilization of watersheds in water resource management	ADB (2016)
11	Feasibility of land and water resources management	De Vries et al. (2003)
14	Review and Presentation of Assignments.	All Refference