MODULE HANDBOOK

Module Name	Mathematics
Code	PER 11516
Semester (s) in which the module is taught	1st semester/1st year
Person responsible for the module	Dr Ir Herlina Hanum, MSi dan Mathematic Team Teaching
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	6 hours and 20 minutes of total workload: 100 minutes for Contact Study; 160 Minutes for practicum, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Explain the concept of the real number system; Solving operations on real numbers. 2. Distinguish between rational and irrational numbers; Understand and apply field Characterisitic 3. Explain the concept of inequality; Finding the solution to a simple inequality, absolute value, square root and square 4. Draw quadrilateral coordinates and the given points 5. Determine the point of intersection of the curve on the coordinate axis; Drawing equation graph 6. Able to determine function value; Drawing function; Completing operations on functions 7. Understand and solve trigonometric function problems 8. Define Understanding the concept and limit theorem ; Determining the continuity of the function 9. Understand the meaning of derivative; Understand the relationship between limits and derivatives ; Determine the derivative of sinus and cosinus 10. Understand the concept of the chain rule; Solving the derivative of the composition function ; Write down the chain rule in the Leibniz way 11. Determine the maximum/minimum critical points of a function 12. Understand the concept of integrals and understand the rules for determining integrals 13. Understand the concept of replacement method;

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	Determine the integral function of the composition 14. Form a matrix with a certain ordo; Performing operations on matrices 15. Form a system of linear equations from the given case
Content	1. Real numeral system; Rational and irrational numbers; Operations on real numbers, ;Characteristif of Field 2. Inequality ; Absolute value; square root; square 3. Quadrilateral coordinate system, point distance, straight line, slope of line 4. The point of intersection of the curve; Draw an equation graph 5. Definition of function; Drawing function; Sum operation and multiplication, Composition of functions and trigonometric functions 6. Definition of limit; limit theorem; Continuity of function 7. Definition of derivative through limit; derivate search rules; derivate sinus dan cosinus 8. Leibniz Writing chain rule; High-level derivative 9. Maximum-minimum function; monotony; Concavity 10. Integral concept; Integral determination rule 11. Integral of composition function (Replacement method 12. Area of flat area 13. Ordo matrix ; Transpose, sumation, multiplication; Determinant ; ajoin, dan kofactor Invers matrix 14. System linear Of equations ; Form matrix from System linear of equations ; Solution System linear Of equations ; Notation sigma $\boldsymbol{\Sigma}$
Examination forms	1. Essays questions 2. Pratical works
Reading list	1.

MODULE HANDBOOK

Module Name	Agricultural Chemistry
Code	PAG 11115
Semester (s) in which the module is taught	1st semester/1st year
Person responsible for the module	Prof. Dr. Ir. Rujito Agus Suwignyo, M. Agr. Dr. Susilawati, S.P., M.Sc. Dr. Ir. Munandar, M.Agr. Dr. Ir. Mery Hasmeda, M. Sc. Fitra Gustiar, S.P., M.Si. Dr. Irmawati, S.P., M. Si., M. Sc Dr. Fikri Adriansyah, S. Si.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching Methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Attitude 1. CP-STN8: Capable of internalizing academic values, norms and ethics Knowledge 1. CP-KIP1: Mastering the theoretical concepts and being able to develop science and technology for the cultivation of food crops, plantations and horticulture based on local wisdom and resources General Skill 1. CP-KBP1: Capable of applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise
Content	1. Introduction of agrochemical. 2. Atomic structure and electron configuration. 3. Chemical bond 4. Nutrients and types of fertilizers. 5. Structure and function of water. 6. Organic chemistry: nomenclature of organic

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	compounds & functional groups. 7. Acid, alkaline and salt. 8. pH, solution and indicator. 9. Structure and function of lipid and lipid acids. 10. Structure and function of carbohydrate and protein. 11. Concentration, ppm, %, molar concept, molarity, normality. 12. Hydroponic nutrient solution media and tissue culture. 13. Soil, nutrients and fertilization. 14. Pesticides and applications.
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1. Mido Y. and M. Satake. 1994. Chemistry for Agriculture and Ecology. Discovery Publishing House. 2. Timberlake, K.C. and W. Timberlake. 2014. Basic Chemistry. Pearson Education. 3. Roberts, T.R. 2000. Metabolism of Agrochemicals in Plants. John Willey and Sons. 4. Mansyur, N.I., E.H. Pudjiwati, A. Murtilaksono. 2021. Pupuk dan Pemupukan. Syiah Kuala University Press. 5. Anac, D., Matin-Prevel, P. 1999. Improved Crop Quality by Nutrient Management. Kluwer Academic Publishers. 6. Michael, F, Waxman. 1998. Agrochemical and Pesticide Safety Handbook. CRC Press. 7. Fageria, N.K. 2014. Nitrogen Management in Crop Production CRC Press. 8. Knowles, D.A. 1998. Chemistry and Technology of Agrochemical Formulations. Springer Dordrecht. 9. Prasad, M.N.V. 2020. Agrochemicals Detection, Treatment and Remediation. Elsevier. 10. Plimmer, J.R., Gammon, D., Nancy, N., Ragsdale. 2002. Encyclopedia of Agrochemicals. Wiley Online Library. 11. Cremlyn, R.J.W. 1991. Agrochemicals: Preparation and Mode of Action. Wiley; 2nd edition. 12. Goodwin., Mercer. 1988. Introduction to Plant Biochemistry. Pergamon Press. 13. Prasad, M.N.V., Strzalka, K. 2002. Physioloy and Biochemistry of Metal Toxicity and Tolerance in Plants. Kluwer Academic Publishers. 14. Khan, N.A. 2006. Ethylene Action in Plants. Springer.

MODULE HANDBOOK

Module Designation	**Botany**
Code	PER 12116
Semester (s) in which the module is taught	1st semester/1st year
Person responsible for the module	Dr. Susilawati, S.P., M.Sc. Dr. Ir. Maria Fitriana, M. Sc. Dr. Ir. Marlina, M. Si. Ir. Teguh Achadi, M. P. Dr. Fikri Adriansyah, S. Si.
Language	Indonesian
Teaching methods	Contextual Learning, Cooperative learning, Project based Learning
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Attitude 1. CP-STN8: Capable of internalizing academic values, norms and ethics Knowledge 1. CP-KIP1: Mastering the theoretical concepts and being able to develop science and technology for the cultivation of food crops, plantations and horticulture based on local wisdom and resources General Skill 1. CP-KBP1: Capable of applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise
Content	1. Introduction, Definition, history and theory of cells. 2. Structure, cell organela and function of plant cells. 3. Cell reproduction. 4. Relationships between cells and tissues. 5. Tissue according to the number of constituent cells, level of development and function. 6. Anatomy, morphology and function of leaves, stems.

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	7. Anatomy, morphology and function of roots. 8. Flower organ. 9. Fruit organ. 10. Taxonomy and plant systematics. 11. Plant nomenclature. 12. Plant identification. 13. Plant description.
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1. Elpel, T.J. 2013. Botany in a Day: The Patterns Method of Plant Identification. HOPS Press. 2. Mauseth, J.D. 1991. Botany: An Introduction to Plant Biology. Jones & Bartlett Learning. 3. Pollan, M. 2001. The Botany of Desire: A Plant's-Eye View of the World. Random House Trade Paperbacks. 4. Hodge, G. 2013. Practical Botany for Gardeners: Over 3,000 Botanical Terms Explained and Explored. University of Chicago Press. 5. Pollan, M. 2001. The Botany of Desire: A Plant's-Eye View of the World. Random House Publishing Group. 6. Wohlleben, P. 2015. The Hidden Life of Trees: What They Feel, How They Communicate – Discoveries from a Secret World. Greystone Books. 7. Erskine, W., Muehlbauer, F.J., Sarker, A., Sharma, B. 2009. The Lentil Botany, Producction and Uses. Icarda. 8. Heywood, V.H., Brummitt, R.K., Culham, A., Seberg, O. 1978. Flowering Plan Families of the World. Firefly Books.

MODULE HANDBOOK

Module Designation	Indonesian
Code	UNI 10509
Semester (s) in which the module is taught	1st semester/1st year
Person responsible for the module	Dr. Zahra A., M.Pd. dan Indonesia Language Team Teaching
Language	Indonesian
Relation to curriculum	Compulsory Course
Type of teaching	Contextual Learning, Cooperative Learning, Case Based Learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	Attitude 1. CP-STN2: Act as citizens who are proud and love their homeland, have nationalism and are responsible for the State and nation, 2. CP-STN4: Upholding human values based on morals and ethics General Skill 1. CP-KBP1: Capable of applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise 2. CP-KBP4: Capable to compiling a scientific description of the results of the studies mentioned above in the form of a Research Project or final project report, and upload it on the university's website Specific Skill 1. CP-KBP14: Capable of identifying problems, providing alternative solutions, and makeing decisions in the cultivation of crops in the agricultural and plantation industrial systems 2. CP-KBP22: Capable of communicating aspects of plant cultivation in an attractive, efficient, effective and productive manner
Module objectives/intended learning outcomes	1. Able to explain the birth of Indonesia 2. Be able to explain the position, function, and legal force of the Indonesian language 3. Explain various academic texts; explain the characteristics of academic texts

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	4. Explain the structure of academic texts 5. Able to Use proper spelling and punctuation in academic texts 6. Able to Using effective sentences in academic texts 7. Understanding the essence of paragraphs; understand and use paragraph elements; understand and use paragraph types 8. Able to use quotes in writing 9. Able to use bibliography in writing 10. Understand the characteristics of an essay 11. Explain the structure of essay writing 12. Able to write essays 13. Able to present the resulting essay writing
Content	1. Able to use bibliography in writing 2. Understand the characteristics of an essay 3. Explain the structure of essay writing 4. Able to write essays 5. Able to present the resulting essay writing 6. Able to use bibliography in writing 7. Understand the characteristics of an essay 8. Explain the structure of essay writing 9. Able to write essays 10. Able to present the resulting essay writing 11. Essay writing structure 12. Essay writing 13. Presentation of the resulting essay writing
Examination forms	1. Essays questions 2. Pratical works
Reading list	1.

MODULE HANDBOOK

Module Designation	Pancasila
Code	UNI 10509
Semester (s) in which the module is taught	1st semester/1st year
Person responsible for the module	Dr. Hudaidah, M.Pd and Pancasila Team Teaching
Language	Indonesian
Relation to curriculum	Compulsory Course
Type of teaching	Contextual Learning, Cooperative Learning, Case Based Learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Attitude 1. CP-STN2: Act as citizens who are proud and love their homeland, have nationalism and are responsible for the State and nation 2. CP-STN3: Capable of contributing in improving the quality of life in society, nation and state based on Pancasila
Content	1. Explain the concept and urgency of Pancasila as a philosophical system 2. Explaining the dynamics and challenges of Pancasila as a philosophical system 3. Explain the concept and urgency of Pancasila as an ethical system 4. Explain the dynamics and challenges of Pancasila as an ethical system 5. Explain the concept and urgency of Pancasila as the basis for the value of developing science 6. Explaining the dynamics and challenges of Pancasila as the basis for the value of science development 7. Explain the concept and urgency of Pancasila as a philosophical system 8. Explaining the dynamics and challenges of Pancasila as a philosophical system 9. Explain the concept and urgency of Pancasila as an ethical system 10. Explain the dynamics and challenges of Pancasila as an ethical system

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	11. Explain the concept and urgency of Pancasila as the basis for the value of developing science 12. Explaining the dynamics and challenges of Pancasila as the basis for the value of science development
Examination forms	1. Essays questions 2. Pratical works
Reading list	1.

MODULE HANDBOOK

Module Name	Civic
Code	UNI 10216
Semester (s) in which the module is taught	1st semester/1st year
Person responsible for the module	DR. LR Retno Susanti, M. Hum dan Team Teaching
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Understand the important background, concepts, goals, vision, mission and foundation of Civic Education. 2. Able to describe the history of the formation of the Indonesian nation; able to formulate the characteristics of national identity; able to identify the factors causing the fading of national identity 3. Able to describe concepts, urgency, the nature of national integration and be able to identify the factors forming national integration 4. Have the ability to explain the meaning of the elements and goals of the State ; Definition, constitutional function; Outlining the constitution of the State of Indonesia; Explaining the amendment UUD 1945. 5. Able to understand the existing rules of the Indonesian constitution 6. Able to explain the obligations and rights of citizens 7. Able to analyze the rights and obligations of citizens in the life of society, nation and state 8. Able to explain the history of the growth and development of democratic ideas/thoughts; Able to analyze various influential variables in the development of democracy ; Analyze the foundation of democracy in Indonesia and describe the history of the development of democracy in Indonesia 9. Able to explain basic concepts/definitions *Rule of Law* and analyze problems *Rule of law*.

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	10. Able to explain the history of development HAM and describe various HAM as well as institutions HAM. 11. Able to explain the concept of geopolitics as a national insight 12. Describe the influence of regional and social aspects on existence and be able to analyze the problems of the archipelago's insight in facing the times 13. Able to explain the concept of Indonesian Geostrategy in the form of national resilience 14. Able to explain the background of the importance of national resilience and describe the main ideas and nature of national resilience in Pancasila and UUD 1945.
Content	13. Concept, Purpose, Vision, Mission and Background importance of Civid Education 14. National Identity 15. National Integration 16. The State and Constitution of Indonesia 17. The Constitution of Indonesia as a Nation-State 18. Rights and obligations of citizens 19. Indonesian Democracy 20. Law enforcement and HAM 21. Archipelago Insights/ Geopolitics. 22. Gestrategis Indonesia/ National Resilience
Examination forms	3. Essays questions 4. Pratical works
Reading list	2.

MODULE HANDBOOK

Module designation	PER 11209 Introduction to Agricultural Science
Semester (s) in which the module is taught	1rd semester/1nd year
Person responsible for the module	1. Prof. Dr. Ir. Dedik Budianta, MS 2. Dr. Ir. A. Napoleon, MP 3. Dr. Ir, Warsito, MS 4. Dra. Dwi Probowati Sulistyani, MS
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain why agriculture is very important. 2. Students are able to explain the history and development of agriculture in the world 3. Students are able to describe the factors influencing crop production 4. Students are able to explain the nutrient cycling for crop yield 5. Students are aware about current issues on climate change related to agriculture

MODULE HANDBOOK

Content (14 meetings)	1. Importance of agriculture for human being 2. History and development of agriculture in the world 3. Factors influencing crop production (Soil, water/irrigation, nutrient/fertilizer, pest control, seed) 4. Soil fertility influencing land for agriculture and land division in the world (wetland and dryland) 5. Irrigation system for agriculture 6. Nutrient cycling 7. Pest control succeeding crop yield 8. Quality seeds for agriculture 9. Climate change threaten sustainable agriculture 10. Examination
Examination forms	1. Essays questions 2. Writing paper 3. Photographs collection on agricultural objects
Reading List	1. Erickson Cl. 1988. Raised field agriculture in the Lake Tricaca Basin: Putting Ancient Agriculture Back to Work. Expedition 30(3):8-16. 2. Guber, DL. The Grassroots of a Green Revolution: Polling America on the Environment. The MIT Press, Cambridge, England. 3. Cowan, CW and Watson, PJ. 2006. The Origin of Agriculture; An International Perspective. The University of Alabama Press, Tuscaloosa. 4. Horne, JE and McDermot, M. 2001 The Next Green Revolution; Essential Step to a Healthy Sustainable Agriculture. Food Products Press, New York. 5. Peng S., Incram KT, Neue HU and Ziska LH. 1995. Climate Change and Rice. Springer, Singapore. 6. Mulongoy, K anad R. Merckx. 1993. Soil organic matter dynamics and sustainable of tropical agriculture. KU. Leuven. Belgium

MODULE HANDBOOK

Module Name	Religion
Code	UNI 10116
Semester (s) in which the module is taught	2nd semester/1st year
Person responsible for the module	Dr. Nurhasan, M. Ag dan Religion Team Teaching
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Describe, explain about the introduction of Islamic Religious Education 2. Explain the meaning, the philosophy of divinity in Islam, the history of human thought about God, God according to religion 3. Explain the meaning, the philosophy of divinity in Islam, the history of human thought about God, God according to religion 4. Describe and explain the implementation of Faith and Taqwa, Explaining Problems, challenges and risks in modern life the role of Faith and Taqwa in Answering the Challenges of Modern Life 5. Describe, explain about humans according to Islam 6. Describe, explain the concept of Law, HAM, and Democracy in Islam 7. Describe, explain the concept of Islamic law, the Contribution of Muslims in Indonesia 8. Describe, explain how to apply al-Karimah's morals in everyday life 9. Describe, explain the concept of science and technology and art in Islam 10. Describe, explain the concept of religious harmony 11. Describe, explain the concept of Civil Society 12. Describe, explain the concept of Islamic Economics 13. Describe, explain the concept of Islamic politics
Content	1. Introduction to Religious education 2. The Concept of God in Islam

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	3. The concept of faith and piety 4. Implementation of Faith and Taqwa in modern life 5. Human nature according to Islam 6. Law, HAM, and Democracy in Islam 7. Islamic Law, Contribution of Muslims in Indonesia 8. Moral and Moral Ethics 9. Science and technology and art in Islam 10. Inter-religious harmony 11. Civil Society 12. Islamic Economics 13. The concept of Islamic culture 14. Islamic political concept
Examination forms	1. Essays questions 2. Pratical works
Reading list	1.

MODULE HANDBOOK

Module designation	PTN 10215 Introduction to Environmental Science
Semester (s) in which the module is taught	2nd semester/1st year
Person responsible for the module	Sabaruddin, Ph.D. Dr. Agus Hermawan
Language	Indonesian
Relation to curriculum	Optional Course
Teaching methods	Contextual Learning, Case-based Course
Workload (incl. Contact hours, self-study hours)	100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	Principle of Soil Science
Module objectives/intended learning outcomes	After attending this course, students are expected to be able to: 1. Describing the boundaries and outlines the basic issues of sustainable human-environment interactions, 2. Describing and examining the interactions between biotic and abiotic components of the environment, 3. Explaining why human populations can cause environmental problems, 4. Evaluating scientific information on environmental issues and drawing reliable conclusions.

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Content	11. Introduction: Course Description and Evaluation; Environmental Science and Environmental Sustainability 12. Environmental Concern Timeline: Global and National The world's and Indonesia's footprint in protecting the environment 13. Ecosystems as Units of Sustainability. 1. What is an ecosystem, 2. Ecosystem structure, 3. Why are ecosystems differents among regions and what are the impacts on humans? 14. Population Growth: Causes and Impacts. 1. Population Growth and its Causes, 2. Environmental and Social Impacts of Population Growth, 15. Introduction to Climate Change Issues: What is Climate Change, Causes of Climate Change, Impact of Climate Change, 16. Introduction to Environmental Ethics: Definition of Ethics, Morals, Ethic and Etiquette; Theories on Ethics, 17. Water, Water Cycle, and Water Management; Water Cycle, Human Impacts on the Water Cycle, Freshwater Sources and Utilization, Water Overdrawing, Getting More Water (Less use of water, and Utilization of sea/salt water/desalting). 18. Pollution and Hazardous Chemicals; Hazards and Potential of Waste, Waste Recycling Constraints, Chemical Properties (HAZMATS), Waste Management to Avoid Pollution. 19. Air Pollution and Atmospheric Change; Introduction to Atmospheric and Air Pollution;Air Pollutants and Their Impacts; Sources of Pollutants; Indoor Air Pollution; Air Pollution Control; Depletion of the ozone layer. 20. Soil Erosion and Its Impact (Sedimentation and Eutrophication); Eutrophication Process; Long Term Strategy to Overcome Eutrophication 21. The Use of Pesticides and Their Residual Impacts; Why Do we need pest control? Benefits and Problems of Chemicals Applications; Alternative Methods of Pest Management; Socio-economic Issues of Pest Management. 22. EIA and Strategic Environmental Assessment; What are EIA and Strategic Environmental Assessment; Why EIA and Strategic Environmental Assessment are important; How EIA and Strategic Environmental Assessment are carried out.

Examination forms	4. Examination (Essays), 5. Group Assignment.
Reading List	1. Nebel, B.J. and R.T. Wright. 1998. Environmental Science. 6th Edition. Prentice Hall. 2. Pierzynski, G.M., J.T. Sims, and G.F. Vance. 2005. Soils and 3. Environemntal Quality. 3rd Edition. Taylor & Francis. 4. Secretariat of the Convention on Biological Biodiversity. 2001. Global Biodiversity Outlook. CBD, Montreal, Canada 5. Keraf, A.S. 2002. Etika Lingkungan. Penerbit Buku Kompas. 6. Salim, E. 2010. Ratusan Bangsa Merusak Satu Bumi. Penerbit Buku Kompas. 7. Neolaka, A. 2008. Kesadaran Lingkungan. Penerbit Bineka Cipta 8. Murdiyarso, D. 2003. CDM: Mekanisme Pembangunan Bersih. Penerbit Buku Kompas

MODULE HANDBOOK

Module Designation	English
Code	UNI 10416
Semester (s) in which the module is taught	2nd semester/1st year
Person responsible for the modul	
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Attitude 1. CP-STN4: Upholding human values based on morals and ethics General Skill 1. CP-KBP1: Capable of applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise 2. CP-KBP4: Capable to compiling a scientific description of the results of the studies mentioned above in the form of a Research Project or final project report, and upload it on the university's website Specific Skill 1. CP-KBP14: Capable of identifying problems, providing alternative solutions, and makeing decisions in the cultivation of crops in the agricultural and plantation industrial systems 2. CP-KBP22: Capable of communicating aspects of plant cultivation in an attractive, efficient, effective and productive manner
Content	1.
Examination forms	1. Essays questions 2. Pratical works
Reading list	1.

MODULE HANDBOOK

Module Designation	**Introduction to Agriculture Economics**
Code	ABI 11216
Semester (s) in which the module is taught	1st semester/1st year
Person responsible for the module	Prof. Dr. Ir. Andy Mulyana, M.Si Dr. Agustina Bidarti, S.P., M.Si Dr. Erni Purbiyanti, S.P., M.Si. Eka Mulyana, S.P., M.Si
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	170 minutes x 3 credits = 6 hours and 20 minutes of total load, with details: 100 minutes of lectures; 160 minutes of assistance; 120 minutes of structured tasks and 120 minutes of group work.
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	**STN5 :** Respecting the diversity of cultures, views, beliefs, and religions and the original opinions/findings of others **KIP 1:** Students able to understand the latest issues in the field of agribusiness both at the basic level and at the advanced level **KIP 2 :** Students able to understand knowledge and technology in the field of agribusiness including the development of professional practices through research studies to produce innovative work in the field of agribusiness tested **KIP 3 :** Students able to understand the fields of economics, management, business, entrepreneurship, institutional, sociology, extension and communication, as well as agricultural sciences for the development of sustainable agribusiness operating systems. **KBP 1:** Able to plan, implement and evaluate the allocation of natural, human, capital, and social resources to improve the operating efficiency of the agribusiness system, as well as being able to operate and develop innovative, accountable agribusiness business units, create added value by

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	prioritizing socio-economic principles of agriculture and quantitative and qualitative approaches to realize sustainable and efficient agribusiness to realize sustainable agribusiness and efficient.
Content	1. Indonesian Agricultural Economy 2. Agricultural Economic Problems 3. Institutional Factors of Agricultural Economic 4. Economic Principles in Agriculture 5. Soil in Agricultural Production 6. Modules in Agricultural Production 7. Labor in Agricultural Production 8. Demand and Supply of Agricultural Products 9. Agricultural Trad 10. Markets and Trade Policy 11. Trade Issues 12. Agricultural Development Theories 13. The Government's Role in Agricultural Development 14. Agricultural Economics Research
Examination forms	1. Essays questions 2. Writing Project Paper 3. Oral presentation
Reading list	1. Frank, R.H., Bernanke ,B.S. 2007. Principles of Macro Economis. McGraw- Hill. 2. Rita, H. 2020. Pengantar Ekonomi Pertanian. Penerbit Andi, Jakarta. 3. Yosi et al. 2012. Pengantar Ekonomi Pertanian. ITB Press. 4. Sharma, L. 2021. Principles of Agricultural Economics. Agrotech Publishing Academy. 5. Rosyidi, S. 1996. Pengantar Teori Ekonomi (Pendekatan Kepada Teori Ekonomi Mikro dan Makro).PT. Raja Grafindo Persada. 6. Husnan, S dan Suwarsono. 1994. Studi Kelayakan Proyek (Edisi ketiga). UPP AMP YKPN. 7. Gittenger, J/P/ 1986. Analisis Ekonomi Proyek-ptoyek Pertanian (Edisi kedua). UI-Press. 8. Kadariah, L. Karlina dan C Gray. 1999. Pengantar Evaluasi Proyek (Edisi Revisi). LPFE Universitas Indoensia. 9. Gray, C., Simanjuntak, P., Sabur, L.K., Maspaitell, R.C.G. Varley. 2005. Pengantar Evaluasi Proyek (edisi kedua). PT Gramedia Pustaka Utama

MODULE HANDBOOK

Module designation	Fundamentals of Management
Semester (s) in which the module is taught	1th semester/1nd year
Person responsible for the module	Ir. Fauzia Asyiek, M.A.,Ph.D Dr. Ir. Idham Alamsyah, M.Si Dr.Ir. Amruzi Minha, M.Si Ir. Yulius, MM Dwi Wulan Sari, S.P.,M.Si.,Ph.D Henny Malini,S.P.,M.Si Erni Purbiyanti, S.P.,M.Si Muhammad Arby, M.Si Thirtawati, S.P.,M.Si Elly Rosana, S.P.,M.Si
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative Learning, Case Based Learning
Workload (incl. Contact hours, self-study hours)	170 minutes x 2 credits = 5 hours and 6 minutes of total load, with details: 100 minutes of lectures; 100 minutes of assistance; 100 minutes of structured tasks and 46 minutes of group work.
Credit points	2 (2-0) credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	**1. Atitude** CP-STN 2 : Students have good morals, ethics and personality in completing their duties CP-STN 4: Studets able to work together and have high social sensitivity and concern for society and the environment. CP-STN 8: Students able to internalize the entrepreneurial spirit **2. Ability of the Field of Science** CP-KIP 3: Students able to understand the fields of economics, management, business, entrepreneurship, institutional, sociology, counseling and communication, as well as agricultural sciences for the development of sustainable agribusiness operating systems.

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	3.Skill CP-KBP 6 : Students able to use methods and formulate strategies for the use of resources to increase the capacity of themselves and the community in facing the challenges of agribusiness development in the future. CP-KBP 7 : Able to communicate business policy and agribusiness management for the benefit of empowering farmers. CP-KBP 11 : Able to manage and develop agribusiness businesses by implementing a management system that ensures quality output
Content	1. Introduction, and Development of Figures of Management 2. Planning Function 3. Organization Function 4. Deparmentation 5. Staff and Committee 6. Delegation 7. Acquiring Employees 8. Advancing Employees 9. Utilizing Employees 10. Dismissing Employees 11. Giving Ordes Function 12. Supervision Function 13. Human Resource Management 14. Presentation Of The Company's Case Review
Examination forms	1. Essays questions 2. Writing Case Paper 3. Oral presentation
Reading List	1. Hasibuan, Malayu. 2001. Management: Basics, Understanding and Problems. Earth Characters. Jakarta Manulang. 1998. 2. Management Basic. Ghalia Indonesia. Jakarta. 3. Rae, Leslie. 1993. 50 Activities to Develop Management Skills. Volume 1. Scripting. Jakarta. 4. Stoner, James. 2001. Management Volumes 1 and 2. Erlngga. Jakarta. Williams, Teresa. 1993. 50 Activities to Develop Management Skills. Volume 2. Scripting. Jakarta. Zandstra, 5. Jack. 1993. 50 Activities to Develop Management Skills. Volume 3. Scripting. Jakarta

MODULE HANDBOOK

Module designation	**Rural Sociology**
Semester (s) in which the module is taught	2nd semester/1nd year
Person responsible for the module	Ir. Fauzia Asyiek, M.A.,Ph.D Ir. Yulian Junaidi, M.Si Dr. Riswani, S.P., M,Si Dr. Yunita, S.P.,M.Si Dr. Agustina Bidarti, S.P.,M.Si Henny Malini,S.P.,M.Si Elly Rosana, S.P.,M.Si Eka Mulayana, S.P.,M.Si Indri Januarti, S.P., M.Si
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning,Case based Learning
Workload (incl. Contact hours, self-study hours)	8 hours and 30 minutes of total load, with details: 100 minutes of lectures; 100 minutes of assistance; 120 minutes of structured tasks and 130 minutes of group work
Credit points	3 (2-1) credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	**1. Atitude** CP-STN 4: Able to work together and have high social sensitivity and concern for society and the environment. CP-STN 5: Able to manage and develop agribusiness businesses by implementing a management system that values cultural diversity, views, beliefs, and religions and the original opinions / findings of others **2. Ability of the Field of Science** CP-KIP 3: Able to understand the fields of economics, management, business, entrepreneurship, institutional, sociology, counseling and communication, as well as agricultural sciences for the development of sustainable agribusiness operating systems. **3.Skill** CP-KBP 5 : Able to communicate and negotiate effectively with rural community stakeholders and in the development of agribinic operating systems by utilizing information technology in the field of

	agribusiness, to realize sustainable and efficient agribusiness CP-KBP 8 : Able to communicate and negotiate effectively with rural community stakeholders and in the development of agribisnist operating systems by utilizing information technology in the field of agribusiness, to realize agribusiness Able to motivate and empower the community in the field of agribusiness business development to improve the welfare of rural communities
Content	1. Understanding Rural Sociology 2. Social Interaction 3. Social Groups 4. Rural Social Institutions 5. Social System 6. Social Structure 7. Culture 8. Social Problems 9. Social Stratification 10. Social Change 11. Social Change in the Countryside 12. Village Development 13. Social Mobility 14. Modernization
Examination forms	1. Essays questions 2. Writing Case Paper 3. Oral presentation
Reading List	1. Cohen, Bruce J.; Simamora, Sahat, translator (Bina Aksara, 1983) Sociology an Introduction, Publisher Rineka Cipta. 2. Rahardjo.1999. Introduction to Rural Sociology and Agriculture. Yogyakarta: Gajah Mada University Press. 3. Soerjono Soekanto, 1985, Sociology of an Introduction, Jakarta: Rajawali Press. 4. Soekanto, Soejono. 2010. Sociology an Introduction. Jakarta: Raja Grafindo Persada. 5. Sugihen. 1996. Rural Sociology An Introduction. Jakarta: PT Raja Grafindo Persada.

MODULE HANDBOOK

Module designation	PTN 10115 **Introduction to Soil Science**
Semester (s) in which the module is taught	2&3^{d} semester/1&2nd year
Person responsible for the module	1. Prof. Dr. Ir. Dedik Budianta, MS 2. Dr. Ir. Warsito, MS 3. Dra. Dwi Probowati Sulistyani, MS 4. Ir, Marsi, MSc, PhD 5. Dr. Ir. Satria Jaya Priatna, MS 6. Dr. Ir. A. Napoleon, MP 7. Dr. Ir. Dwi Setyawan, MSc 8. Dr. Ir. Bambang Prayitno, MSc 9. Dr. Ir. Agus Hermawan, MS 10. Dr. Ir. Bakri, MS 11. Prof. Dr. Ir. Edi Armanto, MS 12. Prof. Dr. Ir. Nuni Gofar, MS 13. Dr. Ir. Madjid Rohim, MS 14. Dr. Ir. Momon Imanuddin, MS 15. Ir. Sabarudin, MSc. PhD 16. Ir. Siti Nurul Aidil Fitri, MS
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain why soil is very important for agriculture. 2. Students are able to explain the definition and the soil genesis 3. Students are able to describe the factors soil forming and soil phases 4. Students are able to explain the soil components related to agriculture 5. Students are knowing the soil distribution and soil classification in Indonesia.

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Content (14 meetings) and two examinations	1. Introduction of soil for agriculture (definition, function, etc) 2. Soil genesis: factors affecting soil formation and soil phases 3. Soil components for agriculture 4. Soil chemistry (soil acidity, soil alkalinity, CEC, SOM, soil liming) 5. Soil physics (soil texture, soil structure, soil pores, soil bulk density, soil specific density, soil moisture). 6. Soil biology (soil fauna and soil flora) 7. Soil development in Indonesia (Soil distribution and soil classification) 8. Examination
Examination forms	1. Essays questions 2. Writing paper 3. Photographs collection on agricultural objects
Reading List	1. Buckman, H.O. an N.C. Brady. 1982. Ilmu Tanah. Terjemahan Prof. Soegiman. Bhratara Karya Aksara Jakarta. 2. Huang, P.M., Li, Y. And Sumner, M.E. 2012. Handbook of Soil Sciences. Resource Management and Environmental Impacts. CRC Press. Taylor & Francis Group. New York.

MODULE HANDBOOK

Module designation	PTN 12215 *Floating Agriculture*
Semester (s) in which the module is taught	2rd semester/1nd year
Person responsible for the module	5. Dr. Ir. Adipati Napoleon, M.P 6. Ir. Siti Nurul Aidil Fitri, M.Si
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	3 hours and 40 minutes of total workload: 50 minutes for Contact Study; 100 minutes for structured academic assignment and 100 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Students are to gain knowledge and be able to understand and explain problems related to floating farming system techniques, making floating rafts and plant cultivation techniques with a floating system...

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Content	1. Introduction and history of development and concept of floating farming system. 2. Definition of floating farming system, types of floating farming and. Why do you need floating farming. 3. Source/Material of floating raft, Types of floating raft, Stages of making a floating raft and Considerations and Uses of floating rafts. 4. Growing media materials, Source of growing media, Types and properties of growing media and Use of growing media. 5. Organic fertilizer ingredients, An organic fertilizer material and Types and properties of agricultural lime. 6. Understanding of organic and inorganic fertilizers 7. Understanding of organic fertilizer technology 8. Midterm exam. 9. Understanding of secondary macro fertilizers Calcium, Magnesium, Sulfur. 10. Understanding of micro fertilizers, Fe, Mn, Zn, Cu, B and Mo. 11. compound fertilizer, Types of compound fertilizers, NPK ratio/grade in compound fertilizers The role of nutrient evaluation. 12. Soil test concept, Development of soil test, Correlation and calibration, Soil test method and soil sampling. 13. Soil and plant characteristics, Plant tissue analysis methods, Plant parts analyzed and Treating plant tissue to beanalyzed. 14. General recommendations for fertilizing and liming Fertilizer and lime recommendations based on location Concept 5 is appropriate for applying fertilizer. 15. Economic calculations and efficiency of fertilizer and lime application, Fertilizer procurement options, Advantages of using fertilizers and Fertilizer application efficiency 16. Final exams
Examination forms	1. Essays questions 2. Writing paper
Reading List	1. Bernas, SM., Napoleon, A dan Fitri, SNA. 2019. Budidaya Tanaman Padi dan Hortikultura Secara Terapung. Unsri Prerss Palembang.

	2. Hanafiah AK. 2016. Dasar-Dasar Ilmu Tanah. 3. Jones, J.B. 2012. Plant Nutrition and Soil Fertility Manual. 2nd Ed. CRC Press. Depok: Raja Grafindo Persada.

MODULE HANDBOOK

Module designation	Agricultural Extension
Semester (s) in which the module is taught	4rd semester/2nd year
Person responsible for the module	Dr. Yunita, S.P., M.Si Dr. Riswani, S.P., M.Si Prof. Dr. Ir. Sriati, M.S. Ir. Fauzia Asyik, M.A., PhD Henny Malini, S.P.,M.Si
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning, Cased Based Learning
Workload (incl. Contact hours, self-study hours)	170 minutes x 3 credits = 6 hours and 20 minutes of total load, with details: 100 minutes of lectures; 160 minutes of assistance; 120 minutes of structured tasks and 120 minutes of group work.
Credit points	3 (2-1) credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	**1. Attitude** STN 6 : Upholding law enforcement and having the spirit to put the interests of the nation and the wider community first. KIP 4 : Able to understand operationally the social, economic and technological principles that underlie the management of agricultural businesses and the agricultural industry and socio-cultural aspects in the countryside for decision making and problem solving in the field of agribusiness **2. Skills** **KBP 5 :** Able to communicate and negotiate effectively with stakeholders in the development of agribusiness operating systems by utilizing information technology in the field of agribusiness, to realize sustainable and efficient agribusiness 3. **Competency** **KBP 7 :** Able to communicate business policy and agribusiness management for farmer empowerment **KBP 8 :** Able to motivate and empower the community in the field of agribusiness business development to improve community welfare

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Content	1. Definition, and Scope of Agricultural Extension 2. Philosophy and Goals of Agricultural Extension 3. Agricultural Extension Method 4. Classification of Agricultural Extension Methods 5. Presentation of Materials and Group Discussion 6. Agricultural Extension Media 7. Agricultural Extension Materials 8. Agricultural Extension Institutions 9. Diffusion of Agricultural Innovation 10. Presentation of Materials and Group Discussion 11. Preparation of Agricultural Extension Planning 12. Revitalization of Agricultural Extension 13. Arrangement of Agricultural Extension System 14. Agricultural Extension in the Digital Age
Examination forms	1. Essays questions 2. Writing Project Paper 3. Oral presentation
Reading List	1. Van den Ban, A.W. and H. S Hawkins. 1999. Agricultural Extension. Kanisius, Yogyakarta. 2. Roger, E.M and F.F. Shoemaker.1971. Diffusion of Innovation. New York: Free Press. 3. Cees Leeuwis, 2010. Communication for Rural Innovation. Rethinking Agricultural Extension. Kasinius, Yogyakarta. 4. Nataliningsih. 2018. Participatory Counseling for Women Farmers Groups. C.V. Alphabet. Bandung. 5. Mardikanto, Totok. 2009. Agricultural Extension System. LPP and UPT Publishing and Printing. UNS.

MODULE HANDBOOK

Module Designation	**Principles of Crop Protection**
Code	PPT 21116
Semester (s) in which the module is taught	3rd semester/2st year
Person responsible for the module	Dr. Ir. Suparman SHK Prof. Dr. Ir. Siti Herlinda, M. Si. Ir. Bambang Gunawan, M. Si. Arsih, S. P., M. Si.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Attitude 1. CP-STN8: Capable of internalizing academic values, norms and ethics Knowledge 1. CP-KIP2: Mastering the theoretical concepts of plant cultivation problems and being able to manage and solve problems in the field Specific Skill 1. CP-KBP21: Capable of thinking analytically and synthetically regarding plant cultivation problems and be responsive to the development of related science and technology
Content	1. Scope of crop protection; insect as crop pest and the impact of their attack to crops. 2. Mite and mice as crop pest and the impact of their attack to crops. 3. Wild pig, bird and snail as crop pest and the impact of their attack to crops. 4. Cultural and biological techniques 5. Resistant variety, physical control and mechanical control techniques. 6. Plant quarantine and chemical control technique. 7. The use of sterile male and Integrated Pest Management. 8. Introducing plant disease: how pathogen cause disease

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	on plants. 9. Plant disease symptoms. 10. Fungi as plant pathogen. 11. Bacteria as plant pathogen. 12. Virus and nematode as plant pathogen. 13. Exclusion, eradication, physical and cultural techniques. 14. Chemical control of plant diseases.
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1. Chandrasekaran B, Annadurai K and Somasundaram. 2010. A Textbook of Agronomy. New Age International Publishers New Delhi. 2. Pareek A, Sopory SK, Bohnert HJ, and Govindjee. 2010. Abiotic Stress in Plants. Springer, Dordrecht, Nederland. 3. Kethan SK. 2001. Microbial Pest Control. Markel Dekker, Inc. New York. 4. Levine MJ.2007. Pesticides; A toxic time bomb in our midst. Praeger, London. 5. Agrios GN. 2005. Plant Pathology 5th Ed. Elsevier Academic Press, New York. 6. Ebbels DL. 2003. Principles of Plant Health and Quarantine. CABI Publishing, Cambridge.

MODULE HANDBOOK

Module Name	Fundamentals of Agronomy
Code	PAG 202116
Semester (s) in which the module is taught	2nd semester/1st year
Person responsible for the module	Dr. Ir. Yakup, M. S. Dr. Ir. Firdaus Sulaiman, M.Si. Dr. Ir. Zaidan Panji Negara, M.Sc. Fitra Gustiar, S.P., M.Si.
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	6 hours and 20 minutes of total workload: 100 minutes for Contact Study; 160 Minutes for practicum, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Capable of understanding, describing and explaining basic definition and scopes of agronomy. 2. Capable of understanding, describing and explaining the development of agricultural and the role of agronomy. 3. Capable of understanding, describing and explaining areas of origin and centers of crop production especially in Indonesia. 4. Capable of grouping the potential agronomic crops for certain agroecosystems. 5. Capable of understanding, describing and explaining the plant growth and development. 6. Capable of understanding, describing and explaining the effect of abiotic factors on plant growth and development and capable of providing solutions for each abiotic problems. 7. Capable of understanding, describing and explaining the effect of biotic factors on plant growth and development and capable of providing solutions for each biotic problems. 8. Capable of understanding, describing and explaining grouping and roles of growth regulator substances (GRS), enzymes, and vitamins. 9. Capable of understanding, describing and explaining

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	the roles and procedure of plant breeding. 10. Capable of understanding, describing and explaining the process of plant propagation (sexual and asexual), and tissue culture. 11. Capable of understanding, describing and explaining the preparation of dry land, swamp land, and micro land especially in Indonesia. 12. Capable of understanding, describing and explaining the process of nurseries, seeding, and planting. 13. Capable of understanding, describing and explaining the cropping patterns and crop diversification especially in Indonesia. 14. Capable of understanding, describing and explaining the agricultural intensification, and agricultural extensification. 15. Capable of describing, explaining and providing sustainability of land resources/conservation, and utilization of agricultural waste. 16. Capable of understanding, describing and explaining the agricultural production facilities.
Content	1. Basic definitions and scopes of agronomy. 2. Agricultural development and the role of agronomy. 3. Areas of origin and centers of crop production. 4. Agronomic plant grouping and examples 5. Plant growth and development 6. Effect of abiotic factors on plant growth and development 7. Effect of biotic factors on plant growth and development 8. Grouping and roles of growth regulator substances (GRS), enzymes, and vitamins 9. Plant breeding 10. Plant propagation (sexual and asexual), and tissue culture 11. Preparation of dry land, swamp land, and micro land 12. Nurseries, seeding, and planting 13. Cropping patterns and crop diversification 14. Agricultural intensification, and agricultural extensification 15. Sustainability of land resources/conservation, and utilization of agricultural waste 16. Agricultural production facilities
Examination forms	1. Essays questions 2. Pratical works

Reading list	1. C.C. Webster & P.N. Wilson. 1998. Agriculture in The Tropics. Blackwell Science. 2. R.L. Arya. 2020. Fundamentals of Agronomy. Scientific Publishers. 3. Chandra de Gopal. 2019. Fundamentals of Agronomy. Oxford and Ibh Publishers. 4. Donald L. Sparks. 2021. Advances in Agronomy, Volume 167. Academic Press; 1st edition. 5. Chandrasekaran B, Annadurai K and Somasundaram. 2010. A Textbook of Agronomy. New Age International Publishers New Delhi. 6. Manoj Kumar Jhariya, Ram Swaroop Meena, Arnab Banerjee. 2021. Ecological Intensification of Natural Resources for Sustainable Agriculture. Springer; 1st ed. 2021 edition. 7. Victor Sadras, Daniel Calderini. 2020. Crop Physiology Case Histories for Major Crops. Academic Press; 1st edition.

MODULE HANDBOOK

Module Designation	**Statistics**
Code	PER 21116
Semester (s) in which the module is taught	3rd semester/2st year
Person responsible for the module	Prof. Dr. Ir. Nuni Gofar, M.S Dr. Ir. Dwi Setyawan, M.Sc
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	Passed PER 21116
Module objectives/intended learning outcomes	Attitude 1. CP-STN 8: Capable of internalizing academic values, norms and ethics Knowledge 1. CP-KIP 1: Mastering the theoretical concepts and being able to develop science and technology for the cultivation of food crops, plantations and horticulture based on local wisdom and resources General Skill 1. CP-KBP 1: Capable of applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise
Content	1. General understanding of statistics; ilustration and examples to use statistics in agriculture research 2. Understanding and relationship between population and sample; ilurstration dan examples to use in agruculture research 3. Understanding several variablesl (quantitative-qualitative; discreat-continue; score; nominal,ordinal, categorical, rational) ilustration and examples in agriculture 4. Understanding, illutration, calculation and application of several measurement of central tendency of agricultural data (arithmatic-harmonic-geometric mean; median, and

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	modus) 5. Understanding, illustration, calculation and application examples on agricultural data, (minimum-maximum, rank, variance, standar deviation) 6. Understanding, illustration, calculation, and application examples of measurement of data position (percentile, quartile, etc.) 7. Explanation and examples of several techiques and methods in data presentation in form of tables, graphics, and hystogram 8. Understanding, illustration, relation, and calculation of probality and binomial distribution 9. Understanding, ilustration, relation, and calculation probability and normal distribution and Z-table 10. Understanding, ilustration, relation, and calculation probability and T-Student distribution and T-table 11. Explanation and calcution of one sample T-test using Z-test and T-test 12. Explanation and calculation of two sample comparionwise test in equal variance by using F-max ratio dan T-test 13. Explanation and calculation of two sample comparionwise test in un-equal variance by using F-max ratio dan T-test 14. Explanation, and introduction toward understanding of analysis variance (Anova) conceipt 15. Simple explanation toward understanding and application several other methods in statistical analysis analisis (regression, correlation, covariance, and non-parametric method)
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1.

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Module designation	PTN 23115 *Soil Biology*
Semester (s) in which the module is taught	3rd semester/2nd year
Person responsible for the module	7. Prof. Dr. Ir. Nuni Gofar, M.S. 8. Dr. Ir. A. Majid, M.S.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning, Project Based Learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain the soil habitat for the living media of soil organisms. 2. Students are able to explain the relationship between soil biology and land management actions 3. Students know the biodiversity of organisms in the soil. 4. Students are able to to explain the activities and soil macro-organisms and their influence on soil properties and plant growth and the environment. 5. Students are able to explain the activities and soil mesofauna and their influence on soil properties and plant growth and the environment. 6. Students are able to explain the activities and soil microflora and their influence on soil properties and plant growth and the environment 7. Students are understand the forms of interaction between microbes.

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	8. Students are able to explain the microbes that play a role in the carbohydrate cycle. 9. Students are able to explain microbes that play a role in the N cycle 10. Students are able to explain microbes that play a role in the P, K and S cycles. 11. Students are able to explain the role of organic matter and soil organic matter, decomposition of organic matter under aerobic and anaerobic conditions. 12. Students are able to understand the correct ways of managing soil organisms 13. Students are able to explain explain how to use soil organisms in soil biotechnology
Content	1. Soil Habitat (Description of Physical, Chemical and Biological Characteristics of Soil; Definition of rhizosphere and characteristics of rhizosphere compared to non-rhizosphere 2. Soil Biology and Management Measures 3. Soil Biodiversity 4. Soil macrofauna and their role in the soil 5. Soil mesofauna and its role in the soil 6. Soil Microflora (Bacteria, Fungi, Algae, Protozoa, Actinomycetes, Viruses and Bacteriophages) 7. Interaction between microbes 8. Soil microbes and nutrient cycles: 1. Microbes and the Carbon Cycle 9. Soil microbes and nutrient cycles: 2. Microbes and the N . Cycle 10. Soil microbes and nutrient cycles: 3. Microbes and P, K and S cycles 11. Interactive discussion using video conference discussing material 9, 10, and 11 12. Organic Mater 13. Soil Organism Management 14. Basics Soil Biotechnology

MODULE HANDBOOK

Examination forms	1. Essays questions 2. Writing paper 3. Project based
Reading List	• Bardgett, R.D. 2008. The Biology of Soil: A community and ecosystem approach. Oxford Univ. Press. • Tate, R.L. 2021. Soil Microbiology. John Wiley and Sons, Inc. • Miessler, D. 2020. Grow Your Soil!: Harness the Power of the Soil Food Web to Create Your Best Garden Ever. Storey Publ., LLC. • Giri, B. and Varma, A. 2020. Soil Health. http://www.springer.com/series/5138 • Saraswati, R., E. Husen, dan RDM. Simanungkalit. 2007. Metode Analisis Biologi Tanah. Balai Besar Litbang Sumberdaya Pertanian, Balitbangtan, Departemen Pertanian. • Hanafiah, KA., I Anas, A. Napoleon, N Gofar. 2005. Biologi Tanah. Rajawali Press, Jakarta.

MODULE HANDBOOK

Module designation	PTN 23215 *Soil Chemistry*
Semester (s) in which the module is taught	3rd semester/2nd year
Person responsible for the module	9. Dr. Ir. Marsi, M.Sc 10. Prof. Dr. Dedik Budianta, M.S. 11. Dr. Agus Hermawan, M.T. 12. Dr. A. Madjid Rohim, M.S.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to understanding the meaning and scope of Soil Chemistry. 2. Students are able to understand the basic principles of chemistry and solution chemistry 3. Students are able to understand the meaning of soil colloids and be able to distinguish between organic and inorganic colloids. 4. Students are able to recognize oxidation-reduction reactions and calculate oxidation number. 5. Students are able to distinguish actual acidity and potential acidity. 6. Students are able to understand the meaning of soil ion adsorption, soil CEC and soil AEC 7. Students are able to understand the role of soil chemistry in soil formation. 8. Students are able to understand about clay-metal-organic matter complex formation in the soil

Content	1. Introduction: Understanding Soil Chemistry; Scope of Soil Chemistry; Sciences Related to Soil Chemistry 2. Basic Principles of Chemistry: Important chemical elements in soil and plants; chemical bonds; Chemical units and their interrelationships 3. Soil Solution Chemistry: The concept of concentration and activity; Acid base concept; Constanta solubility products and its relationship with mineral solubility 4. Inorganic Colloids (Clay) 5. Organic Colloids 6. Definition of Oxidation Reduction. Oxidation-reduction reactions in some important soil nutrients. Flooded Soil Chemistry 7. Acid Sulfate Soil Chemistry 8. Reaction on Acid Soil 9. Soil Reaction in Soil Affected by Salt: Understanding Alkalinity and Salinity; Relationship between SAR and ESP; Chemistry Na 10. Principles of Ion Adsorption by Soil Colloids 11. Cation and Anion Exchange 12. Chemical Processes involved in Weathering Minerals: Hydration, Hydrolysis, Oxidation-Reduction 13. Chemical Processes Involved in Horizon Formation 14. Formation of clay-metal-organic matter complexes
Examination forms	1. Essays questions 2. Writing paper 3. Presentation and Group Discussion on Soil Chemistry Related Topics.

Reading List	1. Sparks, D.L., 2003. Environmental Soil Chemistry. Second Edition. Academic Press. San Diego. California. 352 pp. 2. Evangelou, V.P. 1998. Environmental soil and water chemistry: Principles and applications. John Wiley and Sons. New York. 3. Sposito, G. 2008. The Chemistry of Soils. Oxford University Press. New York. 342 pp 4. Bohn, H.L., B.L. McNeal, and G.A. O'Connor. 2001. Soil Chemistry. 3 rd Edition. John Wiley and Sons. New York. 322 pp. 5. Essington, M.E. 2004. Soil and Water Chemistry. CRC Press. New York. 553 pp 6. Yu, T.R. 1997. Chemistry of Variable Charge Soils. Oxford University Press. Oxford. 518 pp 7. Tan, K.H. 1998. Principles of Soil Chemistry. 3rd Edition. Marcel Dekker. Inc. New York. 556 pp

MODULE HANDBOOK

Module designation	PTN 23315 *Soil Physics*
Semester (s) in which the module is taught	3rd semester/2nd year
Person responsible for the module	13. Dr. Ir. Bakri, M.P 14. Dr. Ir. Satria Jaya Priatna, M.S. 15. Dr. Ir. Muh. Bambang Prayitno, M.Agr.Sc. 16. Dr. Momon Sodik Imanuddin, S.P., M.Agr.Sc.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Provide knowledge and understanding to students regarding the physical properties of soil, soil fraction, structure and its manifestations in the soil, as well as processes that occur in the soil such as groundwater potential, water flow in the soil, strength and compaction properties, rheology and plasticity of soil, air and soil temperature. as well as water balance and water availability and the process of water absorption to plant roots..

Content	1. Introduction, general characteristics of soil physics 2. Soil as a dispersion system, phase properties and each component of soil material and particles (texture), properties and characteristics 3. Continued manifestation of soil texture 4. Soil structure, porosity, manifestation of soil structure 5. Strength and compaction, rheology and soil plasticity 6. Groundwater potential, energy and retention, groundwater characteristic curve 7. Continued discussion of sample questions 8. Water flow in saturated and unsaturated soil (Examples of discussion of problems and calculations) 9. Water flow in saturated and unsaturated soil (Examples of discussion of problems and calculations) 10. Evaporation, infiltration, from ground level 11. Groundwater extraction by plants (Water Availability and Amount of water absorbed by plants and their calculations) 12. (Continued) Uptake of groundwater by plants (Water Availability and Amount of water absorbed by plants and their calculations) 13. Water and energy balance in farmland 14. Continuation and General Conclusion
Examination forms	1. Essays questions 2. Writing paper 3. Jurnal review

Reading List	1. Daniel Hillel, 1982. Introduction To Soil Physics. Academic Press. New York. (buku Kedua) 2. Jury, A.W. and R. Horton, 2004. Soil Physics. John Wiley and Sons. New Jersey. 3. Klute, A. 1986. Methods Of Soil Analysis. Part 1 – Physical And Mineralogical Methods, Second Edition. Asa. Sssa. Wisconsin. USA. 4. Lal, R dan M.K. Shukla, 2004. Principles of soil physics. Marcel Dekker, New York.716p. (Buku Utama) 5. Balai Besar Litbang Sumberdaya Lahan Pertanian. Badan Penelitian dan Pengembangan Pertanian Departemen Pertanian 2016.

MODULE HANDBOOK

Module Designation	**Agroclimatology**
Code	PAG 20116
Semester (s) in which the module is taught	1st semester/1st year
Person responsible for the module	Dr. Ir. Firdaus Sulaiman, M. Si. Dr. Ir. Yakup, M. S. Dr. Ir. Zaidan Panji Negara, M. Sc. Fitra Gustiar, S. P., M. Si.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Knowledge 1. CP-KIP4: Mastering theoretical concepts in the development of appropriate technology that is applicable in the community to increase agricultural production General Skill 1. CP-KBP1: Capable of applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise Specific Skill 1. CP-KBP 12: Capable of applying and modifying local wisdom by using the latest science and technology to be applied in plant cultivation practices with specific locations
Content	1. Scope of agroclimatology 2. The role of climate for agriculture 3. Earth's atmosphere 4. Solar radiation

MODULE HANDBOOK

	5. Air temperature 6. Temperature and plant growth 7. Air Pressure and Wind 8. Humidity 9. Hydrological cycle, clouds, and rain. 10. Climate classification 11. Tropical climate 12. Climate in Indonesia 13. Global warming 14. Climate change 15. The effect of climate on pests and plant diseases 16. Adaptation to climate change
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1. Hatfield, J.L., Sivakumar, M.V.K., Prueger, J.H. Agroclimatology (Agronomy Monographs) 1st Edition. ACSESS; 1st edition. 2. Balasubramanian, T.N. 2021. Agro-Climatology Advances and Challenges. New India Pub Agency Nipa. 3. Veeranjaneyulu., Mahapatra, R. 2011. Agro Climatology: Principles and Predictions. 4. Stigter, K. 2010. Applied Agrometeorology. Springer Berlin Heidelberg. 5. Sahu, D.D., Patel, H.R., Chopada, M.C. 2013. Fundamentals of Agricultural Climatology. Agrobios. 6. Mavi, H.S., Tupper, G.J. 2004. Agrometeorology Principles and Applications of Climate Studies in Agriculture. CRC Press. 7. Pritchard, S.G., Amthor, J.S. 1984. Crops and Environmental Change. Food Products Press.

MODULE HANDBOOK

Module Designation	**Soil Fertility**
Code	PTN 20116
Semester (s) in which the module is taught	3rd semester/2st year
Person responsible for the module	1. Prof. Dr. Ir. Dedik Budianta, MS. 2. Ir, Marsi, M.Sc, Ph.D. 3. Dr. Ir. A. Napoleon, M.P. 4. Dr. Ir. Agus Hermawan, M.S. 5. Prof. Dr. Ir. Nuni Gofar, M.S. 6. Dr. Ir. Madjid Rohim, M.S. 7. Ir. Sabarudin, MSc. Ph.D. 8. Ir. Siti Nurul Aidil Fitri, M.S. 9. Dr. Ir. Madjid Rohim, M.S.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Attitude 1. CP-STN 8: Capable of internalizing academic values, norms and ethics Knowledge 1. CP-KIP 2: Mastering the theoretical concepts of plant cultivation problems and being able to manage and solve problems in the field General Skill 1. CP-KBP 8: Capable of conducting process of self-evaluation of the work group under their responsibility, and able to manage learning independently Specific Skill 1. CP-KBP 14: Capable of identifying problems, providing alternative solutions, and makeing decisions in the cultivation of crops in the agricultural and plantation industrial systems

MODULE HANDBOOK

Content	1. Introduction of soil fertility for agriculture (definition, function, history of soil fertility) 2. Factors affecting the plant growth and its measurements 3. Principles of soil and plant relationship for plant growth 4. Soil nutrients for agriculture (Macro and micro elements and its role for plant growth) 5. Mechanisms nutrient uptake for plant growth 6. Efforts to improve soil fertility (SOM and liming) 7. Soil fertility evaluation 8. Examination
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1. Adams, F. 1984. Soil Acidity and Liming. Soil Sci. Soc. Am. Inc. Madison. USA. 2. Marschner, H. 1986. Mineral nutrition in Higher Plants. Academic. Press Inc. London. 674. P. 3. Mengel, K. and E.A. Kirkby. 1987. Principles of plant nutrition. International Potash Institute. Bern, Switzerland. 687 p. 4. Nyakpa, M.Y., A.M. Lubis, M.A. Pulung, A.G. Amrah, A. Munawar, N. Hakim and G.B. Hong. 1985. Kesuburan Tanah. BKS PTN. WUAE Project, Palembang. 5. Tisdale, S.L., W.L. Nelson, and J.D. Beaton. 1984. Soil Fertility and Fertilizer. Macmillan Pub. Co., New York. 6. Budianta, D and D. Ristiani. 2013. Pengelolaan Kesuburan Tanah. Unsri Press

MODULE HANDBOOK

Module designation	PTN 24115 *Soil and Water Conservation*
Semester (s) in which the module is taught	4rd semester/2nd year
Person responsible for the module	Dr. Ir. Satria Jaya Priatna, M.S Dr.Ir. Bakri
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 Credits
Required and recommended prerequisite for joining the module	Students Have Received Lecture Materials: Soil Science Fundamentals Soil Physics Soil Chemistry
Module objectives/intended learning outcomes	Students are expected to have an understanding of the Definition of Soil and Water Conservation; erosion processes and mechanisms; knowing the consequences caused by erosion and losses due to erosion; have an understanding and ability about: water cycles and equations as well as prediction and measurement of surface runoff; able to explain the factors that influence erosion such as rainfall, soil, slopes, and vegetation; have the understanding and ability to calculate and predict erosion; have an understanding of: erosion control methods; understand the causes of landslides and floods and understand the mitigation actions that must be taken

MODULE HANDBOOK

Content	1. Learning contract, RPS explanation, Scope of Soil and water conservation 2. Process and Mechanism of Erosion. The process of erosion occurs in 3 phases: erosion, transport and deposition; Erosion-causing agents: water and wind; Rainfall properties that affect erosion; Erosion forms; Erosion that can still be allowed 3. Water cycle; Water equation; Discharge measurement and surface runoff prediction 4. Factors Affecting Erosion. Climate factors (rainfall): the amount of CH, intensity, distribution, Soil factors: structure, organic matter, permeability, texture. Topographic factors: the length of the slope and the slope of the slope. Vegetation factors: plant roots, canopy and litter 5. Calculation of the amount of erosion: Calculation of erosion in the experimental plot 6. Erosion prediction (USLE and RUSLE); Erosion mapping (Iso erodent line) 7. Erosion Measurement in Watershed: Monitoring of erosion in the field and watershed 8. Soil Conservation Methods in Erosion Control. Soil Conservation Methods in Erosion Control: Mechanical methods: tillage, terraces, guluds, conservation channels, rorak, (making and measuring) 9. Soil Conservation Methods in Erosion Control. Vegetation methods: cropping according to contour, multiple cropping, cropping in STRIP, rotation, cover cropping. 10. Problems caused by erosion. In situ damage, Water body damage 11. Problems caused by erosion. Downstream damage, floods and landslides 12. Floods and Landslides. Causes and control of floods and landslides 13. Land capability class as the basis for conservation farming 14. Examples of erosion and flood damage in South Sumatra and Indonesia
Examination forms	1. Essays questions 2. Writing paper 3. Group discussion

Reading List	• Arsyad, S. 2010. Soil and Water Conservation. 2nd Edition. Bogor: IPB Press. • Barus, et al. 2011. Final Report Preparation of Criteria for Critical Land. Bogor: Central Regional Development Assessment (P4W) Bogor Agricultural University. • Frederick R. Troeh, J. Arthur Hobbs, Roy L. Donahue; 1980, Rev. ed. of: Soil and water conservation for productivity and environmental protection, by Prentice-Hall, Inc, Englewood Cliffs • Glenn O. Schwab et all, 1981. Soil and Water Coservation Engineering (Third edition); by Jhon and Willey & Sons . Inc

MODULE HANDBOOK

Module designation	PTN 24215 *Soil Morphology and Classification*
Semester (s) in which the module is taught	4rd semester/2nd year
Person responsible for the module	17. Dr. Ir. Dwi Setyawan, M.Sc 18. Dr. Ir. Warsito, M.P
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Students are expected to have an understanding and be able to: 1. Describe the soil profile in the field 2. Explain and distinguish soil morphological characteristics 3. Explain the five soil forming factors 4. Explain four groups of soil formation processes (pedogenesis) 5. Explain taxa (category) in Soil Taxonomy; 6. Classify a soil profile correctly using the Soil Taxonomy system 7. Assess the potential of the main soils based on the soil classification

MODULE HANDBOOK

Content	1. Introduction 1. Soil Diversity, 2. Morphology-genesis-soil classification trilogy, 3. Definition and History of Classification, 4. Purpose and Benefits of Soil Classification, 5. Barriers and Opportunities for Development of Soil Classification 2. Introduction of land in the field: 1.Soil profile: how to prepare, observe and interpret observations, 2. The composition of the main horizon, additional characterizing horizons, correlation of horizon characteristics, 3.Environmental factors of soil formation, 4. Correlation of laboratory data 3. Continued 4. Soil forming factors: 1.Effect of soil parent material 2.Topographic factors, 3. Contribution of biota and vegetation, 4.Climate influence, 5.The concept of time 5. Continued 6. Soil formation processes. 7. Continued 8. Introduction to Soil Classification System 9. USDA Land Taxonomy 10. USDA Land Taxonomy 11. FAO/ UNESCO system 12. PPT system 13. Main lands in Indonesia: 1.Geographical distribution of the main lands in Indonesia, 2.Potentials, problems and utilization of various types of soil in Indonesia, 3.Applied aspects in surveys and land mapping 14. Continued
Examination forms	1. Essays questions 2. Writing paper

Reading List	1. Luthfi Rayes. 2006. Deskripsi profil tanah di lapangan. UP Fakultas Pertanian Universitas Brawijaya, Malang. 2. Soil Survey Staff. 1999. Soil Taxonomy A Basic System of Soil Classification for Making and Interpreting Soil Surveys. Second Edition. AgricultureHandbook number 436. United States Department of Agriculture, Natural Resources Conservation Service. 3. Soil Survey Staff. 2010. Keys to Soil Taxonomy. Eleventh edition. United States Department of Agriculture, Natural Resources Conservation Service.

MODULE HANDBOOK

Module designation	PTN 24315 *Geodetic Surveying and Cartography*
Semester (s) in which the module is taught	4rd semester/2nd year
Person responsible for the module	19. Dra. Dwi Probowati Sulistyani M.S. 20. Dr. Ir. Momon Sodik Imanudin M.Sc 21. 22.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Students are expected to be able to explain the scope of soil geodetic surveying and cartography, the work carried out in soil surveying and its mapping for the purposes of land and land evaluation studies, planning, and as a basis for studying sciences related to soil and land in general. Students understand and understand in writing the general and specific objectives of the Soil Surveying and Cartography course, mentioning the definition and function of measuring soil in agriculture and its mapping, mentioning factors that affect soil mapping and explaining the process of soil mapping as well as explaining the concept of mapping soil and soil types. lettering. Students recognize and understand data sources from remote sensing images and can also recognize data directly in the field and digitally Provide understanding in describing the meaning of symbols on the map, how to present them on a map, describing the relationship between reading and analyzing maps, explaining the meaning in map layouts. Understand what map projection is and be able to explain the importance of map projection, and also understand the importance of map scale Understand the correct measurement method, explain the use of simple soil measuring tools, explain the basics of measuring height differences, profile planes and transverse flat properties, determine coordinates correctly Understanding of the method of making detailed topographic maps using soil measuring instruments and students can find out, learn methods of making detailed soil maps using soil measuring instruments

MODULE HANDBOOK

Content	1. Understand the general and specific objectives of Soil Surveying and Cartography courses 2. Understand the factors in terms of mapping in accordance with the rules of soil cartography. Definition of Cartography, Scope of Cartography Map Definition , Kinds of Maps and their Scope 3. Understanding Map Elements: 1. Definition of map elements 2. Map meaning and function 4. Understanding Lettering in Cartography Lettering type, Strengths and weaknesses of each Lettering Selection of the type of lettering and its depiction. Informative letter placement 5. Kinds of data sources, Data from Remote Sensing Data from direct measurement, Digital data, Data from existing maps. 6. Understanding symbolization in maps, dot symbol line symbol, Symbol area / area 7. Understanding Map Projections 8. Measurement Method 9. Simple measuring tools 10. measurement method under different conditions of height, profile and cross-sectional data 11. Coordinate point determination method 12. Making Topographic Maps as a result of measurements 13. Land Map Making and Result of measurement
Examination forms	1. Essays questions 2. Writing paper 3. Quiz
Reading List	1. Wongsocitro, 1994, Cartography, Kanisius Yogyakarta 2. Sutanto, 1986. Fundamentals of Remote Sensing 3. Umaryono, P., 1986, Soil Surveying Series C, Topographic Mapping Jur. Geodetic Engineering, FTSP, ITB

MODULE HANDBOOK

Module designation	PTN 24515 Land Ecology
Semester (s) in which the module is taught	7th semester/4th year
Person responsible for the module	23. Sabaruddin, Ph.D. 24. Dr. A. Napoleon
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning, Case-based learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Land Ecology (Landscape Ecology) discusses the interaction of spatial patterns and ecological processes, including human influences. This course covers basic concepts on the land ecology, introductions and methods in landscape ecology, and their applications in natural resource conservation, natural resource management, and landscape planning and design. After attending this course, students are expected to be able to: 1. Understand the basic concepts of Land Ecology (Landscape Ecology), and 2. Understand the interactions among landscape components.
Content	1. Introduction: Explanation of Syllabus, Rules, Assessment, Reading Materials, Lecture Schedule; What is Ecology, Land and Landscape, 2. Concepts on Landscape Ecology: Some Basic Concepts in Landscape Ecology; Spatial and Landscape Heterogeneity, 3. Landscape Structure, 4. Landscape Pattern Quantification, 5. Introduction to Ecological Ethics, 6. Wetland Ecology: Riparian Swamp, Tidal Swamp, 7. Ecological Disturbances: Natural and Anthropogenic

MODULE HANDBOOK

Examination forms	1. Write essays 2. Field works 3. Group Assignment
Reading List	Baum, K. A., K. J. Haynes, F. P. Dillemuth, and J. T. DCronin. 2004. The matrix enhances the effectiveness of corridors and stepping stones. Ecology 85:2671-2676. Belisle, M. 2005. Measuring landscape connectivity: The challenge of behavioral landscape ecology. Ecology 86:1988-1995. Burrough, Peter A. and Rachael A. McDonnell. 1998. Errors and Quality Control. Chapter 9 in Principles of Geographical Information Systems. Oxford Univ. Press, Oxford. pp.220-240. Buyantuyev, A., and J. Wu. 2007. Effects of thematic resolution on landscape pattern analysis. Landscape Ecology 22:7-13. Cleary, D. F. R., M. J. Genner, T. J. B. Boyle, T. Setyawati, C. D. Angraeti, and S. B. Menken. 2005. Associations of bird species richness and community composition with local- and landscape-scale environmental factors in Borneo. Landscape Ecology 20:989-1001. FAO. 1977. A framework for land evaluation. ILRI. Ferraz, G., J. D. Nichols, J. E. Hines, P. C. Stouffer, R. O. Bierregaard, and T. E. Lovejoy. 2007. A large-scale deforestation experiment: Effects of patch area and isolation on Amazon birds. Science 315:238-241. Fortin, M.-J., M. R. T. Dale, and J. ver Hoef. 2002. Spatial analysis in ecology. Encyclopedia of Environmetrics 4:2051-2058. FOSTER,D. et al. 2003. The Importance of Land-Use Legacies to Ecology and Conservation. BioScience 53(1): 77-88. Gardner, R. H., B. T. Milne, M. G. Turner, and R. V. O'Neill. 1987. Neutral models for the analysis of broad-scale landscape pattern. Landscape Ecology 1:19-28. Gardner, R. H., and D. L. Urban. 2007. Neutral models for testing landscape hypotheses. Landscape Ecology 22:15-29. Gillson, L. 2004. Evidence of hierarchical patch dynamics in an East African savanna? Landscape Ecology 19:883-894. Goodwin, B. J. 2003. Is landscape connectivity a dependent or independent variable? Landscape Ecology 18:687-699. Hanski, I. 1998. Metapopulation dynamics. Nature 396:41-49. Hanski, I., and O. Ovaskainen. 2000. The metapopulation capacity of a fragmented landscape. Nature 404:755-758. Hess, G. R., and J. M. Bay. 1997. Generating confidence intervals for composition-based landscape indexes. Landscape Ecology 12:309-320. Hook, D.D. 1988. Ecology of wetlands. Croom Helm, London & Sydney Holyoak, M., and C. Ray. 1999. A roadmap for metapopulation research. Ecology Letters 2:273-275. Holderegger, R., U. Kamm, and F. Gugerli. 2006. Adaptive vs. neutral genetic diversity: Implications for landscape genetics. Landscape Ecology 21:797-807. Kannegietera A. 1987. Land Ecology and Land Use Survey. ITC. The Nederlands. Kearns, F. R., N. M. Kelly, J. L. Carter, and V. H. Resh. 2005. A method for

the use of landscape metrics in freshwater research and management. Landscape Ecology 20:113-125.
Koper, N., and F. K. A. Schmiegelow. 2006. A multi-scaled analysis of avian response to habitat amount and fragmentation in the Canadian dry mixed-grass prairie. Landscape Ecology 21:1045-1059.
Li, H. and J. Wu. 2004. Use and misuse of landscape indices. Landscape Ecology 19: 389-399.
Neel, M. C., K. McGarigal, and S. Cushman. 2004. Behavior of class-level landscape metrics across gradients of class aggregation and area. Landscape Ecology 19:435-455.
Noss, R. F. 1987. Corridors in real landscapes: a reply to Simberloff and Cox. Conservation Biology 1:159-164.
Pickett, S. T. A., and M. L. Cadenasso. 1995. Landscape ecology: Spatial heterogeneity in ecological systems. Science 269:331-334.
Pickett, S. T. A., J. Wu, and M. L. Cadenasso. 1999. Patch dynamics and the ecology of disturbed ground. Pages 707-722 in L. R. Walker, editor. Ecosystems of Disturbed Ground. Ecosystems of the World 16. Elsevier, Amsterdam.
Robertson, G. P. 1987. Geostatistics in ecology: Interpolating with known variance. Ecology 68: 744-748.
Shen, W., G. D. Jenerette, J. Wu and R. H. Gardner. 2004. Evaluating empirical scaling relations of pattern metrics with simulated landscapes. Ecography 27: 459-469.
Simberloff, D., and J. Cox. 1987. Consequences and costs of conservation corridors. Conservation Biology 1:63-71.
Tewksbury, J. J., D. J. Levey, N. M. Haddad, S. Sargent, J. L. Orrock, A. Weldon, B. J. Danielson, J. Brinkerhoff, E. I. Damschen, and P. Townsend. 2003. Corridors affect plants, animals, and their interactions in fragmented landscapes. Proceedings of the National Academy of Sciences (USA) 99:12923-12926.
Tischendorf, L., and L. Fahrig. 2000. How should we measure landscape connectivity? Landscape Ecology 15:633-641.
Tischendorf, L. 2001. Can landscape indices predict ecological processes consistently? Landscape Ecology 16:235-254Tran, L. T., R. V. O'Neill, and E. R. Smith. 2006. A generalized distance measure for integrating multiple environmental assessment indicators. Landscape Ecology 21:469-476.
Wimberly, M. C. 2006. Species dynamics in disturbed landscapes: when does a shifting habitat mosaic. Landscape Ecology 21:35-46.
Wu, J. 2004. Effects of changing scale on landscape pattern analysis: Scaling relations. Landscape Ecology 19:125-138.Wu, J. 2006. Cross-disciplinarity, landscape ecology, and sustainability science. Landscape Ecology 21:1-4.
Zonneveld, I.S. 1979. Land evaluation and Land(scape) science. ITC, Netherlands

MODULE HANDBOOK

Module designation	PTN 23415 *Soil Microbiology*
Semester (s) in which the module is taught	3rd semester/2nd year
Person responsible for the module	25. Prof. Dr. Nuni Gofar 26. Dr. Ir. A. Majid, M.S.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Students are able to explain the scope of microbes and classify soil microbes based on morphology and taxonomy, ecology, as well as their role in providing soil and plant nutrients, skilled in calculating total microbes, isolating, recognizing microbial characteristics, and measuring microbial activity, able to explain application techniques for beneficial soil microbes in plants, and be able to explain the interactions of soil microbes and plants
Content	1. Introduction 2. Morphological classification, taxonomy, ecology, and the role of microbes as data providers 3. Microbial Ecology 4. Microbial cultivation 5. Methods for Studying Soil Microbes 6. Isolation and selection techniques 7. Measuring microbial activity in soil 8. Techniques for isolation, selection, propagation, and application of nitrogen-fixing bacteria 9. Techniques for isolation, selection, propagation, and application of phosphate and potassium solubilizing microbes 10. Techniques for isolation, selection, propagation and application of aggregate-strengthening microbes 11. Techniques for isolation, selection, propagation and application of decomposer microbes 12. Microbiome, isolation techniques, selection, propagation and application of plant growth-promoting microbes 13. Interactions between microbes in the soil

	14. Interactions between soil microbes and plants
Examination forms	1. Essays questions 2. Writing paper
Reading List	1. O'Flaherty, V. et al. 2010. Environmental Microbiology. John Wiley & Sons. 2. Bello, B.O. 2015. Soil Microbiology. Edition: First. Publisher: Lab Lambart Publishing, Acadmic Publising, OmniScriptum GmbH & Co, Kg, Deutschland, Germany. Editor: Prof S . Frazier. ISBN: 978-3-659-77893-3_ 3. Hanafiah, K.A., A. Napoleon, Nuni Gofar. 2015. Biologi Tanah, Ekologi dan Mikrobiologi Tanah. Rajawali Press.

MODULE HANDBOOK

Module Designation	**Plant Physiology**
Code	PAG 114216
Semester (s) in which the module is taught	3rd semester/2st year
Person responsible for the module	Prof. Dr. Ir. Rujito Agus Suwignyo, M. Agr. Dr. Irmawati, S. P., M. Si., M. Sc. Dr. Ir. Mery Hasmeda, M. Sc. Dr. Ir. Susilawai, M. Si. Dr. Ir. M. Umar Harun, M. S.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	Passed PAG 109116
Module objectives/intended learning outcomes	Knowledge 1. CP-KIP 3: Mastering the theoretical concepts of sustainable and environmentally friendly plant cultivation management General Skill 1. CP-KBP 1: Capable of applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise Specific Skill 1. CP-KBP 11: Capable of applying plant cultivation in agricultural systems by utilizing biological resources creatively and innovatively
Content	1. Introduction, basic concept, and scope of crop Physiology. 2. Anatomy, cell structure and plant tissue. 3. Plant and water relationship. 4. Physiologial function of water.

MODULE HANDBOOK

	5. Plant growth regulator. 6. Photosynthesis. 7. Photosynthesis and plant growth. 8. Plant respiration. 9. Factors affected respiration and fotorespiration. 10. Enzyme 1. 11. Enzyme 2. 12. Plant growth and development. 13. Plant growth analysis. 14. Biomass, yield and yield components, harvest index.
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1. Fitter, A.H., Hay, R.K.M. 2002. Environmental Physiology of Plants. Academic Press. 2. Luttge, U. 2008. Physiological Ecology of Topical Plants. Springer. 3. Hay, R., Porter. 2006. The Physiology of Crop Yield. Blackwell Publishing. 4. Sadras, W.O., Calderini, D.F. 2009. Crop Physiology Applications for Genetic Improvement and Agronomy. Academic Press. 5. Wilkins, M.B. 1989. Advanced Plant Physiology. Longman Scientific and Technical. 6. Pessarkli, M. 2004. Handbook of Photosynthesis Second Edition. Taylor and Francis. 7. Rao, K.V.M., Raghavendra, A.S., Reddy, K.J. 2006. Physiology and Molecular Biology of Stress Tolerance in Plants. Springer. 8. Foster, G.D., Johansen, I.E., Hong, Y., Nagy, P.D. 2008. Plant Virology Protocols from Viral Sequence to Protein Function. Humana Press. 9. Hawkesford, M.J., Barraclough. 2011. The Molecular and Physiological Basis of Nutrient Use Efficency in Crops. 10. Khan, M.A., Weber, D.J. 2008. Ecophysiology of high Salinity Tolerant Plants. Springer. 11. VK Jain. 2017. Fundamentals of Plant Physiology. Schand. 12. Lambers, H., Chapin III, F.S. 2008. Plant Physiological Ecology. Springer.

	13. Stewart, P., Globig, S. 2012. Plant Physiology. Apple Academic Press. 14. William, G.H., Norman., Honer, P.A- Introduction to Plant Physiology 15. Nobel, P. 2009. Physicochemical and Environmental Plant Physiology. Elsevier. 16. Scott, P. 2008. Physiology and Behavior of Plants. Wiley. 17. Burg, S.P. 2004. Postharvest Physiology and Hypobaric Storage of Fresh Produce. CABI Publishing.

MODULE HANDBOOK

Module designation	PTN 35615 Agricultural Waste Management
Semester (s) in which the module is taught	5th semester/3rd year
Person responsible for the module	1. Sabaruddin, Ph.D. 2. Dr.Agus Hermawan 3. Dr. A. Napoleon
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Agricultural waste management is an important component in the development of sustainable agriculture. The scope of this course covers the concept of sustainable agriculture, the basics of waste management, and the application of agricultural waste for useful resources (land application, composting, biogas, soil ameliorant materials, and potential impacts on the environment. After attending this course, students are expected to be able to: 1. Understand the concept and the importance of agricultural waste management, and 2. Understand the concept of interrelationships between agriculture and the environment.

MODULE HANDBOOK

Content	1. Introduction: Description of the Course; Scope of Agricultural Waste management; Agricultural History; Agriculture and Waste, 2. Agricultural Activities and Pollution Potential: Types of Agricultural Waste (Organic and Inorganic waste); Why is Agricultural Waste a Problem? (Case Study), 3. Introduction to Waste Management and The 3R-concept; Agricultural Waste Management Paradigm, From waste to Worth,Co-benefit Approach (Example of Implementation) 4. Continuation of Lecture IV: Example of Value-added Agricultural Waste Management (case study) 5. Agricultural Waste Management System: Landfilling, Composting; Land Application; Biogas Production; Mulching; Biochar. All are case-based lecture, 6. Legal Aspects of Waste Management in Indonesia, 7. Field Trip and Discussion
Examination forms	6. Essays questions 7. Writing paper 8. Group Assignment

MODUL E HANDBOOK

Reading List	1. Bajoriene, K., D. Jodaugiene, R. Pupaliene, A. Sinkeviciene. 2013. Effect of organic mulches on the content of organic carbon in the soil. Estonian J of Ecol, 62(2):100–106. 2. Bin Wang, Faqin Dong, Mengjun Chen, Jingping Zhu, Jiangyue Tan, Xinmei Fu, Youzhi Wang, 3. Shu Chen. 2016. Advances in recycling and utilization of agricultural wastes in China: Based on environmental risk, crucial pathways, influencing factors, policy mechanisms. Procedia Environmental Sciences 31:12 – 17. 4. Cohen, E, and G. Yom Din. 2010. Agricultural Waste Management: Case Study of a Waste Treatment Plant for Animal Manure. SSRN Electronic Journal 1-17. Environmental Agency. 2001. Towards sustainable agricultural waste management. R&D 5. Technical Report P1-399/1, UK. FAO. 2015. The State of Food and Agriculture Social protection and agriculture: breaking the cycle of rural poverty. The Food and Agriculture Organization of the United Nations (FAO). 6. Giovannucci, D., S. Scherr, D. Nierenberg, C. Hebebrand, J. Shapiro, J. Milder, and K. Wheeler. 2012. Food and Agriculture: the future of sustainability. A strategic input to the Sustainable Development in the 21st Century (SD21) project. New York: United Nations Department of Economic and Social Affairs, Division for Sustainable Development. 7. Hoornweg, D. and P. Bhada-Tata. 2012. What a waste: A Global Review of Solid Waste Management. World Bank. 8. Hussain I., L. Raschid, M. A. Hanjra, F. Marikar, and W. van der Hoek. 2002. Wastewater use in agriculture: Review of impacts and methodological issues in valuing impacts. Working Paper 37. Colombo, Sri Lanka: International Water Management Institute. 9. Jacobs. The Best Management Practices for Agricultural Waste Management. The Canada-Prince 10. Edward Island Water. Framework Agreement for Environmental Cooperation in Atlantic Canada. 11. Kaza, Silpa, Lisa Yao, Perinaz Bhada-Tata, and Frank Van Woerden. 2018. *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. Urban Development Series. Washington, DC: World Bank. doi:10.1596/978-1-4648-1329-0. License: Creative Commons Attribution CC BY 3.0 IGO. 12. Obi, F. O., B. O. Ugwuishiwu, and J. N Nwakaire. 2016. Agricultural Waste Concept, Generation, Utilization, and Management. Nigerian Journal of Tech 35 (4): 957 – 964. 13. Sarkar, N., S. K. Ghosh, S. Bannerjee, K. Aikat. 2012. Bioethanol production from agricultural wastes: An overview. Renewable Energy 37: 19-27. 14. Winpenny, J., I. Heinz, and S. Koo-Oshima. 2010. The wealth of waste: The economics of wastewater use in agriculture. FAO, Rome.

MODULE HANDBOOK

Module Designation	**Experimental Design**
Code	PER 24116
Semester (s) in which the module is taught	4th semester/2nd year
Person responsible for the module	Prof. Dr. Ir.ni Gofar Dr. Ir. Dwi Styawan, M. Sc.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits (2 credits theory and 1 practice)
Required and recommended prerequisite for joining the module	Passed PER 21115
Module objectives/intended learning outcomes	Attitude 1. CP-STN 8: Capable of internalizing academic values, norms and ethics Knowledge 1. CP-KIP 3: Mastering the theoretical concepts of sustainable and environmentally friendly plant cultivation management General Skill 1. CP-KBP 1: Capable of applying logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise Specific Skill 1. CP-KBP 14: Capable of identifying problems, providing alternative solutions, and makeing decisions in the cultivation of crops in the agricultural and plantation industrial systems
Content	1. Introduction: Basic principle, assumption, aplication, and experimental design models 2. Single factor experimental design: Completely random design 3. Single factor experimental design: Randomized complete

MODULE HANDBOOK

	4. Mean comparison methods: LSD, HSD, Duncann, and Contrast analysis. Applicationa and calculation example 5. Factorial design in apriculture. Application and calculation examples 6. Factorial split plot design in apriculture. Application and calculation examples 7. Simple regression, and correlation analysis in agricultural 8. General problem, precission, accuration, and bias in agricultural research; prevention and remediantion (case study) 9. General example in calculation of Anova, LSD, HSD, Duncann, and contrast analysis by using computer program (Excel and SAS)
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1.

MODULE HANDBOOK

Module designation	PTN 35115 *Agrohydrology*
Semester (s) in which the module is taught	5rd semester/3nd year
Person responsible for the module	27. Dr. Ir. Bakri, M.P 28. Dr. Ir. Satria Jaya Priatna, M.S. 29. Dr. Momon Sodik Imanudin, S.P., M.Sc. 30. Dr. Ir. Warsito, M.P.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Provide knowledge and understanding to students are able to explain the cycle and availability of water in nature and the principles in water use and management, as well as learn various calculations related to water availability for agriculture in a broad sense. 1. Student are able to understanding Social Interests and Engineering Relationships; Water Equilibrium or Mass Equilibrium 2. Student are able to understanding Meteorology (Atmosphere, Water Vapor, Solar Energy, Wind, Temperature, Data Diversity) 3. Student are able to understanding Watersheds (DAS), Rain Formation, Rain Classification 4. Student are able to explain water balance in a watershed area 5. Student are able to explain Measurement Methods (Water Level, Flow Meter, Dissolution, Float, Indirect Method using Manning's equation, Hydrograph properties (Hydrograph notes, river type with river flow hydrograph analysis 6. Student are able to process Watershed Data, concentration time (Izzard Formula. Kerby Equation, Kirpich Equation)

MODULE HANDBOOK

Content	23. INTRODUCTION 24. METEOROLOGY AND HYDROLOGICAL CYCLE 25. NATURE AND CHARACTERISTICS OF RIVER FLOW REGIONS (DAS) 26. RAIN 27. INFILTRATION AND EVAPOTRANSPIRATION 28. WATER BALANCE 29. FLOW MEASUREMENT 30. HYDROGRAPH 31. SYNTHETIC HYDROGRAPH 32. FLOW IDENTIFICATION 33. PROBABILITY AND STATISTICS FOR HYDROLOGY 34. GROUNDWATER HYDROLOGY 35. BIGGEST VOLUME AND DEBIT MANAGEMENT
Examination forms	9. Essays questions 10. Writing paper 11. Jurnal review
Reading List	

MODULE HANDBOOK

Module designation	PTN 35215 *Soil Biotechnology*
Semester (s) in which the module is taught	5rd semester/3nd year
Person responsible for the module	1. Dr. Ir. Adipati Napoleon, M.P 2. Ir. Sabaruddin, M.Sc., Ph.D 3. Dr. Ir. Abdul Madjid R
Language	Indonesian and English
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Students are to gain knowledge and be able to understand the relationship between soil microbes and plants, the benefits of soil microbes as biological control agents, bioremediation and as biofertilizers (inoculants), composting technology, enzymes and microbial products in the soil, and microorganism engineering.

Content	1. Introduction, Scope of Soil Biotechnology 2. Soil Biotechnology Development 3. Sapropit microorganisms, role in the decomposition process in soil 4. Soil Healthy 5. Saprophytic microorganisms, roles in nutrient cycling processes in soil 6. Enzymes in the soil 7. Symbiosis of soil microorganisms with plants 8. Soil Biodiversity (Soil Macrooganism) 9. Soil Biodiversity (Soil Microoganism) 10. The role of soil microorganisms in agricultural systems 11. Pollution and its effects on soil organisms 12. Soil bioremediation 13. Management of soil organisms 14. Organic Farming
Examination forms	1. Essays questions 2. Writing paper 3. Jurnal revew
Reading List	1. Bardgett, R.D. 2008. The Biology of Soil: A community and ecosystem approach. Oxford Univ. Press. 2. Tate, R.L. 2021. Soil Microbiology. John Wiley and Sons, Inc. 3. Lynch, J.M.,1982. Soil Biotechnology. Blackwell Scientific Publ. Oxfprd London.

MODULE HANDBOOK

Module designation	PTN 35315 *Land Survey and Evaluation*
Semester (s) in which the module is taught	5rd semester/3nd year
Person responsible for the module	31. Dra. Dwi Probowati Sulistyani M.S. 32. Dr. Ir. Muh Bambang Prayitno M.Agr 33.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Students are expected to have an understanding of the scope of Land Surveys and Land Evaluation, especially in Indonesia, to be able to identify the basic concepts of land surveys and land evaluations, to be able to explain the methods of land surveys and land evaluations, to have an understanding and ability in general about land survey methods and land evaluation. land evaluation and its application in agriculture The basic competencies (C) include: 1. Students are expected to have an understanding of the scope of Land Survey and Land Evaluation, especially in Indonesia (C1). 2. Students are expected to have the ability to identify the basic concepts of land survey and land evaluation (C2). 3. Students are expected to have the understanding and ability to explain the methods of land survey and land evaluation (C3). 4. Students are expected to have an understanding and ability in general about soil survey methods and land evaluation and their application in agriculture (C4). The Competency Indicators (CI) from the learning activities of the Soil Survey and Land Evaluation courses are: 1. Students can know and explain about Land Survey Planning (CI1). 2. Students can know and explain the basic concepts of land surveys, survey accuracy, survey stages (CI2). 3. Students can explain the land potential analysis method, (CI3). 4. Students can know and explain about land use planning methods based on the framework of land suitability assessment and land capability and spatial planning and its application in agriculture (CI4)

Content	1. Introduction: definition and scope, aspects of the study, land survey and land evaluation 2. Land method land survey approach and evaluation 3. An understanding of the types of surveys, the scale, purpose, and level of precision of land surveys 4. An understanding of the stages that must be carried out in carrying out activities starting from preparation until the presentation of the results of land survey activities 5. Understanding of planning soil survey activities starting from the preparation of materials and tools, budget plan, time schedule, soil observation activities in the field, parameters observed in the field and in the laboratory, sampling, laboratory analysis and interpretation of data for planned activities 6. Understanding of basic concepts and frameworks for land evaluation for agriculture 7. Land evaluation system 8. Understanding of technical methods of land suitability assessment for agricultural commodities 9. Understanding of technical methods of land capability assessment 10. Implementation and case studies of planning for agricultural land survey and evaluation activities 11. Implementasi dan studi kasus perencanaan kegiatan survei dan evaluasi lahan dilahan rawa lebak 12. Implementation and planning case studies land survey and evaluation activities on tidal land 13. Implementation and case studies of planning for land survey and evaluation activities on dry land 14. Implementation and case studies of planning survey and evaluation activities on peatlands
Examination forms	1. Essays questions 2. Writing paper 3. Quiz

MODULE HANDBOOK

Reading List	1. Anonymous. 2012. Regulation of the Minister of Agriculture number: 05/Permentan/CT.140/8/2012 concerning: Guidelines for the Development of Agricultural Areas. 2. Beek, K.J., P.A. Burrough, and D.E McCormack. 1986. Quantified Land Evaluation Procedures. ITC Publication No. 6. 3. Pregnant, E.S. 1981. Assessments of the effects on yield of variations in climate and soil characteristics for twenty crops species. AGOF/INS/78/006, Technical Note No 12. Center for Soil research, Bogor, Indonesia 4. CSR/FAO. 1983. Reconnaissance Land Resource Survey 1:250.000 scale. Atlas Format Procedures. Land Resources Evaluation with Emphasis on Outer I Island Project. CSR/FAO Indonesia AGOFANS/78/006. Manual 4 version 1. 5. Djaenudin, D., Basuni, S. Hardjowigeno, H. Subagyo, M. Soekardi, Ismangun, Marsoedi Ds., N. Suharta, L. Hakim, Widagdo, J. Dai, V. Suwandi, S. Bachri, and E.R. Jordan. 1994. Land Suitability for Agricultural and Silvicultural Plants. wipe. Tech. No. 7 Ver.1.0. LREP-II Part C. CSAR, Bogor. 6. Djaenudin, D., Marwan H., Hidayatullah, K. Nugroho, E.R. Jordans, A.J.J. v.d. Eelaart, and D.G. rosters. 1997. Standard Procedures for Land Evaluation. Technical Report No. 18 Version 3.0 LREP-II Part C. CSAR, Bogor. 7. Djaenudin, D., Nata Suharta, Marwan, H., Anny M., and M. Soekardi. 1996. Terms of Reference for Evaluation of Land Resources to Support Regional Spatial Planning for Provinces at Level I Regions (RTRWPD I) Part. Pro. Research on Land Resources and Agroclimate. Puslittanak, version 1.0. 8. Djaenudin, D., Marwan, H., H. Subagyo, A. Mulyani, and Nata Suharta. 2000. Land Suitability Criteria for Agricultural Commodities. Version 3.0. September 2000. Research Center for Agricultural Research and Development Agency. 9. Donald A Davidson. 1992. The Evaluation of Land Resources. Longman Scientific & Technical VS, New York. 10. Driessen. 1971. Parametric suitability of land. Soil Research Institute, Bogor. 11. FAO. 1976. A Framework for Land Evaluation. Soil Resources Management and Conservation Service Land and Water Development Division. FAO Soil Bulletin No. 32. FAO-UNO, Rome. 12. FAO. 1978. Guidelines for Soil Profile Description. FAO/UNESCO. Rome.

MODULE HANDBOOK

Module designation	PTN 35415 *Soil, Water and Plant Analysis*
Semester (s) in which the module is taught	5rd semester/3nd year
Person responsible for the module	1. Dr. Ir. Marsi, M.Sc. 2. Prof. Dr. Dedik Budianta, M.S. 3. Dr. Agus Hermawan, M.T. 4. Dr. Ir. Abdul Madjid Rohim, M.S.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 50 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Provide knowledge and understanding and ability to students about the principles, methods, and procedures for analyzing soil, water, and plants, carrying out independent and group analyzes, interpreting the data from the analysis and calculating fertilization recommendation for plant cultivation.
Content	1. Introduction to *Soil, Water and Plant Analysis* 2. *Laboratory: Function, Organization, Safety and Equipment* 3. Chemical Principles: Reagents, Standard Solutions, Concentration 4. Principles of Soil, Water and Plant Sampling 5. Soil, Water and Plant Analysis: Total Elemental Analysis and Plant Ash 6. Soil, Water and Plant Analysis: Organic Matter and N 7. Soil, Water and Plant Analysis: P 8. Soil, Water and Plant Analysis: S 9. Soil, Water and Plant Analysis: pH, CEC 10. Soil, Water and Plant Analysis: SAR, EC 11. Soil, Water and Plant Analysis: H-exch., Al-exch., Al saturation 12. Soil, Water and Plant Analysis: K, Na, Ca, Mg 13. Data Interpretation 14. Recommendation
Examination forms	1. Essays questions 2. Writing paper 3. Presentation and Group Discussion

Reading List	1. FAO. 2020. Soil Testing Methods Manual. ISBN 978-92-5-131195-0 2. Moorberg, C.J. and Crouse, D.A. 2017. Soils Labor Soils Laboratory Manual. ISBN 978-1-944548-09-4. https://newprairiepress.org/ebooks/15/ 3. Kalra YP. 1998. Reference Methods for Plant Analysis. CRC Press. 4. Rosa Margesin and Franz Schinner. 2005. Manual for Soil Analysis –Monitoring and Assessing Soil Bioremediation. Springer. 5. M.R. Carter and E.G. Gregorich. 2006. Soil Sampling and Methods of Analysis. Canadian Society of Soil Science 6. Balai Penelitian Tanah. 2009. Petunjuk Teknis ANALISIS KIMIA TANAH, TANAMAN, AIR, DAN PUPUK. Edisi 2.

MODULE HANDBOOK

Module Designation	**Research Methods**
Code	PER 31116
Semester (s) in which the module is taught	6th semester/3rd year
Person responsible for the module	Prof. Dr. Ir. Nuni Gofar, M.S Dr. Ir. Dwi Setyawan, M. Sc.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Attitude 1. CP-STN 8: Capable of internalizing academic values, norms and ethics Knowledge 1. CP-KIP 2: Mastering the theoretical concepts of plant cultivation problems and being able to manage and solve problems in the field General Skill 1. CP-KBP 4: Capable to compiling a scientific description of the results of the studies mentioned above in the form of a Research Project or final project report, and upload it on the university's website Specific Skill 1. CP-KBP 15: Capable of planning and evaluating efficient and effective crop cultivation systems
Content	1. Three cardinal sins in research & scientific writings 2. Sistematic steps in searching of research topics 3. Research & publication as a continuum 4. Publications and academic profession 5. Discussion of student-selected issues
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1.

MODULE HANDBOOK

Module designation	PTN 36115 *Landscape Analysis*
Semester (s) in which the module is taught	6rd semester/3nd year
Person responsible for the module	34. Dra. Dwi Probowati Sulistyani 35. Dr. Ir. Muh. Bambang Prayitno, M.Agr.Sc. 36. 37.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	The learning of LANDSCAPE ANALYSIS courses is divided into 2 (two) objectives, namely: General Instructional Objectives (TIU) or known as Basic Competencies (KD) and Specific Instructional Objectives (ICT) or known as Competency Indicators (IK). Basic competencies and competency indicators from learning activities for LANDSCAPE ANALYSIS courses can be classified based on the level of cognitive ability proposed by Bloom which is shown at the end of each goal. These basic competencies (C) include: 1. Students are expected to have an understanding of geomorphology and the geomorphic processes that form it (C1). 2. Students are expected to have the ability to identify basic concepts about landscapes (C2). 3. Students are expected to have the understanding and ability to explain the landscape analysis method (C3). 4. Students are expected to have an understanding and ability in general about the landscape analysis method and its application in agriculture (C4). The Competency Indicators (CI) of the learning activities for the LANDSCAPE ANALYSIS course are: 1. Students can know and explain about the process of geomorphological processes for the formation of landscapes (CI1). 2. Students can know and explain the basic concepts of geomorphology, and its application in agriculture (CI2). 3. Students can know and explain about the landforms that are formed from the forces that form them (CI3) 4. Students can explain the landscape analysis method (CI4)

MODULE HANDBOOK

Content	1. Introduction, definition, scope, basic concepts of landscape analysis aspects of the study, spectrum of basic concepts of geomorphology 2. Geomorphological forces and processes for the formation of the earth's appearance 3. Landform Concepts and Classification 4. Land Forms of Anthropogenic Origin, divide the various types of land forms as a result of human power or activities. Landscape analysis of anthropogenic origin for agricultural activities and their management 5. Land Forms of Karst origin, dividing the various types of land forms as a result of the energy or activities of karst origin. Landscape analysis of karst origin for agricultural activities and their management 6. Landforms of Fluvial origin is the notion of fluvial energy, any fluvial origin that will cause the formation of landforms and divide the various types of landforms as a result of fluvials. Landscape analysis of fluvial origin for farming activities and their management 7. Land form of Structural origin, understanding of structural origin, what forces of structural origin will cause the formation of land forms, dividing various types of land forms as a result of structural. Landscape analysis of structural origin for agricultural activities and their management 8. Land form from Marine is the notion of marine, what kind of energy from marine will cause the formation of landforms and divide the various types of land forms as a result of marine. Landscape analysis of marine origin for activities and management 9. Land form of denudational origin, what is denudational force, divides the types of land forms as a result of denudational energy or activities. Landscape analysis of denudational origin for farming activities and their management 10. Land form from Aolin understanding of aolin, what kind of energy from aolin will cause the formation of land forms and dividing the various types of landforms as a result of aolin Landscape analysis from Aolin for farming activities and their management 11. Land Forms of Organic origin is the notion of organic, any energy of organic origin that will cause the formation of land forms and divide the various types of land forms as a result of organic. Landscape analysis of organic origin for farming activities and their management 12. Land form of Glacial origin is the notion of glacial, what kind of energy from glacial origin will cause the formation of land forms and divide the various types of land forms as a result of glacial. Landscape analysis of glacial origin for agricultural activities and their management 13. Land Forms of Volcanic origin is the notion of volcanic, any force of volcanic origin that will cause the formation of landforms and divide the various types of landforms as a result of volcanic activity. Landscape analysis of volcanic origin for agricultural activities and their management 14. Land Form of Alluvial origin is the notion of alluvial, any energy from alluvial origin that will cause the formation of land forms and divide the various types of land forms as a result of alluvial. Landscape analysis of alluvial origin for agricultural activities and their management
Examination forms	1. Essays questions 2. Writing paper 3. Quiz

Reading List	1. Lobeck, AK. (1939), Geomorphology, An Introduction to the study of Landscape, New York and London: McGraw-Hill Book Company. Inc. 2. Sukmantalya, I Nyoman K, Drs. M.Sc. (1995), Introduction to Geomorphology and Its Application through PJ for Inventorying Land Resources, Cibinong: Bakosurtanal. 3. Suprapto Dibyosaputro, Drs. M.Sc., (1997), Basic Geomorphology, Yogyakarta: Faculty of Geography UGM. 4. Sutikno (1987), Conceptual Geomorphology and Its Application "Paper", Yogyakarta: Faculty of Geography UGM. 5. Van Zuidam, R.A, and F.I. van Zuidam Cancelado, 1979. Terrain Analysis And Classification Using Aerial Photographs, International Institute for Aerial Survey and Earth Science (ITC) 350, Boulevard Al Enschede, The Netherlands

MODULE HANDBOOK

Module designation	PTN 36215 *Fertilizer and Fertilization Technology*
Semester (s) in which the module is taught	6rd semester/3nd year
Person responsible for the module	1. Prof. Dr. Ir. Nuni Gofar, M.S. 2. Dr. Marsi 3. Dr. Sabarudin 4. Dr. Agus Hermawan 5. Dr. A. Napoleon 6. Ir. Siti Nurul Aidil Fitri
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Provide knowledge to students about knowledge and skills related to plant nutrients and fertilizers, properties and types of fertilizers, fertilizer manufacture and their reactions in the soil which include nitrogen, phosphorus, potassium, macro and micro fertilizers. 2. Students are able evaluate the status of nutrients in soil and plants through soil and plant testing. 3. Students are able to understand the basic of fertilization. 4. Students are able to explain and calculate of fertilizer needs on the basis of economy, yield, efficiency of fertilization and liming. 5. Students are able to explain and preparation of fertilizer recommendations.

Content	1. Nutrients, fertilizers, development history and fertilization concepts 2. Meaning, availability of nutrients and the basic problems of fertilization, the history and concept of fertilization: 1. Definition of fertilizer, 2. types of fertilizer, 3. Why plants need to be fertilized 3. The manufacture of N fertilizers, reactions in the soil: 4. The manufacture, properties, reactions of P fertilizers 5. The manufacture, properties and use of K fertilizer 6. The importance of organic fertilizers and organic fertilizer technology: Understanding of organic and inorganic fertilizers and organic fertilizer technology 7. Topics 1-6 Discussion 8. The properties and reactions of fertilizers containing primary and secondary macro nutrients in the soil: Understanding of secondary macro fertilizers Ca, Mg, S 9. The properties and reactions of micro fertilizers in the soil: 1.Understanding microfertilizers, 2.Fe fertilizers, 3.Mn fertilizers, 4.Zn fertilizers, 5.Cu fertilizers, 6.B and Mo fertilizers 10. The manufacture, properties and reactions of compound fertilizers: Compound fertilizers,Types of compound fertilizers, NPK ratio/grade in compound fertilizers The role of nutrient evaluation 11. The method of evaluating soil nutrient status 12. The plant analysis method: 1. Soil and plant characteristics, 2. Plant tissue analysis method, 3. Plant parts analyzed, 4. Treat plant tissue to be analyzed 13. The basics of applying fertilizer and recommendations for fertilizing/liming 14. The basic economic considerations and the efficiency of fertilization and liming
Examination forms	1. Essays questions 2. Writing paper

Reading List	1. Gofar, N. 2015. Teknologi Pupuk dan Pemupukan di Lahan Suboptimal. Polimedia Publishing, Jakarta. 2. Havlin, J.L, Tisdale, S.L., Nelson, W.L., Beaton, J.D. 2013. Soil Fertility and Fertilizers: an introcuction to nutrient management (6th Ed). Macmillan Publishing Company. New York, NY. 3. Jones, J.B. 2012. Plant Nutrition and Soil Fertility Manual. 2nd Ed. CRC Press.

MODULE HANDBOOK

Module designation	PTN 36315 *Land Resource Information System*
Semester (s) in which the module is taught	6rd semester/3nd year
Person responsible for the module	1. Prof. Dr. Ir. M. Edi Armanto 2. Dr. Momon Sodik Imanudin, S.P., M.Sc
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-Fundamental of Soil Science, and Cartografic and Mapping
Module objectives/intended learning outcomes.	• Students are expected to be able to explain the scope of soil surveying and cartography, the work carried out in soil surveying and its mapping for the purposes of land and land evaluation studies, planning, and as a basis for studying sciences related to soil and land in general. • Students are able to classify the kinds of data found in the field, and able to explain the relationship between graphic and tabular data in Arch GIS • Students are able to analyze land resources data and produce output in agriculture with Arch GIS • Student are able to explain the source of data that can used in Land Information System and they able to digitize maps by on chreen digitizer. • Student are able to explain the various of spatial analysis that exist, and able to perform spatial data analysisn eith ArcView GIS. • Student are expected to understand smart farming technology, that was involping the internet tehnology base which could help famer increase crop yields in quantity and quality.

Content	1. Introduction: spatial information system; data presentation; Definition of land information system; supporting science; some of the advantages of using LRIS 2. Cartography basics 3. Map Scale and Projection: Understanding Scale; Definition of Latitude; Longitude; Definition of Map Projection and its Problems; Map Projection Classification; Map Projection Construction & Its Properties; Use of Computers for Projection Construction 4. Base Map and Thematic Map; Base Map; Thematic Maps 5. LRIS concept: software; hardware; users; data; method 6. Data source: graphic data source; attribute data source; Remote sensing as a graphical data source 7. LRIS Components: Sub system input; processing sub system; output sub-system, input sub-system: semi-manual; digitizing manuals; scanning; satellite data processing results 8. Database management system 9. Examples of applications for measurement, mapping, monitoring and modeling: 10. Meta data in LRIS 11. Sub system processing: data processing attributes 12. Sub system processing (Continuation) 13. Sub-system output: Attributes/table 14. Several obstacles to the use of LRIS
Examination forms	1. Essays questions 2. Writing paper 3. A Case study projet analysis

MODUL EHANDBOOK

Reading List	1. Burrough, P.A. 1986. Principles of Geographical Information System. Clarendon Press Oxford 2. Burrough, P.A. 1986. Principles of Geographical Information System. Clarendon Press Oxford. 3. Charter. D. 2004. MapInfo Professional. Informatika Bandung. 4. Dawn J. Wright, and Christian Harder. 2020. GIS for Science Applying Mapping and Spatial Analisis. Esri press. 5. Goodchild, M. F., L. T. Steyaert, and B. O. Parks. 1996. GIS and Environment Modeling. John Wiley & Sons. 6. Jaya, I.N.S. 2002. Applied of Geographic Information System in Forestry. Bogor Agriculture Institute. 7. Molenaar. M.T.J. 1998. An Introductory to the Theory of Spatial Object Modelling for GIS. International Ltd, Padstow, Cornwall. 8. Nurpilihan, B. Dan Irfan, A. 2020. Smart Farming Internet Of Things base in Greenhouse. Unpad Press. 100p 9. Maria, Pangestika, Musraino, Hohary, Suprihati, Yohanes Hendro Agus, Nugraheni Widyawati, Maria Marina Herawati, Alfred Jansen Sutrisno, Yoga Aji Handoko, Liska Simamora, Damara Dinda N. Zebua, Hendrik J. Nadapdap, Tinjung Mary Prihtanti, Yuliawati, Bayu Nuswantara, Maria. 2020. Smart Farming: Agricuoture in Revolution Industries Era 4.0. Penerbit Andi. 256 p. 10. Suraj Kumar Singh, S. Kanga, Gowhar Meraj, Majid Farooq, Sudhanshu. 2021. Geographic Information Science for Land Resource Management. Scrivener Publishing LLC. DOI:10.1002/9781119786375 11. Ripple. W.J. 1989. GIS for Resource Management. Amer. Soc. for Photogrammetry and Remote Sensing. 12. Wadsworth, R. and J. Treweek. Longman. 1999. GIS for Ecology, an Introduction.

MODULE HANDBOOK

Module designation	PTN 36415 *Soil and Water Management*
Semester (s) in which the module is taught	6rd semester/3nd year
Person responsible for the module	1. Dr. Ir. Satria Jaya Priatna, M.S 2. Dr.Ir. Warsito, MP 3. Dr.Ir. Muh Bambang Prayitno, M.Agr.Sc.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	Students Have Received Lecture Materials: Soil Science Fundamentals Soil Physics Soil Chemistry Soil Biology
Module objectives/intended learning outcomes	Students are expected to have an understanding of the defenition of Soil and Water Management; Understanding the Nature and Characteristics of Degraded Soil and the Principles of Soil and Water Management; Knowing the dry land management system; knowing the management of polluted soil and water; understand intensive and sustainable farming systems; understand the management of soil that has experienced erosion; Understand the management system for acid sulphate soil and saline or sodic soil; Understand peat and organic soil management systems; and understand the management system and land reclamation of paddy fields and agroforestry farming systems in wetlands

Content	1. Learning contract, RPS explanation, Scope of Soil and Water Management 2. Introduction Definition and Scope of Soil Management and Factors Affecting Its Decline Soil Quality 3. Characteristics of damaged soil and principles of soil and water management 4. Dry Land Management Management of Polluted Soil and Water (1) 5. Dry Land Management Management of Polluted Soil and Water (continued) 6. Intensive And Sustainable Agriculture 7. Management of Soil whose top soil has been eroded by erosion 8. Acid Sulfate Soil Management 9. Salinity and Sodic Soil Management 10. Management of Peat and Organic Soil Water (1) 11. Management of Peat and Organic Soil Water (continued) 12. Paddy Field Land Reclamation and Management 13. Paddy Field Land Reclamation and Management (continued) 14. Agroforestry Farming System In Wetlands
Examination forms	1. Essays questions 2. Writing paper (Independent paper) 3. Group discussion

MODULE HANDBOOK

Reading List	• Arsyad, S. 2010. Soil and Water Conservation. 2nd Edition. Bogor: IPB Press. • Agus, F., and I.G. Subixa. 2008. Peatlands: potential for agriculture and environmental aspects. Soil Research Institute. Agricultural Research and Development Agency. World Agroforestry Centre. Bogor. • Andriesse, J.P. 1992. Nature and Management of Tropical Peat Soils. FAO Soil Bulls. 59-165 p. • Arafah. 2009. Technical Guidelines for Rice Field-Based Fertility Improvement • Sanchez, A.P. 1993 Nature and Management of Tropical Soils; Publisher: Bandung : Publisher ITB., 1993; Physical Description. 2 ji., 302 p. • Suripin. 2004. Conservation of Soil and Water Resources; Yogyakarta : Andi Offset, ISBN 979-731-431-6

MODULE HANDBOOK

Module designation	PTN 36515 *Irrigation and Drainage*
Semester (s) in which the module is taught	6rd semester/3nd year
Person responsible for the module	1. Dr. Ir. Bakri, M.P. 2. Dr. Momon Sodik Imanudin, S.P., M.Sc. 3. Dr. Ir. Satria Jaya Priatna, M.S.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Provide knowledge and understanding to students in order to be able to explain irrigation water quality, Calculation of plant water needs and irrigation water needs, irrigation and drainage buildings and irrigation and drainage systems

Content	1. Introduction 2. Statistics / Groundwater Dynamics 3. Irrigation Water Source / Storage 4. Irrigation Water Quality 5. Plant Water Needs 6. Irrigation Water Delivery Method 7. Planting and Irrigation Scheduling 8. Preparation of Irrigated Land 9. Operation & Maintenance of Irrigation Network Reclamation / Drainage Project Planning Phase Identitification & Feasibility Study Phase 10. Drainage System Plan / Drainage Reclamation to Control Water Level 11. Soil (General System, Special System) Project Preparation, Installation and Maintenance (Final Project Preparation and Specifications, Installation, Operation and Maintenance) 12. Reclamation of Lebak Swamp and Tides in Indonesia 13. Equipment / Construction of Flowing Irrigation/Pumping Water Irrigation / Irrigation Efficiency 14. Water Resources Management / Forestry and Environment Policy
Examination forms	1. Essays questions 2. Writing paper 3. Jurnal revew

Reading List	Hansen, V. E., O. W. Israelsen, dan G.E. Stringham. 1986. Dasar-dasar dan Praktek Irigasi (terjemahan ke Bahasa Indonesia oleh E.P. Tachyan dan Soetjipto). Penerbit Air Langga. Teknik Konservasi Tanah dan Air. 1997. Robiyanto H. Susanto dan Rahmad H. Purnomo (terjemahan : Soil and Water Concervation, Gleen O. Scwab dkk. 1990). Ochs, W. J. dan B. G. Bishay. 1992. Drainage Guideline. World Bank Technical Paper No. 194. Bardan, M. 2014. Irigasi. Graha Ilmu Yogyakarta. Rosadi, R. A. B. 2015. Dasar-dasar Teknik Irigasi. Graha Ilmu Yogyakarta. Sangsongko, D. 1985. Alih Bahasa. Ray. K. L. and Joseph. B. F. Teknik Sumber Daya Air. Penerbit Air Langga. Mawardi, M. 2016. Irigasi Asas dan Praktek. Penerbit Bursa Ilmu.

MODULE HANDBOOK

Module designation	PTN 36615 Organic Farming System
Semester (s) in which the module is taught	5^{d} semester/3nd year
Person responsible for the module	1. Prof. Dr. Ir. Dedik Budianta, MS 2. Ir. Sabaruddin, MSCs, PhD
Language	Indonesian
Relation to curriculum	Optional/elective Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	6. Students are able to explain what is the organic farming. 7. Students are able to compare the organic farming and conventional farming 8. Students are able to apply organic farming 9. Students are able to explain the models of organic farming 10. Students are aware about the disadvantage of conventional farming
Content (14 meetings) dan two examinations	1. Introduction of organic farming (definition, characteristic of organic farming, etc) 2. Organic farming producing healthy food 3. Utilization of local resources to support organic farming 4. Regulation organic farming in Indonesia (Indonesia national standard) 5. Apply organic farming in farm level 6. Organic farming for producing soil and food health 7. Organic farming for improving soil properties 8. Organic farming related with climate change 9. Examination
Examination forms	1. Essays questions 2. Writing paper

Reading List	1. Sparling, G.; Schipper, L., Hewitt, A. 1988. Soil Quality Characteristric of Walareka and Wakanui Soils Under Cropping. New Zealand Soil Science Society Conference, 16-19 Nov. 1998. pp 153-154 2. Mulongoy, K anad R. Merckx. 1993. Soil organic matter dynamics and sustainable of tropical agriculture. KU. Leuven. Belgium 3. Rachman Sutanto. 2002. Penerapan Pertanian Organik. Pemasyarakatn dan Pengembangannya. Kanisius

MODULE HANDBOOK

Module designation	PTN 36715 *Lowland Management*
Semester (s) in which the module is taught	6rd semester/3nd year
Person responsible for the module	1. Dr. Ir. Marsi, M.Sc 2. Dr. Ir. Moh. Bambang Prayitno 3. Dr. Momon Sodik Imanuddin, S.P., M.Sc. 4. Dr. Ir. Bakri, M.P.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to understand the meaning and scope of Lowland 2. Students are able to understand and differentiate tidal and freshwater swampland 3. Students are able to understand the typology of swampland based on soil hydro-topography and soil type 4. Students are able to understand the pyrite formation, oxidation and how to minimalize pyrite oxidation and its impact. 5. Students are able to understand soil salinity concept and its effect on soil characteristics and plant growth 6. Students are able to understand water management on tidal and freshwater swamplands 7. Students are able to understand peatland formation and its characteristics. 8. Students are able to understand management concept of peatland for agricultural and non-agricultural Uses 9. Students are able to understand peatland and coastal ecosystem restoration

MODULE HANDBOOK

Content	1. Introduction: Definition and scope of swampland; Conditions For the formation of swamp land. 2. Typology of Tidal Swamp land and its Soil Characteristics. 3. Typology of the Freshwater swamp land and its soil characteristics 4. Process of pyrite formation in tidal swamp land, pyrite oxidation and its management 5. Impact of pyrite oxidation on soil and water quality 6. Effect of salinity on soil and water characteristics and its management 7. Effect of height and duration of inundation on soil characteristics of freshwater swamp land. 8. Water Management of Tidal Swamp and Freshwater Swamp land 9. Formation of Peat Soil and its characteristics 10. Peatland management for agriculture 11. Peatland management for non-agricultural sector 12. Peat Ecosystem Restoration 13. Swamp and Coastal Ecosystem
Examination forms	1. Essays questions 2. Writing paper 3. Presentation and Group Discussion on Lowland Management Related Topics.

Reading List	1. Haryono. 2013. Lahan Rawa: Lumbung Pangan Masa Depan Indonesia. Badan Penelitian dan Pengembangan Pertanian Kementerian Pertanian. 2. Didi Ardi S., Undang Kurnia, Mamat H.S., Wiwik Hartatik, dan Diah Setyorini. 2006. Karakteristik Dan Pengelolaan Lahan Rawa. Balai Besar Penelitian Dan Pengembangan Sumberdaya Lahan Pertanian. Badan Penelitian dan Pengembangan Pertanian Departemen Pertanian. 3. Najiyati, S., Lili Muslihat dan I Nyoman N. Suryadiputra. 2005. Panduan pengelolaan lahan gambut untuk pertanian berkelanjutan Bogor: Wetlands International - xi + 231 hlm; ISBN: 979-97373-2-9 4. Reddy, K.R. and R.D. DeLaune. 2008. Biogeochemistry of Wetland: Science and Application. CRC Press. 806 pp. 5. Perillo, G.M.E., E. Wolanski, D.R. Cahoon, and M.M. Brinson (Eds). 2009. Coastal Wetlands: An Integrated Ecosystem Approach. Elsevier. 975 pp. 6. Richardson, J.J. and M.J. Vepraskas (Eds). 2001. Wetland Soils: Genesis, Hydrology, Landscapes and Classification. Lewis Publishers. 432 pp. 7. Corner, W.H., T.W. Doyle, K.W. Krauss (Eds). 2007. Ecology of Tidal Freshwater Forested Wetlands of the Southern United States. Springer. 508 pp 8. Kadlec, R.H. and S.D. Wallace. 2009. Treatment Wetland. 2nd Ed. CRC Press. 1048 pp.

MODULE HANDBOOK

Module designation	PTN 36815 *Practical of Lowland Management*
Semester (s) in which the module is taught	6rd semester/3nd year
Person responsible for the module	1. Dr. Ir. Muh Bambang Prayitno, M.Agr.Sc 2. Dr. Marsi
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to understanding the meaning and scope of Lowland (Tidal Lowland, Non Tidal Lowland and Peatland), 2. Students are able to know how to observe swamp land in the field ((process of formation and arrangement of soil horizons), 3. Students are able to know how to observe some physical and chemical properties of swamp land in the field and in the laboratory, 4. Students are able to know how to observe some chemical properties of swamp land in the field and in the laboratory, 5. Students are able find out how to overcome the limiting factors of some soil chemical properties for agricultural activities, 6. Students can identify and use fertilizers, lime, organic materials, etc to improve soil capacity and support plant growth

Content	1. Introduction: definition of low land land (tidal lowland, Non Tidal Lowland and Peatland), Lowland Management, 2. Tidal Lowland 1: formation process, soil horizon, soil profile, 3. Tidal Lowland 2: Observing the physical properties of the soil and its characteristics, 4. Tidal Lowland 3: observing the chemical properties of the soil and its characteristics, 5. Tidal Lowland 4: land and water management for agriculture 6. Non Tidal Lowland 1: formation process, soil horizon, soil profile, 7. Non Tidal Lowland 2: Observing the physical properties of the soil and its characteristics, 8. Non Tidal Lowland 3: observing the chemical properties of the soil and its characteristics, 9. Midterm Examination 10. Non Tidal Lowland 4: land and water management for agriculture 11. Peatland 1: formation process, soil horizon, soil profile, 12. Peatland 2: Observing the physical properties of the soil and its characteristics, 13. Peatland 3: observing the chemical properties of the soil and its characteristics, 14. Peatland 4: land and water management for agriculture, 15. General discussion and evaluation: the first meeting to the end. 16. semester final exam
Examination forms	1. Essays questions 2. Writing paper 3. Presentation and Group Discussion on Related Topics.

MODULE HANDBOOK

Reading List:	Pedoman Pengamatan Tanah di Lapangan. Badan Penelitian dan Pengembangan Pertanian Kementerian Pertanian 2017. IAARD Press Badan Penelitian dan Pengembangan Pertanian Jalan Ragunan No. 29, Pasarminggu, Jakarta 12540 Telp. +62 21 7806202, Faks.: +62 21 7800644 ISBN 978-602-344-163-1 Petunujk Teknis. PEDOMAN PENILAIAN KESESUAIAN LAHAN UNTUK KOMODITAS PERTANIAN STRATEGIS Tingkat Semi Detail Skala 1:50.000. Wahyunto, Hikmatullah, Erna Suryani, Chendy Tafakresnanto, Sofyan Ritung, Anny Mulyani, Sukarman, Kusumo Nugroho, Yiyi Sulaeman, Yayan Apriyana, Suciantini, Aris Pramudia, Suparto, Rudi Eko Subandiono, Teddy Sutriadi, Dedi Nursyams. Balai Besar Litbang Sumberdaya Lahan Pertanian Badan Penelitian dan Pengembangan Pertanian Jl. Tentara Pelajar No. 12, Kampus Penelitian Pertanian, Cimanggu, Bogor 16114 E-mail: bbsdlp.litbang.pertanian.go.id; csar@indosat.net.id Website: http://bbsdlp.litbang.pertanian.go.id Pencetakan buku ini dibiayai DIPA BBSDLP TA 2016 Edisi April, 2016 ISBN 978-602-6759-16- Petunjuk Teknis PEDOMAN SURVEI DAN PEMETAAN TANAH Tingkat Semi Detail Skala 1:50.000. Wahyunto, Hikmatullah, Erna Suryani, Chendy Tafakresnanto, Sofyan Ritung, Anny Mulyani, Sukarman, Kusumo Nugroho, Yiyi Sulaeman, Suparto, Rudi Eko Subandiono, Teddy Sutriadi, Dedi Nursyamsi. Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian Badan Penelitian dan Pengembangan Pertanian Jl. Tentara Pelajar No. 12, Kampus Penelitian Pertanian Cimanggu, Bogor 16114 E-mail: bbsdlp@litbang.pertanian.go.id; csar@indosat.net.id Website: http://bbsdlp.litbang.pertanian.go.id Pencetakan buku ini dibiayai DIPA BBSDLP TA 2016 Edisi April, 2016 ISBN 978-602-6759-14-6. LOWLAND RICE CULTIVATION GUIDE. Tatsushi TSUBOI. Rice Technical Advisor. Promotion of Rice Development (PRiDe) Projec. Study of Management Practices for Lowland Rice in Nepalese Context. ACTA SCIENTIFIC AGRICULTURE (ISSN: 2581-365X). Volume 3 Issue 10 October 2019 Growing lowland rice: a production handbook. Africe Rice Center (WARDA). Nwilene F.E., Oikeh S.O., Agunbiade T.A., Oladimeji O., Ajayi O., Sié M., Gregorio G.B., Togola A. and A.D. Touré. Integrated management practices for lowland rice production. Article in Pesquisa Agropecuaria Brasileira · March 2009https://www.researchgate.net/publication/262430911 LAHAN GAMBUT INDONESIA Pembentukan, Karakteristik, dan Potensi Mendukung Ketahanan Pangan (Edisi Revisi). Fahmuddin Agus Markus Anda Ali Jamil Masganti. BADAN PENELITIAN DAN PENGEMBANGAN PERTANIAN KEMENTERIAN PERTANIAN 2016. Petunjuk Teknis UNTUK KOMODITAS PERTANIAN. Sofyan Ritung Kusumo Nugroho Anny Mulyani Erna Suryani. Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian Badan Penelitian dan Pengembangan Pertanian, Kementerian Pertanian Kampus Penelitian Pertanian Jl. Tentara Pelajar No. 12, Bogor 16114 Telp. 62.0251.8323012, Fax. 62.0251.8311256 e-mail: csar@indosat.net.id, website: www.bbsdlp.litbang.deptan.go.id Edisi Pertama Tahun 2003 Edisi Revisi Tahun 2011 ISBN 978-602-8977-47-0.

MODULE HANDBOOK

Module Designation	**Entrepreneurship**
Code	PER 37109
Semester (s) in which the module is taught	6th semester/3rd year
Person responsible for the module	Dr. Ir. Adipati Napoleon Ir.
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Attitude 1. CP-STN 4: Upholding human values based on morals and ethics General Skill 1. CP-KBP 6: Capable of maintaining and developing work networks with supervisors, colleagues, colleagues both inside and outside the institution Specific Skill 1. CP-KBP 13: Capable of conducting plant cultivation practices and collaborating with teams from various scientific backgrounds 2. CP-KBP 14: Capable of identifying problems, providing alternative solutions, and makeing decisions in the cultivation of crops in the agricultural and plantation industrial systems 3. CP-KBP 16: Capable of recognizing and taking advantage of business opportunities in the field of agricultural cultivation 4. CP-KBP 18: Capable of actualizing creative and innovative ideas related to plant cultivation technology into commercial activities
Content	1. Understanding entrepreuneurship and techopreuneurship, and their role in economic development. 2. Best practices of several professional entreupreuneurship in agriculture created and managed by young generation.

MODULE HANDBOOK

	3. Understanding and definition of role and source of inovation and creativity to build and improve entreupreuneurship 4. Capita selecta in creaitivity and innovation developed by young generation 5. Entreupreuneurship creation, characters, steps, and challenges to develop entreupreuneurship in agriculture; Pre-proposal creation: Inspiration, innovation, and creativity to innitiate entreupreuneurship unit in agriculture 6. Explanation and example on administration, organization, operational, and financial balance sheet in agriculture entreupreuneurship 7. Explanation and example of procedures and documents required to built agricultural entreupreuneurship 8. Explanation best practices on innovation, creativity, and its characters to develop entreupreuneurship 9. Explanation and examples of bisnis proposal to develop agricultural entreupreuneurship to get financial support from the bank 10. Practice, discussion, and report to make bisnis proposal; Intructional task to visit local entreupreuneurship unit 11. Group discussion on innovation and creativity to improve visited entreupreuneurship unit 12. Report and presentation on innovation and creativity to improve visited entreupreuneurship unit (1) 13. Report and presentation on innovation and creativity to improve visited entreupreuneurship unit (2).
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1.

MODULE HANDBOOK

Module designation	PTN 47115 *Regional Planning and Development*
Semester (s) in which the module is taught	7rd semester/4nd year
Person responsible for the module	1. Dra. Dwi Probowati Sulistyani, M.S 2. Dr. Ir Muh Bambang Prayitno M.Agr 3. Dr Ir. Warsito MP
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	The learning of the Regional Development Planning course is divided into 2 (two) objectives, namely: General Instructional Objectives (TIU) or known as Basic Competencies (KD) and Specific Instructional Objectives (ICT) or known as Competency Indicators (IK). Basic competencies and competency indicators from learning activities for the Regional Development Planning course can be classified based on the level of cognitive domain ability proposed by Bloom which is shown at the end of each goal. These basic competencies (C) include: 1. Students are expected to have an understanding of the scope of Agricultural Regional Development Planning in Indonesia (C1). 2. Students are expected to have the ability to identify the basic concepts of regional planning, and spatial planning and its application in agriculture (C2). 3. Students are expected to have an understanding and ability to explain the method of regional potential analysis (C3). 4. Students are expected to have an understanding and ability in general about regional and spatial planning methods and their applications in agriculture (C4). Competency Indicators (CI) from learning activities for the Regional Development Planning course are: 1. Students can know and explain about the Planning of Agricultural Area Development in Indonesia (CI1). 2. Students can know and explain the basic concepts of the area, and spatial planning and its application in agriculture (CI2). 3. Students can explain the method of regional potential analysis (CI3). 4. Students can know and explain about regional and spatial planning methods and their applications in agriculture (CI4)

MODULE HANDBOOK

Content	1. Introduction: understanding and scope, aspects of the study, spectrum of the Regional Planning and Development system and regional concepts 2. The basic concepts of area and spatial planning include: concept and history of PPW, concepts, policies and strategies and strategic issues of spatial planning. 3. Development Theory and Planning. Region. The sub-topics are: the purpose of planning, planning methods and why planning is important, planning strategies, planning approaches and planning stages 4. Regional potential analysis method, sub-topics Population analysis design, Population by age, Population by gender, Population by livelihood, Population by income level, Population by education, Population by religion, and Population by labor force 5. Area potential analysis method, sub-topics Population analysis design, Population by age, Population by gender, Population by livelihood 6. Agricultural Area Development Concept, sub-topics: understanding and boundaries, basic patterns, approaches, strategies and policies for developing agricultural areas 7. Agricultural Land Use Planning in Indonesia 8. Implementation of agricultural area development 9. Application of the Planning Method for the case study area of agropolitan and paddy fields 10. Application of regional planning methods, sub-topics of SWOT analysis methods, analysis of internal factors, external factors 11. Regional planning method application. sub-topics of SWOT analysis application guidelines, formation of working groups, collection of internal and external data, determination of strengths, weaknesses, opportunities and threats 12. Basic understanding, general principles, patterns of spatial use in the area of spatial use structure, spatial planning in agropolitan areas, reviews and views on future agropolitan areas 13. Spatial planning method, sub subject. understanding, aims and objectives, conflicts, problems, deviations, linkages, principles, scope and spatial policies 14. Spatial planning methods, sub-topics of development impacts on land, land and space, ecological, technical, industrial, socio-economic functions and disturbed land components due to development programs 15. Spatial planning methods, sub-topics of development

	impacts on land, land and space, ecological, technical, industrial, socio-economic functions and disturbed land components due to development programs
Examination forms	1. Essays questions 2. Writing paper 3. Quiz
Reading List	1. Rustiadi, E; Sunsun, S and Dyah R. P. 2011. Regional Development Planning. Crestpent Press and the Indonesian Obor Library Foundation. Jakarta 2. Dardak, H, A in Arsyad, S. et al. 2008. Land use based on spatial planning as an effort to realize a comfortable, productive and sustainable living space. Crestpent Press and the Indonesian Obor Library Foundation. Jakarta 3. Anonymous. 2012. Regulation of the Minister of Agriculture number: 05/Permentan/CT.140/8/ 2012 concerning: Guidelines for the Development of Agricultural Areas

MODULE HANDBOOK

Module designation	PTN 47115 WATERSHED MANAGEMENT
Semester (s) in which the module is taught	3rd semester/2nd year
Person responsible for the module	1. Dr. Ir. Satria Jaya Priatna, M.S 2. Dr.Ir. Bakri, MP
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	3 hours and 40 minutes of total workload: 90 minutes for Contact Study; 120 minutes for structured academic
Credit points	2 Credits
Required and recommended prerequisite for joining the module	Students Have Received Lecture Materials: Soil Science Fundamentals Soil Physics Soil Chemistry Soil Biology
Module objectives/intended learning outcomes	students are able to understand the scope of the subject of watershed management courses; able to understand the meaning of watershed, the meaning and purpose of watershed management; understand the morphometry and characteristics of the watershed; understand and explain water processes in the watershed; understand and explain the type of rain, rain parameters, measurement & determination of rain area; understand and explain the infiltration process in the watershed; understand surface runoff & river characteristics; understand and analyze river discharge & hydrograph ; understand and explain flood-drought events & water quality; understand and recognize hydrological models for watershed management; explain watershed management strategies and understand and explain integrated watershed management

MODULE HANDBOOK

Content	1. Learning contract, RPS explanation, Scope of watershed management 2. Definition of watershed and Watershed Management; Nomenclature hierarchy watershed; Management objectives watershed 3. Watershed Morphometry: watershed shape, area watershed, long river, center point watershed, slope watershed, network rivers and more 4. watershed as a system; Processes hydrology in the watershed: interception,infiltration, evapotranspiration, runoff surface, and other 5. Rain type ;Rain parameter ; Rain measurement; Area determinationRain 6. Forms and properties of flow surface; Flow component surface; flow. 7. River characteristics 8. debit and discharge measurement; Hydrograph 9. erosion process; The factors that influence erosion 10. Sedimentation Proces 11. Hydrological model watershed; Multiple models watershed hydrology 12. Simulation and evaluation watershed management 13. Definition of strategy watershed management; Strategy technical/biophysical; 14. Social strategy economics and culture; Strategy policy/institution
Examination forms	1. Essays questions 2. Writing paper 3. Group discussion

Reading List	• Asdak, Chay. 2007. Hidrologi dan pengelolaan Daerah Aliran Sungai; Yogjakarta : Gadjah Mada University Press • Arsyad, S. 2010. Soil and Water Conservation. 2nd Edition. Bogor: IPB Press. • Farida et al. 2005. Hydrological Rapid Assessment: An Integrated Approach to Assessing Watershed Functions (DAS). Bogor: Rewarding Upland Poor for Environmental Services (RUPES) Program World Agroforestry Center (ICRAF) • Fuady, Z and Azizah, C. 2008. Overview of Watersheds as Ecology and Watershed Management. Lantern: Vol.6. • Notohadiprawiro. Q. 2006. Watershed Management and Programs Greening. Faculty of Agriculture. Gadjah Mada University. Yogyakarta.

MODULE HANDBOOK

Module designation	PTN 47415 Land Degradation and Reclamation
Semester (s) in which the module is taught	7th semester/4th year
Person responsible for the module	1. Sabaruddin, Ph.D. 2. Dr. Dwi Setyawan
Language	Indonesian
Relation to curriculum	Optional Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Land degradation is a process involving bio-physical and socio-economic processes. The degradation occurs in various scales (time and spatial). Because each scale has important implications and impacts, land degradation indicators need to be grouped according to different levels, namely global, national and local. After attending this course, students are expected to understand: 1. Definition of land degradation, 2. The influence of various human activities on land quality, 3. How to assess the level of land degradation 4. How to prevent land degradation, and 5. How to restore degraded land.

MODULE HANDBOOK

Content	1. Introduction: Course Description, Scope of land Degradation and Reclamation 2. Climate and Land Degradation: Global Climate Change, Climate Change and Land Degradation, Future Perspectives 3. Why is Soil Degradation Information Important: How Much Land Is Available? Impact of Human Dominance on Soil, Global and Indonesian Distribution of Soil Degradation, Land Degradation and Agricultural Productivity 4. Forms of Land Degradation: Soil Erosion, Structural Damage Due to Compaction, Inundation/Submergence, Decrease in Soil Fertility, Salinization, Pollution, Vegetation Loss 5. Land Degradation Assessment: What Are Indicators? Qualitative Assessment of Land Degradation, Quantitative Assessment of Land Degradation 6. Land Damage Due to Forest Fires: Ecological and Economic Impact of Fire, Peat and its Problems, Recovery of Burnt Soil 7. Watershed Degradation: Watershed Boundaries, Watershed Functions, Watershed Degradation, Forest Functions in Watershed Protection, 8. Soil and Water Pollution: What is a Pollutant, Types of Pollutants, Agriculture and Soil Pollution, Remediation Principles, Remediation Technology 9. Desertification: Definitions of Desertification, Causes of Desertification, Impact of Desertification, Prevention and Recovery of Desertification 10. Land Degradation and Agricultural Productivity: Evaluation of the impact of Soil Degradation on Food Security, Footprint of Soil Degradation, Soil Degradation and the Future of Food Security, Policy and Research Priorities 11. Reclamation of Degraded Land: Definition of Rehabilitation and Reclamation, Why are Rehabilitation and Reclamation Important? What is Land Conservation? Strategies to Overcome Land Degradation 12. Sustainable Land Management Approach: What is Sustainable Management, Economic Approach, Institutional Approach, Technological Approach.

MODULE HANDBOOK

Examination forms	1. Write essays 2. Doing practical works 3. Individual Assgnment
Reading List	1. Adriano, D.C., J.M. Bollag, W.T. Frankenberger, Jr., & R.C. Sims. 1999. Bioremediation of contaminated soils. Agronomy, Madison, Wisconsin, USA. 2. Goldammer, J.G. 1990. Fire in the tropical biota. Springer-Verlag, New York. 3. van de Born, G.J., B.J. de Haan, D.W. Pearce, & A. Howarth. 2000. Technical report on soil degradation. RIVM, EFTEC, NTUA, and IIASA in association with TME and TNO under contract with the Environment Directorate-General of the European Commission 4. FAO & ISRIC. 2000. Soveur guidelines for the assessment of soil degradation. FAO, Rome Italy. 5. Europe Environment: The third assessment. 6. Stocking, M. & N. Murnaghan. 2000. Land degradation – Guideline for field assessment. UNEP, UNU, PLEC, DFIED, ODG/UEA & Ministry of Foreign Affair of the Royal Government of Norway. 7. Ekha, I. 1993. Dilema pestisida: Revolusi hijau. Penerbit Kanisius, Yogyakarta. 8. Green, M.B., G.S. Hartley & J.T. West. 1979. Chemical for crop protection and pest control. Pergamon Press, Ltd., Oxford, England. 9. Hartley, G.S. 1964. Pesticide in soil. John Wiley & Sons Inc., New York. 10. Metting, F.B. 1993. Soil microbial ecology: Applications in agricultural and environmental management. Marcel Dekker Inc., New York. 11. Troeh, F.R., J.A. Hobbs, & R.L. Donahue. 1980. Soil and water conservation for productivity and environmental protection. Prentice-Hall, New Jersey. 12. Dregne, H.E. Desertification of arid lands. 13. Glants, M.N. and Orlovsky, N. Desertrification: A review of the concept. 14. Zhendla, Zhu. Trends of desertification and its rehabilitation in China. 15. William, J., Walker, G.R. and Hatton, T.J. Dryland salinization : a challenge for land and water management in the Australian landscape. 16. FAO. 2001. Guidelines for the qualitative assessment of land resources and degradastion 17. FAO. 2004. Guiding principles for the quantitative assessment of soil degradation. 18. WMO. 2005. Climate and Land Degradation.

	19. Wetland Indonesia. 2015. Pengelolaan Lahan Gambut Berbasis Masyarakat di Indonesia 20. IPS. 2010. Strategy for Responsible Peatland management. 21. FAO. 2014. Toward Climate-Responsible Peatlands Management.

MODULE HANDBOOK

Module designation	PTN 47615 Soil O*rganic Matter Management*
Semester (s) in which the module is taught	7^{d} semester/4nd year
Person responsible for the module	1. Prof. Dr. Ir. Dedik Budianta, MS 2. Dr. Ir. A. Napoleon, MP
Language	Indonesian
Relation to curriculum	Optional/elective Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain what is the soil organic matter 2. Students are able to explain the function of soil organic matter for soil improvement 3. Student ae able to explain the role of organic matter for plant growth 4. Students are able to explain the soil organic matter decomposition 5. Students know the source of soil organic matter 6. Students know the role of organic matter for chelating agent

Content (14 meetings) and two examinations	1. Introduction and definition of soil organic matter 2. Characteristic and properties of soil organic matter 3. Function of soil organic matter for soil improvement 4. Organic matter for nutrient sources 5. Decomposition process of organic matter 6. Factors inhibiting organic matter decomposition 7. Soil organic matter transformation 8. Humus forming and characterization 9. Dynamic of soil organic mater 10. Functional groups for chelating process 11. Efforts to supply organic matter
Examination forms	1. Essays questions 2. Writing paper
Reading List	1. Stevenson, F.J. 1994. Humus Chemistry:Gensis, composition and reaction. 2nd edition. Wiley.

MODULE HANDBOOK

Module designation	PTN 47715 Land Resource and Environmental Managment
Semester (s) in which the module is taught	7th semester/4th year
Person responsible for the module	1. Sabaruddin, Ph.D. 2. Dr. Warsito
Language	Indonesian
Relation to curriculum	Optional Course
Teaching methods	Contextual Learning, Cooperative learning
Workload (incl. Contact hours, self-study hours)	5 hours and 40 minutes of total workload: 100 minutes for Contact Study; 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	2 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	Various problem on the of natural resources arise because they are managed beyond their carrying and changes in natural resources which causes the carrying capacity. Therefore, natural resource management steps do require comprehensive planning to avoid degradation. After attending this course, students are expected to: 1. Understand the concepts of utilization and management of natural resources, 2. Explain the economic and ecological approach in natural resource management, and 3. Conduct simulation analysis on the Development - Natural Resource Linkages.

MODULE HANDBOOK

Content	1. Introduction: Syllabus Explanation, What are Natural Resources and Environment, Management Definitions, Classification of Natural Resources, Why Natural Resources are Important, 2. Central Issue in Natural Resource Management: Can Natural Resources be Managed? Human Dominance over Natural Resources, Resource Flows, 3. Impact of Human Domination on Natural Resources, What is the role of Natural Resource Management? Natural Resources Management System (System Approach, Institutional Framework), 4. Sustainable Natural Resource Management: Sustainability Constraints and Issues, Framework Structure, Monitoring and Evaluation Framework, Monitoring and Evaluation Indicators, 5. Causes of Environmental Problems: Natural Events, Population Growth, Over-exploitation of Natural Resources, Industrialization and Transportation, Solid, Liquid, and Gas Waste, 6. Studying Alternatives: Different Perspectives Can Affect the Study, Benefit-Cost Analysis, Impact Analysis Techniques, EIA in Indonesia, 7. Local Knowledge System: What is Local Knowledge, Co-management, Local Knowledge for Natural Resources Management, 8. Complexity, Uncertainty and Shock: Shock, Chaos, Managing Changes, Complexity and Uncertainty, Various Approaches to Conflict Resolution, Alternative Conflict Resolution, Conditions for Conflict Resolution, Implementation of Alternative Conflict Resolution, 9. Forest Resources: Forest Functions and Formation, Causes of Forest Degradation, Impact of Forest Degradation, Management of Degraded Forest, 10. Land Resources: Conservation of Land Productivity Through Land Management, Land Carrying Capacity, Land for Agriculture, Land Degradation, 11. Water Resources: Water for Life, Water Classification and Designation, Water Quality Parameters, Water Pollution Control, 12. Atmosphere: Air Pollution Sources, Global Environmental Problems (Acid Rain, Global Warming, Ozone Layer Damage), Important Air Quality Parameters (SO2, CO, NOX, NH3, HC, Pb, Dust, Noise).

Examination forms	1. Write essays 2. Assignment 3. Examination
Reading List	Carroll, B. and Turpin T. 2009. Environmental impact assessment handbook, Second edition. Thomas Telford Ltd, ISBN 978-0-7277- 3509-6 . Chafid Fandeli. 2011. Analisis Mengenai Dampak Lingkungan Pembangunan Pelabuhan. 979-420-760-8. Penerbit GMUP. Chafid fandeli. 1995. Analisis mengenai dampak lingkungan prinsip dasar dan pemapanannya dalam pembangunan. Penerbit : liberty. offset. Yogyakarta . Edisi : 2, cet.1. Kolasi : xvii, 365 hlm, ilus, 23 cm. Ditjen Pengembangan Perkotaan. 2000. Analisis Dampak Lingkungan. Penerbit Ditjen Kotdes. Glasson, J; Therivel, R; Chadwick A. 2005. Introduction to Environmental Impact Assessment. Routledge, London Hanna, K. 2009. Environmental Impact Assessment: Practice and Participation". Second edition, Oxford.

MODULE HANDBOOK

Module Designation	Community Service Program
Code	UNI 40109
Semester (s) in which the module is taught	7th semester/4th year
Person responsible for the module	
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	
Credit points	4 credits
Required and recommended prerequisite for joining the module	-
Module objectives/intended learning outcomes	1.
Content	1.
Examination forms	1. Essays questions 2. Pratical works
Reading list	1.

MODULE HANDBOOK

Module Designation	**Field Practice**
Code	PER 49209
Semester (s) in which the module is taught	7th semester/4th year
Person responsible for the module	Advisor Lecturer
Language	Indonesian
Relation to curriculum	Compulsory Course
Teaching methods	Contextual Learning, Cooperative learning and assignment
Workload (incl. Contact hours, self-study hours)	8 hours and 40 minutes of total workload/week consisted of 100 minutes for Contact Study; 180 minutes for laboratory practice, 120 minutes for structured academic assignment and 120 minutes for self-study per week
Credit points	3 credits
Required and recommended prerequisite for joining the module	Passed PER 31116
Module objectives/intended learning outcomes	1. Capable to understand the problems of plant cultivation in the field. 2. Capable to analyze data and information on plant cultivation well. 3. Capable to make the right decisions for solving plant cultivation problems. 4. Capable to carry out plant cultivation practices based on scientific knowledge. 5. Capable to work with teams that have backgrounds in various related disciplines. 6. Capable to conduct studies to generate specific plant cultivation ideas or recommendations. 7. Capable to think analytically and synthetically to respond the plant cultivation problems that arise from time to time in the field. 8. Capable to adapt physically to environmental conditions in the field.

MODULE HANDBOOK

Content	1. Choose of field practice crop commodities (annual crops, or perennial crops). 2. Get the location of field practice activities (agricultural/plantation institutions, agro-industrial companies, agrochemical companies, or the location of certain plant cultivation). 3. Choose the aspects of plant cultivation that will become the topic of field practice activities. 4. Preparation of proposals for the implementation of field practice activities. 5. Collect early data and information related to the topic of field practice activities. 6. Conducting interviews with competent respondents on the topic of field practice activities. 7. Following hands-on practice in the field regarding the topic of field practice activities. 8. Collect and analyze data and information, interview results, and documentation of field practice activities. 9. Preparation of reports on field practice activities 10. Completion of field practice activity reports.
Examination forms	1. Essays questions 2. Pratical works 3. Writing Case Paper 4. Oral presentation
Reading list	1. Danelo, D. J. 2017. The Field Researcher's Handbook : A Guide to The Art and Science of Professional Fieldwork. Georgetown University Press. 144 p. 2. Dris, R., I.A. Khan and R. Niskanen. 2002. Environment and Crop Production. CRC Press. 360 p. 3. Jones, Jr., J. B. 2003. Agronomic Handbook, Management of Crops, Soils, and Their Fertility. CRC Press. 450 p. 4. Krishnaprabu, S. 2020. Agronomic Management Practices for Field Crop Production. Satish Serial Publishing House. 436 p. 5. Pratley, J. 2003. Principles of Field Crop Production. 4th Edition. Oxford University Press. 576 p. 6. Singh, S. S. and R. Singh. 2015. Principles and Practices of Agronomy. Kalyani Publishers. 348 p. 7. Rana, S. S. and S. C. Negi. 2018. Practical Guide to

	Farming System and Sustainable Agriculture. Department of Agronomy, College of Agriculture, CSK HPKV, Palampur, India. 82 p. 8. Vero, S. E. 2021. Fieldwork Ready, An Introductory Guide to Field Research for Agriculture, Environment, and Soil Scientists. Wiley. 272 p.

MODULE HANDBOOK

Module Designation	Research Project
Code	PER 49209
Semester (s) in which the module is taught	7th semester/4th year
Person responsible for the module	
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	
Credit points	6 credits
Required and recommended prerequisite for joining the module	Passed PER 31116
Module objectives/intended learning outcomes	General Skill 1. CP-KBP 4: Capable to compiling a scientific description of the results of the studies mentioned above in the form of a Research Project or final project report, and upload it on the university's website 2. CP-KBP 9: Capable of documenting, storing, securing, and recover data to ensure validity and preventing plagiarism Specific Skill 1. CP-KBP 20: Capable of writing research results as mentioned above in the form of scientific articles and present them in scientific forums
Content	1.
Examination forms	1. Essays questions 2. Pratical works
Reading list	1.

MODULE HANDBOOK

Module Designation	Seminar
Code	PER 49309
Semester (s) in which the module is taught	7th semester/4th year
Person responsible for the module	
Language	Indonesian
Type of teaching	Lecture, practical, and project
Relation to curriculum	Compulsory Course
Workload (incl. Contact hours, self-study hours)	
Credit points	6 credits
Required and recommended prerequisite for joining the module	Passed PER 31116
Module objectives/intended learning outcomes	General Skill 1. CP-KBP 9: Capable of documenting, storing, securing, and recover data to ensure validity and preventing plagiarism Specific Skill 1. CP-KBP 22: Capable of communicating aspects of plant cultivation in an attractive, efficient, effective and productive manner
Content	1.
Examination forms	1. Essays questions 2. Pratical works
Reading list	1.

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