



**Kampus  
Merdeka**  
INDONESIA JAYA



# **MODULE HANDBOOK**

**AGRONOMY STUDY PROGRAM  
FACULTY OF AGRICULTURE  
SRIWIJAYA UNIVERSITY**

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Semester 1

Pancasila UNI 10509

| Module Designation   | Pancasila   |
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| Code   | UNI 10509   |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year   |
| Person responsible for the module                            | 1. Dr. Hudaidah, M.Pd<br>2. Pancasila Teaching Team   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the Introduction to Pancasila Education: the concept and urgency of Pancasila education, the reason of the need for Pancasila education</li> <li>2. Understand and be able to explain the Introduction to Pancasila Education: the concept and urgency of Pancasila education, the reason of the need for Pancasila education</li> <li>3. Understand and be able to explain Pancasila education politics</li> <li>4. Understand and be able to explain the dynamics of Pancasila education</li> <li>5. Understand and be able to explain the challenges of Pancasila education</li> <li>6. Understand and be able to explain the essence and urgency of Pancasila education for the future</li> <li>7. Understand and be able to explain Pancasila in the Current History of the Indonesian Nation</li> <li>8. Understand and be able to explain Pancasila as the State Foundation</li> <li>9. Understand and be able to explain the Pancasila as the State Ideology</li> </ol> |

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|                        | <ol style="list-style-type: none"> <li>10. Understand and be able to explain Pancasila as a Philosophical System</li> <li>11. Understand and be able to explain Pancasila as a System of Ethics</li> <li>12. Understand and be able to explain Pancasila as the Basic Value of Science Development</li> <li>13. Understand and be able to explain The dynamics of Pancasila as the basis for the value of science development</li> <li>14. Understand and be able to explain The challenges of Pancasila as the basis for the value of science development</li> </ol>   |
| Content                | <ol style="list-style-type: none"> <li>1. Introduction to Pancasila Education: the concept and urgency of Pancasila education, the reason for the need for Pancasila education, historical sources, sociological, Pancasila education politics</li> <li>2. The dynamics and challenges of Pancasila education and the essence and urgency of Pancasila education for the future</li> <li>3. Pancasila in the Current History of the Indonesian Nation</li> <li>4. Pancasila as the State Foundation</li> <li>5. Pancasila as the State Ideology</li> <li>6. Pancasila as a Philosophical System</li> <li>7. Pancasila as a System of Ethics</li> <li>8. Pancasila as the Basic Value of Science Development</li> <li>9. The dynamics and challenges of Pancasila as the basis for the value of science development</li> </ol> |
| Examination forms      | Quiz, Mid-terms and Final Examination<br><ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> </ol>  |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Putra, Z., Wajdi, H.F. 2021. Buku Ajar Pendidikan Pancasila dan Kewarganegaraan Panduan Kuliah di Perguruan Tinggi. Ahlimedia Book.</li> <li>2. Wahono, S., Suajiyo., Malik, D.K. Pendidikan Pancasila untuk Perguruan Tinggi. Akademika.</li> <li>3. Suharta. 2019. Pancasila. Penerbit Lakeisha.</li> </ol>   |
| Date of last amendment | June 30, 2021   |

## Indonesian UNI 10315

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| Module Designation   | Indonesian   |
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| Code   | UNI 10509  |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. Zahra A., M.Pd.<br>2. Indonesia Language Teaching Team  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.00hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain history of Indonesian Language Development.</li> <li>2. Understand and be able to explain the position, function.</li> <li>3. Understand and be able to explain legal force of the Indonesian language.</li> <li>4. Understand and be able to explain characteristics of academic texts.</li> <li>5. Understand and be able to explain academic text structure.</li> <li>6. Understand and be able to explain spelling and punctuation in academic texts.</li> <li>7. Understand and be able to explain the Nature of Effective Sentences; Characteristics of Effective Sentences; Sentence Structure; Types of Sentences.</li> <li>8. Understand and be able to explain the Nature of Paragraphs; Paragraph Forming Elements; Types of Paragraphs; Requirements for a Good Paragraph; Techniques and Patterns of Paragraph Development.</li> <li>9. Understand and be able to explain systematics of writing quotes.</li> <li>10. Understand and be able to explain systematics of writing a bibliography.</li> <li>11. Understand and be able to explain characteristics of an essay.</li> </ol> |

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|                        | <p>12. Understand and be able to explain Essay writing structure.</p> <p>13. Understand and be able to explain essay writing.</p>  |
| Content                | <ol style="list-style-type: none"> <li>1. History of Indonesian Language Development</li> <li>2. The position, function, and legal force of the Indonesian language</li> <li>3. Characteristics of academic texts</li> <li>4. Academic text structure</li> <li>5. Spelling and punctuation in academic texts</li> <li>6. The Nature of Effective Sentences; Characteristics of Effective Sentences; Sentence Structure; Types of Sentences</li> <li>7. The Nature of Paragraphs; Paragraph Forming Elements; Types of Paragraphs; Requirements for a Good Paragraph; Techniques and Patterns of Paragraph Development</li> <li>8. Systematics of writing quotes</li> <li>9. Systematics of writing a bibliography</li> <li>10. Characteristics of an essay</li> <li>11. Essay writing structure</li> <li>12. Essay writing</li> <li>13. Presentation of the resulting essay writing</li> </ol> |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> </ol>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Rokhmansyah, A., Rijal, S., Puwanti. 2018. Bahasa Indonesia untuk Perguruan Tinggi. Unnes Press.</li> <li>2. Awaluddin. 2017. Pengantar Bahasa Indonesia untuk Perguruan Tinggi. Deepublish.</li> <li>3. Mukodas. 2020. Bahasa Indonesia Cendekia Mata Kuliah Wajib Umum Bahasa Indonesia. Penerbit Lindan Bestari.</li> </ol>   |
| Date of last amendment | June 30, 2021  |

## Mathematics PER 11516

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| Module Designation   | Mathematics   |
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| Code   | PER 11516   |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Herlina Hanum, M.Si.<br>2. Mathematic Team Teaching  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 35.00 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 35.00 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 4.43 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Explain the concept of the real number system; Solving operations on real numbers.</li> <li>2. Distinguish between rational and irrational numbers; Understand and apply field Characteristic.</li> <li>3. Explain the concept of inequality; Finding the solution to a simple inequality, absolute value, square root and square.</li> <li>4. Draw quadrilateral coordinates and the given points.</li> <li>5. Determine the point of intersection of the curve on the coordinate axis; Drawing equation graph.</li> <li>6. Able to determine function value; Drawing function; Completing operations on functions.</li> <li>7. Understand and solve trigonometric function problems.</li> <li>8. Define Understanding the concept and limit theorem; Determining the continuity of the function.</li> <li>9. Understand the meaning of derivative; Understand the relationship between limits and derivatives; Determine the derivative of sinus and cosinus.</li> <li>10. Understand the concept of the chain rule; Solving the derivative of the composition function; Write down the chain rule in the Leibniz way.</li> <li>11. Determine the maximum/minimum critical points of a function.</li> </ol> |

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|                        | <p>12. Understand the concept of integrals and understand the rules for determining integrals.</p> <p>13. Understand the concept of replacement method; Determine the integral function of the composition.</p> <p>14. Form a matrix with a certain ordo; Performing operations on matrices.</p> <p>15. Form a system of linear equations from the given case.</p>  |
| Content                | <p>1. Real numeral system; Rational and irrational numbers; Operations on real numbers; Characteristic of Field.</p> <p>2. Inequality; Absolute value; square root; square.</p> <p>3. Quadrilateral coordinate system, point distance, straight line, slope of line.</p> <p>4. The point of intersection of the curve; Draw an equation graph.</p> <p>5. Definition of function; Drawing function; Sum operation and multiplication, Composition of functions and trigonometric functions.</p> <p>6. Definition of limit; limit theorem; Continuity of function.</p> <p>7. Definition of derivative through limit; derivate search rules; derivate sinus and cosines.</p> <p>8. Leibniz Writing chain rule; High-level derivative.</p> <p>9. Maximum-minimum function; monotony; Concavity</p> <p>10. Integral concept; Integral determination rule.</p> <p>11. Integral of composition function (Replacement method)</p> <p>12. Area of flat area.</p> <p>13. Ordo matrix; Transpose, summation, multiplication; Determinant; join, dan cofactor Invers matrix.</p> <p>14. System linear of equations; Form matrix from System linear of equations; Solution System linear of equations; Notation sigma <math>\Sigma</math>.</p> |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>Essays questions</li> <li>Practical works</li> </ol>  |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>Mulyadi, S.R., Patty, E.N.S., Ama, H.M., Anggraeni, D.M. 2020. Buku Matrikulasi Matematika Dasar untuk Tingkat Perguruan Tinggi. uwais inspirasi Indonesia.</li> <li>Jumini, S. 2017. Buku Ajar Matematika Dasar Untuk Perguruan Tinggi. Penerbit Mangku Bumi.</li> <li>Suryanti, S., Zawawi, I. 2020. Pengantar Dasar Matematika. Deepublish.</li> </ol>  |
| Date of last amendment | June 30, 2021   |



## Agrochemicals PAG 101116

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| <b>Module Designation</b>                                    | <b>Agrochemicals</b>  |
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| Code   | PAG 11115   |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year   |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Prof. Dr. Ir. Rujito Agus Suwignyo, M.Agr.</li> <li>2. Dr. Susilawati, S.P., M.Sc.</li> <li>3. Dr. Ir. Mery Hasmeda, M.Sc.</li> <li>4. Fitra Gustiar, S.P., M.Si.</li> <li>5. Dr. Irmawati, S.P., M.Si., M.Sc.</li> <li>6. Dr. Fikri Adriansyah, S.Si.</li> </ol>   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 19.83 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the objectives and scope of areas of agrochemicals.</li> <li>2. Understand and be able to explain the atomic structure and electron configuration.</li> <li>3. Understand and be able to explain about chemical bonds, including ionic bonds, covalent bonds, and intermolecular atomic bonds.</li> <li>4. Understand and be able to explain about organic chemistry, classification of organic compounds and the nomenclatures.</li> <li>5. Understand and be able to explain about structures, properties and nomenclatures of chemical functional groups.</li> <li>6. Understand and be able to explain the molecular structure and physical properties of water and its function.</li> <li>7. Understand and be able to explain the chemical properties of organic compound, including acidity, alkaline and salt.</li> </ol> |



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|                   | <ol style="list-style-type: none"> <li>8. Understand and be able to explain about pH, solution and indicator.</li> <li>9. Understand and be able to explain overview of carbohydrate.</li> <li>10. Understand and be able to explain the molecular structures of mono-, di-, oligo and poly-saccharides.</li> <li>11. Understand and be able to explain amino acids and peptides chain.</li> <li>12. Understand and be able to explain about lipid and lipid acids.</li> <li>13. Understand and be able to explain about stoichiometry: concentration, ppm, %, molar concept, molarity, normality.</li> <li>14. Understand and be able to explain about hydroponic nutrient solution and tissue culture media.</li> <li>15. Understand and be able to explain about soil minerals and fertilization.</li> <li>16. Understand and be able to explain about pesticides and the application.</li> </ol> |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction of agrochemical.</li> <li>2. Atomic structure and electron configuration.</li> <li>3. Chemical bond.</li> <li>4. Nutrients and types of fertilizers.</li> <li>5. Structure and function of water.</li> <li>6. Organic chemistry: nomenclature of organic compounds &amp; functional groups.</li> <li>7. Acid, alkaline and salt.</li> <li>8. pH, solution and indicator.</li> <li>9. Structure and function of lipid and lipid acids.</li> <li>10. Structure and function of carbohydrate and protein.</li> <li>11. Concentration, ppm, %, molar concept, molarity, normality.</li> <li>12. Hydroponic nutrient solution media and tissue culture.</li> <li>13. Soil, nutrients and fertilization.</li> <li>14. Pesticides and applications.</li> </ol>   |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media Employed    | Quiz, Mid-terms and Final Examination  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Mido Y. and M. Satake. 1994. Chemistry for Agriculture and Ecology. Discovery Publishing House.</li> <li>2. Timberlake, K.C. and W. Timberlake. 2014. Basic Chemistry. Pearson Education.</li> </ol>   |

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|                        | <ol style="list-style-type: none"> <li>3. Roberts, T.R. 2000. Metabolism of Agrochemicals in Plants. John Willey and Sons.</li> <li>4. Mansyur, N.I., E.H. Pudjiwati, A. Murtilaksono. 2021. Pupuk dan Pemupukan. Syiah Kuala University Press.</li> <li>5. Anac, D., Matin-Prevel, P. 1999. Improved Crop Quality by Nutrient Management. Kluwer Academic Publishers.</li> <li>6. Michael, F, Waxman. 1998. Agrochemical and Pesticide Safety Handbook. CRC Press.</li> <li>7. Fageria, N.K. 2014. Nitrogen Management in Crop Production CRC Press.</li> <li>8. Knowles, D.A. 1998. Chemistry and Technology of Agrochemical Formulations. Springer Dordrecht.</li> <li>9. Prasad, M.N.V. 2020. Agrochemicals Detection, Treatment and Remediation. Elsevier.</li> <li>10. Plimmer, J.R., Gammon, D., Nancy, N., Ragsdale. 2002. Encyclopedia of Agrochemicals. Wiley Online Library.</li> <li>11. Cremlyn, R.J.W. 1991. Agrochemicals: Preparation and Mode of Action. Wiley; 2nd edition.</li> <li>12. Goodwin., Mercer. 1988. Introduction to Plant Biochemistry. Pergamon Press.</li> <li>13. Prasad, M.N.V., Strzalka, K. 2002. Physiolooy and Biochemistry of Metal Toxicity and Tolerance in Plants. Kluwer Academic Publishers.</li> <li>14. Khan, N.A. 2006. Ethylene Action in Plants. Springer.</li> <li>15. Research publications related to research agrochemicals.</li> </ol> |
| Date of last amendment | July 23, 2021   |

## Introduction to Agricultural Science PER 11215

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| Module Designation   | Introduction to Agricultural Science  |
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| Code   | PER 11215   |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year   |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Benyamin Lakitan, M.Sc.<br>2. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>3. Dr. Ir. Firdaus Sulaiman, M. Si.<br>4. Dr. Ir. Erizal Sodikin   |
| Language   | Indonesian.   |
| Relation to curriculum                                       | Compulsory Course.  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to definition, scope, and clusters of Agricultural Sciences.<br>2. Understand and be able to the role of agriculture and people's perceptions of agriculture.<br>3. Understand and be able to The development of agricultural development in Indonesia.<br>4. Understand and be able to The economic dimension in agricultural development.<br>5. Understand and be able to Challenges and opportunities for agricultural development in Indonesia.<br>6. Understand and be able to agroecosystem potential in Indonesia for agricultural development.<br>7. Understand and be able to the development of agricultural technology and the conception of sustainable agriculture.<br>8. Understand and be able to management of food crops and horticulture.<br>9. Understand and be able to management of plantation crops and forestry.<br>10. Understand and be able to integrated control of plant pests (COP).<br>11. Understand and be able to mechanization in agriculture. |

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|                        | 12. Understand and be able to harvest and post-harvest management.<br>13. Understand and be able to biotechnology and genetic engineering in agriculture.<br>14. Understand and be able to agricultural development policies in Indonesia.  |
| Content                | 1. Introduction, the scope and development of agriculture.<br>2. History and development of agriculture.<br>3. Progress and pioneers in agriculture.<br>4. Major issues in the agricultural sector.<br>5. Agriculture as a sub-sector of national development.<br>6. The role of science and technology in agriculture.<br>7. Development of agribusiness and agro-industry in increasing people's income.<br>8. Food security and food security issues.<br>9. Natural resources.<br>10. The environment in relation to agricultural activities.<br>11. Free trade.<br>12. Law and policy in agriculture.   |
| Examination forms      | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Writing Case Paper<br>3. Oral presentation   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | 1. Murphy, D.J. 1992. Safety and Health for Production Agriculture. ASAE.<br>2. Webster, C.C., Wilson, P.N. 1998. Agriculture in the Tropics Third Edition. Blackwell Science<br>3. Spedding, C.R.W. 1988. An Introduction to Agricultural Systems. Springer.<br>4. Sheaffer, C.C., Kristine., Moncada, M. 2011. Introduction to Agronomy. Cengage Learning.<br>5. Lee, J.S., Turner, D.L. 1997. Introduction to World Agri science and Technology. Interstate Publisher, Inc.<br>6. Chandrasekaran, B., Annadurai, K., Somasundaram. 2010. A Textbook of Agronomy. New Age International Publishers New Delhi.<br>7. Pareek, A., Sopory, S.K., Bohnert, H.J., Govindjee. 2010. Abiotic Stress in Plants. Springer, Dordrecht, Nederland. |
| Date of last amendment | July 21, 2021   |

Introduction to Agriculture Economics ABI 11216

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| Module Designation   | Introduction to Agriculture Economics  |
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| Code   | ABI 11216  |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Prof. Dr. Ir. Andy Mulyana, M.Si.</li> <li>2. Dr. Agustina Bidarti, S.P., M.Si.</li> <li>3. Dr. Erni Purbiyanti, S.P., M.Si.</li> <li>4. Eka Mulyana, S.P., M.Si.</li> </ol>   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 19.83 hours per semester</li> </ol>  |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the meaning and scope of economics and relation to the agricultural economy in Indonesia.</li> <li>2. Understand and be able to explain provide the alternative solutions to agricultural economic problems.</li> <li>3. Understand and be able to explain institutional factors of agricultural economic.</li> <li>4. Understand and be able to explain the definition, farming management, and production benefits.</li> <li>5. Understand and be able to explain the function of soil in agricultural production, theory of land rent, land issues, forms of land property and agricultural production.</li> <li>6. Understand and be able to explain modules in agricultural production.</li> <li>7. Understand and be able to explain introduction, history, classification, and characteristic labor in agricultural production.</li> <li>8. Understand and be able to explain demand and supply of agricultural products.</li> <li>9. Understand and be able to explain trade liberization, importance of trade, balance of trade, export, and import.</li> </ol> |

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|                   | <p>10. Understand and be able to explain introduction and principles to world economic integration (WTO), terms and policy of trade.</p> <p>11. Understand and be able to explain trade issues.</p> <p>12. Understand and be able to explain agricultural development theories.</p> <p>13. Understand and be able to explain the Government's role in agricultural developments.</p> <p>14. Understand and be able to explain agricultural economics research.</p>   |
| Content           | <ol style="list-style-type: none"> <li>1. Indonesian Agricultural Economy.</li> <li>2. Agricultural Economic Problems.</li> <li>3. Institutional Factors of Agricultural Economic.</li> <li>4. Economic Principles in Agriculture.</li> <li>5. Soil in Agricultural Production.</li> <li>6. Modules in Agricultural Production.</li> <li>7. Labor in Agricultural Production.</li> <li>8. Demand and Supply of Agricultural Products.</li> <li>9. Agricultural Trading.</li> <li>10. Markets and Trade Policy.</li> <li>11. Trade Issues.</li> <li>12. Agricultural Development Theories.</li> <li>13. The Government's Role in Agricultural Development.</li> <li>14. Agricultural Economics Research.</li> </ol>               |
| Examination forms | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Writing Project Paper</li> <li>3. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Frank, R.H., Bernanke, B.S. 2007. Principles of Macro Economic. McGraw- Hill.</li> <li>2. Rita, H. 2020. Pengantar Ekonomi Pertanian. Penerbit Andi, Jakarta.</li> <li>3. Yosi et al. 2012. Pengantar Ekonomi Pertanian. ITB Press.</li> <li>4. Sharma, L. 2021. Principles of Agricultural Economics. Agrotech Publishing Academy.</li> <li>5. Rosyidi, S. 1996. Pengantar Teori Ekonomi (Pendekatan Kepada Teori Ekonomi Mikro dan Makro). PT. Raja Grafindo Persada.</li> <li>6. Husnan, S dan Suwarsono. 1994. Studi Kelayakan Proyek (Edisi ketiga). UPP AMP YKPN.</li> <li>7. Gittenger, J/P/ 1986. Analisis Ekonomi Proyek-ptoyek Pertanian (Edisi kedua). UI-Press.</li> </ol> |

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|                        | <ol style="list-style-type: none"><li>8. Kadariah, L. Karlina dan C Gray. 1999. Pengantar Evaluasi Proyek (Edisi Revisi). LPFE Universitas Indoensia.</li><li>9. Gray, C., Simanjuntak, P., Sabur, L.K., Maspaitell, R.C.G. Varley. 2005. Pengantar Evaluasi Proyek (edisi kedua). PT Gramedia Pustaka Utama</li></ol> |
| Date of last amendment | July 16, 2021  |



## Botany PER 12116

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| Module Designation   | Botany   |
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| Code   | PER 12116  |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. Susilawati, S.P., M.Sc.<br>2. Dr. Ir. Maria Fitriana, M.Sc.<br>3. Dr. Ir. Marlina, M. Si.<br>4. Ir. Teguh Achadi, M.P.<br>5. Dr. Fikri Adriansyah, S.Si.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 34.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain introduction, definition, history and theory of cells.<br>2. Understand and be able to explain the Structure, cell organelle and function of plant cells.<br>3. Understand and be able to explain the Cell reproduction.<br>4. Understand and be able to explain the Relationships between cells and tissues.<br>5. Understand and be able to explain The Tissue according to the number of constituent cells, level of development and function.<br>6. Understand and be able to explain, anatomy, morphology and function of leaves, stems.<br>7. Understand and be able to explain, anatomy, morphology and function of roots.<br>8. Understand and be able to explain the flower organ.<br>9. Understand and be able to explain fruit organ.<br>10. Understand and be able to explain taxonomy and plant systematics.<br>11. Understand and be able to explain, plant nomenclature. |

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|                        | <p>12. Understand and be able to explain plant identification.</p> <p>13. Understand and be able to explain Plant description.</p>  |
| Content                | <ol style="list-style-type: none"> <li>1. Introduction, Definition, history and theory of cells.</li> <li>2. Structure, cell organelle and function of plant cells.</li> <li>3. Cell reproduction.</li> <li>4. Relationships between cells and tissues.</li> <li>5. Tissue according to the number of constituent cells, level of development and function.</li> <li>6. Anatomy, morphology and function of leaves, stems.</li> <li>7. Anatomy, morphology and function of roots.</li> <li>8. Flower organ.</li> <li>9. Fruit organ.</li> <li>10. Taxonomy and plant systematics.</li> <li>11. Plant nomenclature.</li> <li>12. Plant identification.</li> <li>13. Plant description.</li> </ol>  |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Elpel, T.J. 2013. Botany in a Day: The Patterns Method of Plant Identification. HOPS Press.</li> <li>2. Mauseth, J.D. 1991. Botany: An Introduction to Plant Biology. Jones &amp; Bartlett Learning.</li> <li>3. Pollan, M. 2001. The Botany of Desire: A Plant's-Eye View of the World. Random House Trade Paperbacks.</li> <li>4. Hodge, G. 2013. Practical Botany for Gardeners: Over 3,000 Botanical Terms Explained and Explored. University of Chicago Press.</li> <li>5. Pollan, M. 2001. The Botany of Desire: A Plant's-Eye View of the World. Random House Publishing Group.</li> <li>6. Wohlleben, P. 2015. The Hidden Life of Trees: What They Feel, How They Communicate – Discoveries from a Secret World. Greystone Books.</li> <li>7. Erskine, W., Muehlbauer, F.J., Sarker, A., Sharma, B. 2009. The Lentil Botany, Production and Uses. Icarda.</li> <li>8. Heywood, V.H., Brummitt, R.K., Culham, A., Seberg, O. 1978. Flowering Plan Families of the World. Firefly Books.</li> </ol> |
| Date of last amendment | June 30, 2021   |

## Agroclimatology PAG 20116

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| Module Designation   | Agroclimatology  |
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| Code   | PAG 20116  |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Firdaus Sulaiman, M. Si.<br>2. Dr. Ir. Yakup, M.S.<br>3. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>4. Fitra Gustiar, S.P., M.Si.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and able to differentiate climate and weather<br>2. Understand and able to explain factors to affect climate and weather<br>3. Understand and able to explain the function of atmosphere for environment<br>4. Find out and explain the component of atmosphere<br>5. Explain the function of each layer of atmosphere<br>6. Understand and able to explain the function of atmosphere for environment<br>7. Find out and explain the component of atmosphere<br>8. Understand and able to explain the function of atmosphere for environment<br>9. Find out and explain the component of atmosphere<br>10. Explain the function of each layer of atmosphere<br>11. Understand and able to explain the definition of temperature<br>12. Understand and able to explain the difference between temperature and heat, and how to heat distribution on the atmosphere |

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|                | <ol style="list-style-type: none"> <li>13. Understand and able to explain the mechanism of humidity on the atmosphere</li> <li>14. Understand and able to explain how to measure humidity</li> <li>15. Understand and able to explain condensation and sublimation</li> <li>16. Understand and able to explain hydrological cycle</li> <li>17. Understand and able to explain terminology of evaporation, evapotranspiration, cloud formation, presipitation process, and artificial rainfall</li> <li>18. Understand and able to explain measurement of rainfall</li> <li>19. Understand and able to explain effect of rainfall on plant</li> <li>20. Understand and able to explain the advantages of artificial rainfall on plant</li> <li>21. Understand and be able to explain terminology of air pressure, wind, and turbulence</li> <li>22. Understand and able to explain air pressure formation and effect of wind blows on plant growth</li> <li>23. Understand the method of Oldeman and Mohr classified climate system</li> <li>24. Understand and be able to explain climate classification on the world</li> <li>25. Understand and be able to explain International and Indonesia classification</li> <li>26. Understand and able to explain the role of classifikaiton from Oldemann, Mohr, Junghunh, Wladimir Koppen, Schmidt-Fergusson. IRRI, Thornwait, and association of soil and climate research institution</li> <li>27. Understand and able to explain tropical and subtropical zone of climate</li> <li>28. Understand and able to explain distribution of variation tropical and subtropical plant</li> <li>29. Understand and able to explain global climate change on the entire earth and atmosphere</li> <li>30. Understand and explain Effect of green house for the entire earth, and mitigation on climate change</li> </ol> |
| <p>Content</p> | <ol style="list-style-type: none"> <li>1. Scope of agroclimatology.</li> <li>2. The role of climate for agriculture.</li> <li>3. Earth's atmosphere.</li> <li>4. Solar radiation.</li> <li>5. Air temperature.</li> <li>6. Temperature and plant growth.</li> <li>7. Air Pressure and Wind.</li> <li>8. Humidity.</li> <li>9. Hydrological cycle, clouds, and rain.</li> </ol>   |

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|                        | <p>10. Climate classification.</p> <p>11. Tropical climate.</p> <p>12. Climate in Indonesia.</p> <p>13. Global warming.</p> <p>14. Climate change.</p> <p>15. The effect of climate on pests and plant diseases.</p> <p>16. Adaptation to climate change.</p>   |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Balasubramanian, T.N., R. Jagannthan and V. Geethalaksmi. 2021. Agro-Climatology, Advances and Challenges. CRC Press. 332 p.</li> <li>2. Bishnoi, P. 2010. Applied Agroclimatology. Oxford Book Company. 551 p.</li> <li>3. Bryant, C.R., M.A. Saar and K. Delusca. 2016. Agricultural Adaptation to Climate Change. Springer. 247 p.</li> <li>4. Das, R. 2017. Climate Variability and Its Impact on Crop Production. Asia Toy and Play Association. 576 p.</li> <li>5. Ferreira, L.G.B. 2021. Agroclimatology. KS Omniscryptum Publishing. 180 p.</li> <li>6. Ganesaraja, V., R. Veeraputiran and V.K. Paulpandi. 2011. Agro Climatolog: Principles and Predictions. Associated Publishing Company. 90 p.</li> <li>7. Hatfield, J.L., M. Sivakumar and J. Prueger. 2020. Agroclimatology: Linking Agriculture to Climate. American Society of Agronomy. Wisconsin, US. 656 p.</li> <li>8. Lalic, B., J. Eitzinger, A.D. Marta, S. Orlandini, A.F. Sremac and B. Pacher. 2018. Agricultural Meteorology and Climatology. Firenze University Press. 352 p.</li> <li>9. Mago, P. 2014. Climate Change, Effect and Impact on Agricultural. Anuradha Prakashan. 120 p.</li> <li>10. Oldemen, L.R. and M. Frere. 1982. Technical Report on a Study of The Agroclimatology of The Humid Tropics of Southeast Asia. Food and Agriculture Organization, UN. 229 p.</li> <li>11. Sahu, D.D. 2013. Fundamentals of Agricultural Climatology. Agrobios Publishers. Jodhpur, India. 422 p.</li> <li>12. Wang, Y. 2020. Admosphere and Climate. CRC Press. Boca Raton. 389 p.</li> <li>13. Research publications related to agroclimatology.</li> </ol> |
| Date of last amendment | July 21, 2021   |

## Fundamentals of Management ABI 11116

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| Module Designation   | Fundamentals of Management  |
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| Code   | UNI 10509   |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year   |
| Person responsible for the module                            | 1. Ir. Fauzia Asyiek, M.A., Ph.D.<br>2. Dr. Ir. Idham Alamsyah, M.Si.<br>3. Dr. Ir. Amruzi Minha, M.Si.<br>4. Ir. Yulius, MM.<br>5. Dwi Wulan Sari, S.P., M.Si., Ph.D.<br>6. Henny Malini, S.P., M.Si.<br>7. Erni Purbiyanti, S.P., M.Si.<br>8. Muhammad Arby, M.Si.<br>9. Thirtawati, S.P., M.Si.<br>10. Elly Rosana, S.P., M.Si.  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain Introduction, and Development of Figures of Management.<br>2. Understand and be able to explain Planning Function.<br>3. Understand and be able to explain Organization Function.<br>4. Understand and be able to explain departmentation<br>5. Understand and be able to explain Staff and Committee.<br>6. Understand and be able to explain Delegation<br>7. Understand and be able to explain Acquiring Employees.<br>8. Understand and be able to explain the Advancing Employees.<br>9. Understand and be able to explain Utilizing Employees.<br>10. Understand and be able to explain the Dismissing Employees.<br>11. Understand and be able to explain Giving Orders Function. |

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|                        | <p>12. Understand and be able to explain Supervision Function.</p> <p>13. Understand and be able to explain Human Resource Management.</p> <p>14. Understand and be able to Presentation of The Company’s Case Review.</p>   |
| Content                | <p>1. Introduction, and Development of Figures of Management.</p> <p>2. Planning Function.</p> <p>3. Organization Function.</p> <p>4. Departmentation.</p> <p>5. Staff and Committee.</p> <p>6. Delegation.</p> <p>7. Acquiring Employees.</p> <p>8. Advancing Employees.</p> <p>9. Utilizing Employees.</p> <p>10. Dismissing Employees.</p> <p>11. Giving Orders Function.</p> <p>12. Supervision Function.</p> <p>13. Human Resource Management.</p> <p>14. Presentation of The Company’s Case Review.</p>  |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <p>1. Essays questions</p> <p>2. Writing Case Paper</p> <p>3. Oral presentation</p>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <p>1. Hasibuan, Malayu. 2001. Management: Basics, Understanding and Problems. Earth Characters. Jakarta Manulang. 1998.</p> <p>2. Management Basic. Ghalia Indonesia. Jakarta.</p> <p>3. Rae, Leslie. 1993. 50 Activities to Develop Management Skills. Volume 1. Scripting. Jakarta.</p> <p>4. Stoner, James. 2001. Management Volumes 1 and 2. Erlangga. Jakarta. Williams, Teresa. 1993. 50 Activities to Develop Management Skills. Volume 2. Scripting. Jakarta. Zandstra,</p> <p>5. Jack. 1993. 50 Activities to Develop Management Skills. Volume 3. Scripting. Jakarta</p> |
| Date of last amendment | July 16, 2021  |



Semester 2

Religion UNI 10116

| Module Designation   | Religion   |
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| Code   | UNI 10116  |
| Semester (s) in which the module is taught                   | 2 <sup>nd</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. Nurhasan, M.Ag.<br>2. Religion Teaching Team  |
| Language   | Indonesian   |
| Type of teaching   | Lecture, practical, and project  |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Describe, explain about the introduction of Islamic Religious Education</li> <li>2. Explain the meaning, the philosophy of divinity in Islam, the history of human thought about God, God according to religion</li> <li>3. Explain the meaning, the philosophy of divinity in Islam, the history of human thought about God, God according to religion</li> <li>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</li> <li>5. Describe, explain about humans according to Islam</li> <li>6. Describe, explain the concept of Law, HAM, and Democracy in Islam</li> <li>7. Describe, explain the concept of Islamic law, the Contribution of Muslims in Indonesia</li> <li>8. Describe, explain how to apply al-Karimah's morals in everyday life</li> <li>9. Describe, explain the concept of science and technology and art in Islam</li> <li>10. Describe, explain the concept of religious harmony</li> </ol> |

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|                        | <ul style="list-style-type: none"> <li>11. Describe, explain the concept of Civil Society</li> <li>12. Describe, explain the concept of Islamic Economics</li> <li>13. Describe, explain the concept of Islamic politics</li> </ul>  |
| Content                | <ul style="list-style-type: none"> <li>1. Introduction to Religious education.</li> <li>2. The Concept of God in Islam.</li> <li>3. The concept of faith and piety.</li> <li>4. Implementation of Faith and Taqwa in modern life.</li> <li>5. Human nature according to Islam.</li> <li>6. Law, HAM, and Democracy in Islam.</li> <li>7. Islamic Law, Contribution of Muslims in Indonesia.</li> <li>8. Moral and Moral Ethics.</li> <li>9. Science and technology and art in Islam.</li> <li>10. Inter-religious harmony.</li> <li>11. Civil Society.</li> <li>12. Islamic Economics.</li> <li>13. The concept of Islamic culture.</li> <li>14. Islamic political concept.</li> </ul> |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ul style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> </ul>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ul style="list-style-type: none"> <li>1. Dikti. 2016. Pendidikan Agama Islam Untuk Perguruan Tinggi. Dikti.</li> <li>2. Rustam, R., Haris, Z.A. Buku Ajar Pendidikan Agama Islam Di Perguruan Tinggi. Omega.</li> <li>3. Amin, R. 2015. Sistem Pembelajaran Pendidikan Agama Islam pada Perguruan Tinggi Umum. Deepublish.</li> </ul>   |
| Date of last amendment | June 30, 2021  |

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English UNI 10416

| Module Designation   | English  |
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| Code   | UNI 10416  |
| Semester (s) in which the module is taught                   | 2 <sup>nd</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | English Teaching Team  |
| Language   | Indonesian   |
| Type of teaching   | Lecture, practical, and project  |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> </ol>  |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>  |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain definition of vocabulary, measuring vocabulary, the English Language's appropriated vocabulary, English vocabulary by region</li> <li>2. Understand and be able to explain grammar vocabulary</li> <li>3. Understand and be able to explain assessing grammar, designing assessment tasks (selected response, limited production, extended production), assessing vocabulary, defining lexical knowledge, some consideration in designing assessment tasks, designing assessment tasks (receptive vocabulary, productive vocabulary)</li> <li>4. Understand and be able to explain grammar : present tense, past tense, perfect tense, future tense, passive voice</li> <li>5. Understand and be able to explain grammar : reading comprehension, adjective clause, noun clause, gerund and infinitive</li> <li>6. Understand and be able to explain : a. the definition of words, words classess and phrases classess, major word classess, typical word-class suffixes, other word classess (prepositions, pronouns, determiners, onjunctions, interjections), word formation, word order and focus. b. the definition of sentences, example, basic sentence structure, four functional types of sentence</li> </ol> |

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|                        | <ol style="list-style-type: none"> <li>7. Understand and be able to explain types of sentences based on structurally such as : simple sentences, compound sentences, complex sentences, compound - complex sentences</li> <li>8. Understand and be able to explain types of sentences based on functionally such as : declarative sentences, imperative sentences, interrogative sentences, and exclamatory sentences</li> <li>9. Understand and be able to translating English to Indonesian</li> <li>10. Understand and be able to translating Indonesian to English</li> <li>11. Understand and be able to listening 1</li> <li>12. Understand and be able to listening 2</li> <li>13. Understand and be able to speaking 1</li> <li>14. Understand and be able to speaking 2</li> </ol> |
| Content                | <ol style="list-style-type: none"> <li>1. Vocabulary in English.</li> <li>2. Grammar and sentences in English.</li> <li>3. Mastery of the meaning of words and sentences in English.</li> <li>4. Mastery of translating English to Indonesian in the agricultural sector.</li> <li>5. The use and disclosure of words and sentences in write well and correctly.</li> <li>6. The use and disclosure of words and sentences in good and correct speech.</li> <li>7. Mastery of the ability to communicate using English.</li> </ol>  |
| Examination forms      | Quiz, Mid-terms and Final Examination<br><ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> </ol>  |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Hutchinson, T. 2007. English for Life: Pre-intermediate. Student's book. Oxford University Press.</li> <li>2. Susesno, E. 2019. Bahasa Inggris untuk Pemula Metode Komik. Deepublish.</li> <li>3. Priyasudiarja, Y. 2016. English for Presentation and Public Speaking. Al-Mizan.</li> </ol>  |
| Date of last amendment | June 30, 2021   |

## Genetics PAG 108116

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| Module Designation   | Genetics  |
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| Code   | PAG 108116  |
| Semester (s) in which the module is taught                   | 2 <sup>nd</sup> semester/1 <sup>st</sup> year   |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Dr. Ir. Mery Hasmeda, M.Sc.</li> <li>2. Dr. Ir. E. S. Halimi, M.Sc.</li> <li>3. Dr. Ir. Dwi Putro Priadi, M.Sc.</li> <li>4. Dr. Ir. Andi Wijaya, M.Agr.</li> </ol>  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 19.83 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 48.00 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain genetics scope, history, and genetic development</li> <li>2. Understand and be able to explain norms and ethic that applies plants as objects in genetic research</li> <li>3. Understand and be able to explain theory, principal, law and norms in genetics</li> <li>4. Understand and be able to explain theoretical concepts of probability in genetics and being able to perform genetic calculations</li> <li>5. Understand and be able to explain the theoretical concept of inheritance through the cytoplasm</li> <li>6. Understand and be able to explain concept of chromosomes as gene carriers</li> <li>7. Understand and be able to explain the concept of diversity in the number and structure of chromosomes</li> <li>8. Understand and be able to explain theoretical concept mutation and mutagenesis</li> <li>9. Understand and be able to explain Linkage theoretical concept and chromosome mapping</li> <li>10. Understand and be able to explain theoretical concept and gene express</li> </ol> |

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|                          | <ol style="list-style-type: none"> <li>11. Understand and be able to explain structure and replication DNA</li> <li>12. Understand and be able to explain concept, theory, and principal in genetics population</li> <li>13. Understand and be able to explain genetics quantitative and evolution</li> <li>14. Understand and be able to explain germplasm and plant genetic improvement</li> <li>15. Understand and be able to explain germplasm and plant genetic improvement</li> </ol>  |
| <p>Content</p>           | <ol style="list-style-type: none"> <li>1. Introduction: Scope of genetic and history of genetic development</li> <li>2. Inheritance and diversity of traits: a. Mendel Principle, b. Segregation on Generation, c. Dominance Patterns, d. Epistasis.</li> <li>3. Probability theory: a. Principles of Probability, b. genetic count</li> <li>4. Inheritance through the Cytoplasm: a. Inheritance Character through Cytoplasm, b. Inheritance on Organelle Cell, c. Male infertile and Maternal Effect.</li> <li>5. Chromosome as gene carrying: a. Consistency Number of Chromosome, b. Mitosis and Meiosis c. Chromosome as Sex Determinant.</li> <li>6. Diversity of number and structure of chromosome: a. Chromosome Shape, b. Polyploidy, c. Aneuploidy, d. Chromosome Aberration.</li> <li>7. Mutation and mutagenesis: a. Biochemistry of Mutation, b. Spontaneous of Mutation, c. Induced Mutation.</li> <li>8. Linkage and chromosome mapping: a. Gene Location on Chromosome and Recommendation. B. Cross Over.</li> <li>9. Gene expression: a. Relationship between Gene and polypeptide, b. Transcription, c. Genetic Code.</li> <li>10. Structure and DNA replication: a. Chemical Structure of DNA, b. Physical Structure of DNA, c. Synthesis and Replication of DNA.</li> <li>11. Population of genetic: a. Allele Frequency and Genotype Frequency, b. Cross system, c, Principles of Hardy-Weinberg, d. Inbreeding.</li> <li>12. Genetic quantitative and evolution: a. Quantitative Inheritance, b. Variances, c. Heritability.</li> <li>13. Germplasm and plant genetic Improvement.</li> <li>14. Germplasm and plant genetic Improvement.</li> </ol> |
| <p>Examination forms</p> | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> </ol>   |

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| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Mukherjee, S. 2017. The Gene: An Intimate History. Large Print Press.</li> <li>2. Varshney, R.K., Chitkineni, A., Pandey, M.K. 2018. Plant Genetics and Molecular Biology. Springer.</li> <li>3. Arencibia, A.D. 2000. Plant Genetic Engineering: Towards the Third Millennium. Elsevier Science.</li> <li>4. Grotewold, E., Chappell, J., Kellogg, E.A. 2015. Plant Genes, Genomes and Genetics. Wiley Online Books.</li> <li>5. Graner, A., Tuberosa, R., Frison, E. 2013. Genomics of Plant Genetic Resources: Volume 1. Managing, sequencing and mining genetic resources. Springer.</li> <li>6. Falconer, D.S. 1986. Introduction to Quantitative Genetics Secon Edition. Longman Scientific &amp; Technical.</li> <li>7. Murphy, D.J. 2007. People, Plants and Genes. Oxford Press.</li> <li>8. Simpson, S. 2008. Plant Genetics and Genomics: Crops and Models. Springer.</li> <li>9. Suarez, M.F., Bozhkov. 2008. Plant Embryogenesis. Humana Press.</li> <li>10. Research publications related to genetics.</li> </ol> |
| Date of last amendment | July 21, 2021   |



## Fundamentals of Plant Physiology PAG 109116

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| Module Designation   | Fundamentals of Plant Physiology   |
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| Code   | PAG 109116   |
| Semester (s) in which the module is taught                   | 2 <sup>nd</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Rujito Agus Suwignyo, M.Agr.<br>2. Dr. Susilawati, S.P., M.Si.<br>3. Dr. Irmawati, S.P., M. Si., M.Sc.<br>4. Dr. Ir. Lidwina Niniek S., M.Si.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 5. Lectures (explanation, discussion)<br>6. Structured assignment (i.e.: article reading and review)<br>7. The class size 30-75 students per class<br>8. Contact hours for lecture are 23.33 hours per semester<br>9. Total hours practical is 34.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 4. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>5. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>6. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the definition and scope of fundamentals of plant physiology<br>2. Understand and be able to explain water characteristic, water molecule, and its translocation<br>3. Understand and be able to explain function and transfer of water in plants and transfer of water in plant cells<br>4. Understand and be able to explain transpiration and stomatal activity<br>5. Understand and be able to explain the relationship between transpiration and plant growth<br>6. Understand and be able to explain definition and classification of mineral nutrients for plants<br>7. Understand and be able to explain benefits from each mineral nutrients for plants<br>8. Understand and be able to explain mineral nutrient absorption system in plants<br>9. Understand and be able to explain symptoms of excess plant mineral nutrients<br>10. Understand and be able to explain symptoms of plant deficiency of mineral nutrients<br>11. Understand and be able to explain plant growth regulator |

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|                   | 12. Understand and be able to explain plant enzyme<br>13. Understand and be able to explain photosynthesis process<br>14. Understand and be able to explain pigments that play a role in the process of photosynthesis following the absorption of light and the process of transporting electrons<br>15. Understand and be able to explain definition of respiration and its role in metabolism<br>16. Understand and be able to explain respiration and the cycle and process of respiration<br>17. Understand and be able to explain plant growth and development                                 |
| Content           | 1. Introduction, basic concept of the lecture.<br>2. Water properties and its translocation.<br>3. Plant and water relationship.<br>4. Transpiration 1.<br>5. Transpiration 2.<br>6. Mineral nutrients 1.<br>7. Mineral nutrients 2.<br>8. Plant growth regulator.<br>9. Plant enzyme.<br>10. Photosynthesis 1.<br>11. Photosynthesis 2.<br>12. Respiration 1.<br>13. Respiration 2.<br>14. Plant growth and development.  |
| Examination forms | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works<br>3. Writing Case Paper<br>4. Oral presentation  |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | 1. Angus, S.M., E. Zeiger., and I.M. Meller (eds.). 2018. Plant Physiology and development. Oxford University Press, London, UK.<br>2. Lakitan, B. 2018. Dasar-Dasar Fisiologi Tumbuhan. Cetakan ke 14. Rajawali Press. Jakarta. INA.<br>3. Jain, V.K. 2017. Fundamentals of plant physiology. Schand and Company limited. New Delhi. IND.<br>4. Manju, M. 2021. Plant Physiology. Horizon Books. A Division of Ignited Minds Edutech P Ltd. New Delhi, IND.<br>5. Pessarakli, M (Ed.). 2014. Handbook of Plant and Crop Physiology. 3rd Edition. CRC Pres. Taylor and Francis Group. New York. USA. |

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|                        | <ol style="list-style-type: none"> <li>6. Salisbury, F.B. 1992. Plant Physiology. Thomson Press Ltd. New Delhi. IND.</li> <li>7. VK Jain. 2017. Fundamentals of Plant Physiology. Schand.</li> <li>8. Lambers, H., Chapin III, F.S. 2008. Plant Physiological Ecology. Springer.</li> <li>9. Stewart, P., Globig, S. 2012. Plant Physiology. Apple Academic Press.</li> <li>10. William, G.H., Norman., Honer, P.A. 2011. Introduction to Plant Physiology</li> <li>11. Nobel, P. 2009. Physicochemical and Environmental Plant Physiology. Elsevier.</li> <li>12. Scott, P. 2008. Physiology and Behavior of Plants. Wiley.</li> <li>13. Research publications related to plant physiology.</li> </ol> |
| Date of last amendment | July 21, 2021   |

**Fundamentals of Agronomy PAG 202116**
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| <b>Module Designation</b>                                    | <b>Fundamentals of Agronomy</b>  |
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| Code   | PAG 202116   |
| Semester (s) in which the module is taught                   | 2 <sup>nd</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Yakup, M.S.<br>2. Dr. Ir. Firdaus Sulaiman, M.Si.<br>3. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>4. Fitra Gustiar, S.P., M.Si.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 34.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the meaning of agronomy and its basic elements.<br>2. Understand and be able to explain the and scope of agronomy.<br>3. Understand and be able to explain the stages of agricultural development.<br>4. Understand and be able to explain advances in plant cultivation technology.<br>5. Understand and be able to explain area of origin of plant species.<br>6. Understand and be able to explain centers of plant diversity.<br>7. Understand and be able to explain the role of plant breeding improving genetic traits.<br>8. Understand and be able to explain the role of plant breeding in increasing production.<br>9. Understand and be able to explain the role of plant breeding improving genetic traits.<br>10. Understand and be able to explain the role of plant breeding in increasing production.<br>11. Understand and be able to explain plant growth. |

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|         | <ol style="list-style-type: none"> <li>12. Understand and be able to explain plant development.</li> <li>13. Understand and be able to explain between plant growth a development.</li> <li>14. Understand and be able to explain sexual reproduction plants.</li> <li>15. Understand and be able to explain asexual reproduction plants.</li> <li>16. Understand and be able to explain the influence of abiotic factors on plant growth and development.</li> <li>17. Understand and be able to explain the influence of biotic factors on plant growth and development.</li> <li>18. Understand and be able to explain the dryland preparation.</li> <li>19. Understand and be able to explain the wetland preparation</li> <li>20. Understand and be able to explain nurseries and seeding.planting.</li> <li>21. Understand and be able to explain the planting.</li> <li>22. Understand and be able to explain plant embroidery.</li> <li>23. Understand and be able to explain plant maintenance.</li> <li>24. Understand and be able to explain cropping patterns.</li> <li>25. Understand and be able to explain crop diversification.</li> <li>26. Understand and be able to explain land conservation.</li> <li>27. Understand and be able to explain waste management.</li> <li>28. Understand and be able to explain the agricultural production facilities.</li> </ol> |
| Content | <ol style="list-style-type: none"> <li>1. Basic definitions and scopes of agronomy.</li> <li>2. Agricultural development and the role of agronomy.</li> <li>3. Areas of origin and centers of crop production.</li> <li>4. Agronomic plant grouping and examples.</li> <li>5. Plant growth and development.</li> <li>6. Effect of abiotic factors on plant growth and development.</li> <li>7. Effect of biotic factors on plant growth and development.</li> <li>8. Grouping and roles of growth regulator substances (GRS), enzymes, and vitamins.</li> <li>9. Plant breeding.</li> <li>10. Plant propagation (sexual and asexual), and tissue culture.</li> <li>11. Preparation of dry land, swamp land, and micro land.</li> <li>12. Nurseries, seeding, and planting.</li> <li>13. Cropping patterns and crop diversification.</li> <li>14. Agricultural intensification, and agricultural extensification.</li> </ol>  |

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|                   | <p>15. Sustainability of land resources/conservation, and utilization of agricultural waste.</p> <p>16. Agricultural production facilities.</p>  |
| Examination forms | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Arya, R. L. 2020. Fundamentals of Agronomy. Scientific Publishers. 171 p.</li> <li>2. Ankerman, D. And R. Large. 2007. Agronomy Handbook. Midwest Laboratories, Inc. Omaha 135 p.</li> <li>3. Djafar, Z.R., Dartius, Ardi, D. Suryati, E. Yuliadi, Hadiyono, Y. Sjofian. M. Aswad dan S. Sagiman. 1990. Dasar-Dasar Agronomi. Western Universities Agricultural Education (WUAE) Project . Palembang</li> <li>4. Chandrasekaran, B., K. Annadurai and E. Somasundaram. 2010. A Textbook of Agronomy. New Age International (P) Limited Publishers. New Delhi. 835 p.</li> <li>5. Dris, R., I. A. Khan and R. Niskanen. 2002. Environmental and Crop Production. CRC Press. 360 p.</li> <li>6. Gopal, C. D. 2019. Fundamentals of Agronomy. Oxford and IBH Publishers, 2<sup>nd</sup> edition. 444 p.</li> <li>7. Harjadi, M.M.S.S. 2019. Dasar-Dasar Agronomi. Gramedia Pustaka Utama. Jakarta. 300 h.</li> <li>8. Hartman, H.T., D.E.Kester, F.T. Davies and R.L. Geneve. 1997. Plant Propagation, Principles and Practices. 6th Edition. Prentice Hall, Englewood Cliffs.</li> <li>9. Jenkins, A. 2016. Agronomy and Crop Production. Syrawood Publishing House. 205 p.</li> <li>10. Jones Jr, J. B. 2002. Agronomic Handbook, Management of Crops, Soils and Their Fertility. CRC Press. 450 p.</li> <li>11. Jumin, H.B. 2005. Dasar-Dasar Agronomi. PT Raja Grafindo Persada. Jakarta. 250 h.</li> <li>12. Kuswanto, H. 1996. Dasar-Dasar Teknologi Produksi Tanaman Pangan. Penerbit Andi. Yogyakarta.</li> <li>13. Rai, I.N. 2018. Dasar-Dasar Agronomi. Penerbit Pelawa Sari. Denpasar. 265 h.</li> <li>14. Shiddieq, D., P. Sudiro dan Tohari. 2020. Aspek Dasar Agronomi Berkelanjutan. Gadjah Mada University Press. Yogyakarta. 400 h.</li> </ol> |

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|                        | <ol style="list-style-type: none"> <li>15. Sitompul, S.M. dan B. Guritno. 1995. Analisis Pertumbuhan Tanaman. Gadjah Mada University Press. Yogyakarta. 412 h.</li> <li>16. Sugito, Y. 1994. Dasar-Dasar Agronomi. Fakultas Pertanian Universitas Brawijaya. Malang.</li> <li>17. Kamburova, V. J. and S. K. Kim. 2018. Fundamentals of Agronomy. Scitus Academic LLC. 370 p.</li> <li>18. Parashar, A. and M. K. Bishnoi. 2021. Fundamentals of Agronomy and Agricultural Meteorology. Bhavya Books. 200 p.</li> <li>19. Sharanappa. 2021. Fundamentals of Agronomy. New India Publishing Agency-Nipa. 164 p.</li> <li>20. Singh, S.S. and R. Singh. 2015. Principles and Practices of Agronomy. Kalyani Publishers. 348 p.</li> <li>21. Sparks, D. L. 2021. Advances in Agronomy, Volume 167. Academic Press. 320 p.</li> <li>22. Webster, C. C. and P. N. Wilson. 1998. Agriculture in The Tropics. Wiley-Blackwell, 3<sup>rd</sup> edition. 552 p.</li> </ol> |
| Date of last amendment | June 30, 2021   |

## Fundamentals of Soil Science PTN 10116

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| Module Designation   | Fundamentals of Soil Science   |
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| Code   | PTN 10116  |
| Semester (s) in which the module is taught                   | 2 <sup>nd</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Dedik Budianta, MS.<br>2. Dr. Ir. Warsito, MS.<br>3. Dra. Dwi Probowati Sulistyani, MS.<br>4. Ir, Marsi, MSc, Ph.D.<br>5. Dr. Ir. Satria Jaya Priatna, MS.<br>6. Dr. Ir. A. Napoleon, MP.<br>7. Dr. Ir. Dwi Setyawan, M.Sc.<br>8. Dr. Ir. Bambang Prayitno, M.Sc.<br>9. Dr. Ir. Agus Hermawan, MS.<br>10. Dr. Ir. Bakri, MS.<br>11. Prof. Dr. Ir. Edi Armanto, MS.<br>12. Prof. Dr. Ir. Nuni Gofar, MS.<br>13. Dr. Ir. Madjid Rohim, MS.<br>14. Dr. Ir. Momon Imanuddin, MS.<br>14. Ir. Sabarudin, MSc. Ph.D<br>15. Ir. Siti Nurul Aidil Fitri, MS. |
| Language   | Indonesian   |
| Type of teaching   | Lecture, practical, and project  |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>Total hours practical is 34.00 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain introduction of soil for agriculture<br>2. Understand and be able to explain factors affecting soil formation<br>3. Understand and be able to explain Factors affecting soil phases<br>4. Understand and be able to explain Soil acidity<br>5. Understand and be able to explain Soil alkalinity  |



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|                        | 6. Understand and be able to explain CEC, SOM, and Soil liming<br>7. Understand and be able to explain Soil texture<br>8. Understand and be able to explain soil structure and soil pores<br>9. Understand and be able to explain Soil bulk density<br>10. Understand and be able to explain soil specific density<br>11. Understand and be able to explain soil moisture<br>12. Understand and be able to explain soil fauna and soil flora<br>13. Understand and be able to explain soil distribution<br>14. Understand and be able to explain soil classification |
| Content                | 1. Introduction of soil for agriculture (definition, function, etc).<br>2. Soil genesis: factors affecting soil formation and soil phases,<br>3. Soil components for agriculture.<br>4. Soil chemistry (soil acidity, soil alkalinity, CEC, SOM, soil liming).<br>5. Soil physics (soil texture, soil structure, soil pores, soil bulk density, soil specific density, soil moisture).<br>6. Soil biology (soil fauna and soil flora).<br>7. Soil development in Indonesia (Soil distribution and soil classification).<br>8. Examination.                           |
| Examination forms      | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Writing paper<br>3. Photographs collection on agricultural objects  |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | 1. Buckman, H.O., N.C. Brady. 1982. Ilmu Tanah. Terjemahan Prof. Soegiman. Bhratara Karya Aksara Jakarta.<br>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.<br>3. Tan, H.T. 2011. Principles of Soil Chemistry. CRC Press. Taylor & Francis Group.<br>4. Research publications related to soil science.  |
| Date of last amendment | June 30, 2021  |

## Civic UNI 10216

| Module Designation   | Civic  |
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| Code   | UNI 10216  |
| Semester (s) in which the module is taught                   | 1 <sup>st</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. LR Retno Susanti, M.Hum.<br>2. Civic Teaching Team  |
| Language   | Indonesian   |
| Type of teaching   | Lecture, practical, and project  |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 48.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 48.00 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand the important background, concepts, goals, vision, mission and foundation of Civic Education</li> <li>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</li> <li>3. Able to describe concepts, urgency, the nature of national integration and be able to identify the factors forming national integration</li> <li>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</li> <li>5. Able to understand the existing rules of the Indonesian constitution</li> <li>6. Able to understand the existing rules of the Indonesian constitution</li> <li>7. Able to analyze the rights and obligations of citizens in the life of society, nation and state</li> <li>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</li> </ol> |

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|                        | <p>Indonesia and describe the history of the development of democracy in Indonesia</p> <ol style="list-style-type: none"> <li>9. Able to explain basic concepts/definitions Rule of Law and analyze problems Rule of law</li> <li>10. Able to explain the history of development HAM and describe various HAM as well as institutions HAM.</li> <li>11. Able to explain the concept of geopolitics as a national insight</li> <li>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</li> <li>13. Able to explain the concept of Indonesian Geostrategy in the form of national resilience</li> <li>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.</li> </ol> |
| Content                | <ol style="list-style-type: none"> <li>1. Concept, Purpose, Vision, Mission and Background importance of Civic Education.</li> <li>2. National Identity.</li> <li>3. National Integration.</li> <li>4. The State and Constitution of Indonesia.</li> <li>5. The Constitution of Indonesia as a Nation-State.</li> <li>6. Rights and obligations of citizens.</li> <li>7. Indonesian Democracy.</li> <li>8. Law enforcement and HAM.</li> <li>9. Archipelago Insights/ Geopolitics.</li> <li>10. Geostrategies Indonesia/ National Resilience.</li> </ol>   |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> </ol>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Widodo, W., Anwari, B., Maryanto. 2015. Pendidikan Kewarganegaraan. Andi Offset.</li> <li>2. Wasiyem. 2021. Pendidikan Kewarganegaraan untuk Perguruan Tinggi. <a href="http://repository.uinsu.ac.id">http://repository.uinsu.ac.id</a>.</li> <li>3. BPMKU Unila. Pendidikan Kewarganegaraan. <a href="https://bpmku.unila.ac.id">https://bpmku.unila.ac.id</a>.</li> </ol>   |
| Date of last amendment | June 30, 2021  |

Rural Sociology ABI 11316

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| Module Designation   | Rural Sociology   |
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| Code   | ABI 11316   |
| Semester (s) in which the module is taught                   | 2 <sup>nd</sup> semester/1 <sup>st</sup> year   |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Ir. Fauzia Asyiek, M.A., Ph.D.</li> <li>2. Ir. Yulian Junaidi, M.Si.</li> <li>3. Dr. Riswani, S.P., M.Si.</li> <li>4. Dr. Yunita, S.P., M.Si.</li> <li>5. Dr. Agustina Bidarti, S.P., M.Si.</li> <li>6. Henny Malini, S.P., M.Si.</li> <li>7. Elly Rosana, S.P., M.Si.</li> <li>8. Eka Mulayana, S.P., M.Si.</li> <li>9. Indri Januarti, S.P., M.Si.</li> </ol>   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 19.83 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the understanding rural sociology</li> <li>2. Understand and be able to explain social interaction</li> <li>3. Understand and be able to explain social groups</li> <li>4. Understand and be able to explain rural social institutions</li> <li>5. Understand and be able to explain social system</li> <li>6. Understand and be able to explain social structure</li> <li>7. Understand and be able to explain culture</li> <li>8. Understand and be able to explain social problems</li> <li>9. Understand and be able to explain social stratification</li> <li>10. Understand and be able to explain social change</li> <li>11. Understand and be able to explain social change in the countryside</li> <li>12. Understand and be able to explain village development</li> <li>13. Understand and be able to explain social mobility</li> </ol> |

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|                        | 14. Understand and be able to explain modernization   |
| Content                | <ol style="list-style-type: none"> <li>1. Understanding Rural Sociology.</li> <li>2. Social Interaction.</li> <li>3. Social Groups.</li> <li>4. Rural Social Institutions.</li> <li>5. Social System.</li> <li>6. Social Structure.</li> <li>7. Culture.</li> <li>8. Social Problems.</li> <li>9. Social Stratification.</li> <li>10. Social Change.</li> <li>11. Social Change in the Countryside.</li> <li>12. Village Development.</li> <li>13. Social Mobility.</li> <li>14. Modernization.</li> </ol>  |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Cohen, Bruce J.; Simamora, Sahat, translator (Bina Aksara, 1983) Sociology an Introduction, Publisher Rineka Cipta</li> <li>2. Rahardjo.1999. Introduction to Rural Sociology and Agriculture. Yogyakarta: Gajah Mada University Press</li> <li>3. Soerjono Soekanto, 1985, Sociology of an Introduction, Jakarta: Rajawali Press</li> <li>4. Soekanto, Soejono. 2010. Sociology an Introduction. Jakarta: Raja Grafindo Persada</li> <li>5. Sugihen. 1996. Rural Sociology An Introduction. Jakarta: PT Raja Grfindo Persada.</li> </ol> |
| Date of last amendment | July 16, 2021   |

## Plant Growth Regulator\* PAG 113116

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| Module Designation   | Plant Growth Regulator*  |
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| Code   | PAG 113116   |
| Semester (s) in which the module is taught                   | 2 <sup>nd</sup> semester/1 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. M. Umar Harun, M.S.<br>2. Dr. Irmawati, S.P., M.Si, M.Sc.<br>3. Dr. Ir. Lidwina Niniek S., M.Si.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Elective Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 4. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>5. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>6. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain discovery of auxin, biosynthesis and metabolism, auxin transport.<br>2. Understand and be able to explain Influence of auxin on plant development.<br>3. Understand and be able to explain Cytokinin discovery and identification.<br>4. Understand and be able to explain Cell division and plant development, biosynthesis, metabolism and transport of cytokinin.<br>5. Understand and be able to explain Biological role of cytokinin.<br>6. Understand and be able to explain Discovery of gibberellins, biosynthesis and metabolism of gibberellins.<br>7. Understand and be able to explain Influence of gibberellins on plant growth and development.<br>8. Understand and be able to explain Physiological mechanisms of growth due to the action of gibberellins.<br>9. Understand and be able to explain Role of gibberellins on germination.<br>10. Understand and be able to explain Discovery of Ethylene Structure and biosynthesis of ethylene. |

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|                        | <ol style="list-style-type: none"> <li>11. Understand and be able to explain influence of ethylene on plant physiology and development.</li> <li>12. Understand and be able to explain identification of hormones, growth regulators, biosynthesis.</li> <li>13. Understand and be able to explain metabolism and transportation of inhibitory substances.</li> <li>14. Understand and be able to explain the effect of inhibitory substances on plant physiology and development.</li> </ol>   |
| Content                | <ol style="list-style-type: none"> <li>1. Discovery of auxin, biosynthesis and metabolism, auxin transport, influence of auxin on plant development</li> <li>2. Cytokinin discovery and identification, cell division and plant development, biosynthesis, metabolism and transport of cytokinin, biological role of cytokinin</li> <li>3. Discovery of gibberellins, biosynthesis and metabolism of gibberellins, influence of gibberellins on plant growth and development, physiological mechanisms of growth due to the action of gibberellins, role of gibberellins on germination</li> <li>4. Discovery of Ethylene, structure and biosynthesis of ethylene, influence of ethylene on plant physiology and development</li> <li>5. Identification of hormones, growth regulators, biosynthesis, metabolism and transportation of inhibitory substances, the effect of inhibitory substances on plant physiology and development.</li> </ol> |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Davies, P.R. 2007. Plant Hormones Biosynthesis, Signal Transduction, Action. Springer.</li> <li>2. Lamattina, L., Polacco, J.C. 2007. Nitric Oxide in Plant Growth, Development and Stress Physiology. Springer.</li> <li>3. Mengel, K., Kirby, E.A. 1982. Principles of Plant Nutrition International Potash Institute.</li> <li>4. Khan, N.A. 2006. Ethylene Action in Plants. Springer.</li> <li>5. Plimmer, J.R., Gammon, D., Nancy, N., Ragsdale. 2002. Encyclopedia of Agrochemicals. Wiley Online Library.</li> <li>6. Research publications related to plant growth regulator.</li> </ol>   |
| Date of last amendment | July 21, 2021   |



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Semester 3

Statistics PER 21116

| Module Designation   | Statistics  |
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| Code   | PER 21116   |
| Semester (s) in which the module is taught                   | 3 <sup>rd</sup> semester/2 <sup>st</sup> year   |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Prof. Dr. Ir. Siti Herlinda, M.Si.</li> <li>2. Prof. Ir. Suwandi, M.Agr., Ph.D.</li> <li>3. Dr. Rahmat Pratama, S.Si.</li> <li>4. Arsi, S.P., M.Si.</li> </ol>  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 19.83 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PER 21116  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Know the meaning, general benefits and functions of statistics in scientific research</li> <li>2. Understand the concept of population, sample, to produce valid data and correct conclusions according to statistical rules</li> <li>3. Understand several methods of sampling techniques to produce valid data and correct conclusions according to statistical rules</li> <li>4. Understand the concept, understanding some parameters and statistical variables.</li> <li>5. Understand the meaning and be able to calculate and determine the size of the concentration and distribution of data.</li> <li>6. Mastering several types of data presentation techniques manually</li> <li>7. Mastering several types of presentation techniques using computer application facilities.</li> <li>8. Understanding the concept of data frequency, normal distribution, leading to an understanding of probability theory and calculations</li> </ol> |



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|                | <ol style="list-style-type: none"> <li>9. Understand and be able to use standard normal distribution tables (Table Z) and T-Student Tables in analyzing and concluding simple research data in agriculture.</li> <li>10. Able to perform calculations and conclude simple research using the "Two-sample comparisonwise T-test" method on data with the same diversity.</li> <li>11. Able to perform calculations and conclude simple research using the "Two-sample comparisonwise T-test" method on data with unequal diversity.</li> <li>12. Understand introduction to the basic principles of the analysis of variance (ANOVA) method, correlation, and simple regression.</li> <li>13. Get to know several computer applications</li> <li>14. Able to calculating and analyzing research data.</li> </ol>   |
| <p>Content</p> | <ol style="list-style-type: none"> <li>1. General understanding of statistics; illustration and examples to use statistics in agriculture research.</li> <li>2. Understanding and relationship between population and sample; illustration dan examples to use in agriculture research.</li> <li>3. Understanding several variables (quantitative-qualitative; discrete-continue; score; nominal, ordinal, categorical, rational) illustration and examples in agriculture.</li> <li>4. Understanding, illustration, calculation and application of several measurement of central tendency of agricultural data (arithmetic -harmonic-geometric mean; median, and modus).</li> <li>5. Understanding, illustration, calculation and application examples on agricultural data, (minimum-maximum, rank, variance, standard deviation).</li> <li>6. Understanding, illustration, calculation, and application examples of measurement of data position (percentile, quartile, etc.).</li> <li>7. Explanation and examples of several techniques and methods in data presentation in form of tables, graphics, and histogram.</li> <li>8. Understanding, illustration, relation, and calculation of probability and binomial distribution.</li> <li>9. Understanding, illustration, relation, and calculation probability and normal distribution and Z-table.</li> <li>10. Understanding, illustration, relation, and calculation probability and T-Student distribution and T-table.</li> <li>11. Explanation and calculation of one sample T-test using Z-test and T-test.</li> </ol> |

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|                        | <p>12.Explanation and calculation of two sample. Comparison-wise test in equal variance by using F-max ratio dan T-test.</p> <p>13.Explanation and calculation of two sample comparison-wise test in un-equal variance by using F-max ratio dan T-test.</p> <p>14.Explanation, and introduction toward understanding of analysis variance (ANOVA) concept.</p> <p>15.Simple explanation toward understanding and application several other methods in statistical analysis (regression, correlation, covariance, and non-parametric method).</p>  |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Gomez, K.A. and A.A. Gomez. 1984. Statistical Procedures for Agricultural Research. A Wiley Interscience Publication, John Wley and Sons. New York. 680 p.</li> <li>2. Samuels, M.L. and J.A. Witmer. 2003. Statistics for The Life sciences. Third Edition. Prentice Hall. New Jersey. 623 p.</li> <li>3. Bender, F.E., L.W. Douglass, and A. Kramer. 1989. Statistical Methods for Food and Agriculture. FPP Press, London, UK.</li> <li>4. Saefuddin, A., K.A. Notodipuro, A. Alamudi, dan K. Sadik. 2009. Statistika Dasar. PT. Grasindo, Jakarta.</li> <li>5. Sanders, D.H. 1990. Statistics. McGraw-Hill, New York USA.</li> <li>6. Supardi, U.S. 2011. Aplikasi Statistika dalam Penelitian. PT. Prima Ufuk Semesta, Jakarta.</li> <li>7. SAS Institute. 1983. SAS Program and User’s Guide. SAS Institute, NC, USA.</li> <li>8. McDonald, J.H. 2014. Handbook of Biological Statistics (3rd ed.). Sparky House Publishing, Baltimore, Maryland.</li> <li>9. Suwandi, S; Herlinda, S. Pratama, R, Arsi, A. 2022. R-code for statistical analysis of researches in plant protection.</li> <li>10. Research publications related to statistics.</li> </ol> |
| Date of last amendment | June 30, 2021   |

Plant Ecology PAG 304216

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| Module Designation   | Plant Ecology  |
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| Code   | PAG 304216   |
| Semester (s) in which the module is taught                   | 3 <sup>rd</sup> semester/2 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Yakup, M.S.<br>2. Dr. Ir. Erizal Sodikin<br>3. Dr. Ir. Muhammad Ammar, M.P.<br>4. Dr. Ir. Maria Fitriana, M.Sc.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 34.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain Agricultural perspectives in controlled environmental conditions.<br>2. Understand and be able to explain Vegetation community (life form), and ecotone.<br>3. Understand and be able to explain Description and analysis of vegetation by floristic and non-floristic methods.<br>4. Understand and be able to explain Vegetation succession, concept and theory of climax.<br>5. Understand and be able to explain Distribution of vegetation and plant ecotypes.<br>6. Understand and be able to explain Plant adaptation and plant adaptation tests.<br>7. Understand and be able to explain Definition and classification of plants, as well as plant introduction.<br>8. Understand and be able to explain Indicator plants and types of indicator plants.<br>9. Understand and be able to explain Preservation of vegetable germplasm.<br>10. Understand and be able to explain Management of vegetable germplasm. |

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|                   | <ol style="list-style-type: none"> <li>11. Understand and be able to explain The nature of the environment and the principles in the environment.</li> <li>12. Understand and be able to explain Environmental components (soil and water).</li> <li>13. Understand and be able to explain Agricultural perspectives on controlled environments.</li> </ol>   |
| Content           | <ol style="list-style-type: none"> <li>1. Definition, development, and plant ecological uses.</li> <li>2. Vegetation communities, life forms, and ecotones.</li> <li>3. Description and vegetation analysis of floristic and non-floristic.</li> <li>4. Vegetation succession, concept and theory of climax.</li> <li>5. Plant adaptation and plant adaptation test.</li> <li>6. Distribution of vegetation and plant ecotype.</li> <li>7. Definition and classification of plants, as well as plant introductions.</li> <li>8. Plant indicators and types of plant indicators.</li> <li>9. Preservation of plant germplasm.</li> <li>10. Management of plant germplasm.</li> <li>11. Natural environment and natural environmental principles.</li> <li>12. Environmental components (soil and water).</li> <li>13. Environmental components (temperature and light).</li> <li>14. The impact of the greenhouse effect on plant growth and production.</li> <li>15. Agricultural perspective in controlled environment.</li> </ol> |
| Examination forms | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites   |
| Reading list      | <ol style="list-style-type: none"> <li>1. Aiken, C. 2018. Crop Ecology: Productivity and Management in Agricultural Systems. Calista Reference. 220 p.</li> <li>2. Bohlen, P. J. and G. House. 2009. Sustainable Agroecosystem Management: Integrating Ecology, Economics and Society. CRC Press. 322 p.</li> <li>3. Dris, R., I. A. Khan and R. Niskanen. 2002. Environment and Crop Production. CRC Press. 360 p.</li> <li>4. Hamilton, S. K., J. E. Doll and G.P. Robertson. 2015. The Ecology of Agricultural Landscapes. Oxford University Press. 448 p.</li> </ol>  |

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|                        | <ol style="list-style-type: none"> <li>5. Keddy, P.A. 2017. Plant Ecology: Origins, Processes, Consequences. 2<sup>nd</sup> Edition. Cambridge University Press. 624 p.</li> <li>6. Kumar, U. 2018. Ecology and Plant Geography. Amiga Press, Inc. India. 224 p.</li> <li>7. Larcher, W. 2003. Physiological Plant Ecology: Ecophysiology and Stress Physiology of Functional Groups. Springer. 514 p.</li> <li>8. Nurman, N.J.T., C.J. Pearson and P.G. Searle. 1995. The Ecology of Tropical Food Crops. 444 p.</li> <li>9. Pugnaire, F. and F. Valladares. 2007. Functional Plant Ecology. CRC Press. 746 p.</li> <li>10. Shuka, R.S. and P. Chandel. 2005. Text Book of Plant Ecology, Ethnobotany and Soil Science. Schand and Co Ltd. 512 p.</li> <li>11. Yadav, S. 2021. Ecology and Phytogeography with Practical. Mahaveer Publications. 224 p</li> <li>12. Vandermeer, J.H. 2010. The Ecology of Agroecosystems. Illustrated Edition. Jones and Bartlist Learning. 392 p.</li> <li>13. Schulze, E-D., Beck, E., Muller-Hohenstein, K. 2002. Plant Ecology. Springer.</li> <li>14. Johnson, E.A., Miyanishi, K. 2007. Plant Disturbance Ecology the Process and the Response. Academic Press.</li> <li>15. Lambers, H., Chapin III, F.S., Pons, T.L. 2008. Plant Physiological Ecology. Springer.</li> <li>16. Myers, J.H., Bazely, D.R. 2005. Ecology and Control of Introduced Plants. Cambridge University.</li> <li>17. Gurevitch, J., Scheiner, S.M., Fox, G.A. 2006. The Ecology of Plants. Sinauer Associates.</li> <li>18. Research publications related to plant ecology.</li> </ol> |
| Date of last amendment | July 21, 2021  |

## Plant Physiology PAG 114216

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| Module Designation   | Plant Physiology  |
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| Code   | PAG 114216  |
| Semester (s) in which the module is taught                   | 3 <sup>rd</sup> semester/2 <sup>st</sup> year   |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Prof. Dr. Ir. Rujito Agus Suwignyo, M.Agr.</li> <li>2. Dr. Ir. Munandar, M.Agr.</li> <li>3. Dr. Irmawati, S.P., M. Si., M.Sc.</li> <li>4. Dr. Ir. Mery Hasmeda, M.Sc.</li> <li>5. Dr. Ir. Susilawai, M. Si.</li> <li>6. Dr. Ir. M. Umar Harun, M.S.</li> </ol>  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 19.83 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PAG 109116   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the function of each plant cell organelle and know the location and position of each organelle</li> <li>2. Understand and be able to explain the process of entering/exiting an enzyme or organic material from a cell organelle</li> <li>3. Understand and be able to explain the concept of chemical and physical properties of water in relation to plant activities</li> <li>4. Understand and be able to explain the differences in the processes of diffusion, osmosis, and imbibition that occur in plant cells</li> <li>5. Understand and be able to explain the differences in the process of water absorption by the roots, and the passage of water from the roots to the leaves of plants</li> <li>6. Understand and be able to explain the mechanism of transpiration in leaves, and the benefits and control of transpiration and guttation.</li> </ol> |

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|                   | <ol style="list-style-type: none"> <li>7. Understand and be able to explain the stages and mechanisms of movement of nutrients in root cells and plant organs</li> <li>8. Understand and be able to explain the stages N and S metabolism in plants</li> <li>9. Understand and be able to explain the mechanism of dark reaction, light reaction, energy transfer, and grouping of C<sub>3</sub>, C<sub>4</sub> and CAM plants</li> <li>10. Understand and be able to explain the process of respiration, aerobic and anaerobic respiration processes and the relationship between respiration and plant growth</li> <li>11. Understand and be able to explain the metabolism of carbohydrates and lipids and the enzymes involved in the process</li> <li>12. Understand and be able to explain the of sink-source process, and C/N ratio balance</li> <li>13. Understand and be able to explain the types and functions of plant growth hormone in terms of plant growth and development</li> <li>14. Understand and be able to explain the process of synthesis and some examples of secondary metabolites which are indicators of plant stress.</li> </ol> |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction, basic concept, and scope of crop Physiology.</li> <li>2. Anatomy, cell structure and plant tissue.</li> <li>3. Plant and water relationship.</li> <li>4. Physiological function of water.</li> <li>5. Plant growth regulator.</li> <li>6. Photosynthesis.</li> <li>7. Photosynthesis and plant growth.</li> <li>8. Plant respiration.</li> <li>9. Factors affected respiration and photorespiration.</li> <li>10. Enzyme 1.</li> <li>11. Enzyme 2.</li> <li>12. Plant growth and development.</li> <li>13. Plant growth analysis.</li> <li>14. Biomass, yield and yield components, harvest index.</li> </ol>  |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |



## Reading list

1. Angus, S.M., E. Zeiger., and I.M. Meller (eds.). 2018. Plant Physiology and development. Oxford University Press, London, UK.
2. Lakitan, B. 2018. Dasar-Dasar Fisiologi Tumbuhan. Cetakan ke 14. Rajawali Press. Jakarta. INA.
3. Jain, V.K. 2017. Fundamentals of plant physiology. Schand and Company limited. New Delhi. IND.
4. Manju, M. 2021. Plant Physiology. Horizon Books. A Division of Ignited Minds Edutech P Ltd. New Delhi, IND.
5. Pessarakli, M (Ed.). 2014. Handbook of Plant and Crop Physiology. 3rd Edition. CRC Pres. Taylor and Francis Group. New York. USA.
6. Salisbury, F.B. 1992. Plant Physiology. Thomson Press Ltd. New Delhi. IND.
7. Fitter, A.H., Hay, R.K.M. 2002. Environmental Physiology of Plants. Academic Press.
8. Luttge, U. 2008. Physiological Ecology of Topical Plants. Springer.
9. Hay, R., Porter. 2006. The Physiology of Crop Yield. Blackwell Publishing.
10. Sadras, W.O., Calderini, D.F. 2009. Crop Physiology Applications for Genetic Improvement and Agronomy. Academic Press.
11. Wilkins, M.B. 1989. Advanced Plant Physiology. Longman Scientific and Technical.
12. Pessarkli, M. 2004. Handbook of Photosynthesis Second Edition. Taylor and Francis.
13. Research publications related to plant physiology.
14. Rao, K.V.M., Raghavendra, A.S., Reddy, K.J. 2006. Physiology and Molecular Biology of Stress Tolerance in Plants. Springer.
15. Foster, G.D., Johansen, I.E., Hong, Y., Nagy, P.D. 2008. Plant Virology Protocols from Viral Sequence to Protein Function. Humana Press.
16. Hawkesford, M.J., Barraclough. 2011. The Molecular and Physiological Basis of Nutrient Use Efficiency in Crops.
17. Khan, M.A., Weber, D.J. 2008. Ecophysiology of high Salinity Tolerant Plants. Springer.
18. VK Jain. 2017. Fundamentals of Plant Physiology. Schand.
19. Lambers, H., Chapin III, F.S. 2008. Plant Physiological Ecology. Springer.
20. Stewart, P., Globig, S. 2012. Plant Physiology. Apple Academic Press.



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|                        | <p>21. William, G.H., Norman., Honer, P.A- Introduction to Plant Physiology.</p> <p>22. Nobel, P. 2009. Physicochemical and Environmental Plant Physiology. Elsevier.</p> <p>23. Scott, P. 2008. Physiology and Behavior of Plants. Wiley.</p> <p>24. Burg, S.P. 2004. Postharvest Physiology and Hypobaric Storage of Fresh Produce. CABI Publishing.</p> |
| Date of last amendment | July 21, 2021  |

## Plant Biochemistry PAG 112216

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| Module Designation   | Plant Biochemistry  |
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| Code   | PAG 112216  |
| Semester (s) in which the module is taught                   | 3 <sup>rd</sup> semester/2 <sup>st</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Mery Hasmeda, M.Sc.<br>2. Dr. Irmawati, S.P., M. Si., M.Sc.<br>3. Dr. Fikri Adriansyah, S.Si.  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PAG 10116  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the introduction and scope of Plant Biochemistry</li> <li>2. Understand and be able to explain the structure and function of cell: plasma membrane, cell walls, nucleus, cytoplasm, endoplasmic reticulum, golgi body, etc.</li> <li>3. Understand and be able to explain mechanism of water transport in a plant</li> <li>4. Understand and be able to explain diffusion, osmosis, and active transport in cells</li> <li>5. Understand and be able to explain metabolism of enzymes; enzymes in plants; definition and properties of enzymes; composition, classification, function, and structure of enzymes; how enzymes work</li> <li>6. Understand and be able to explain Protein type, protein deficiency plant characteristic, structure and function of protein, protein source and composition</li> <li>7. Understand and be able to explain characteristic, structure and protein function as well as Nucleic Acid and genetic information</li> <li>8. Understand and be able to explain the definition, characteristic, structure, function, classification, and source of lipid</li> </ol> |

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|                   | <ol style="list-style-type: none"> <li>9. Understand and be able to explain Lipids based on whether or not they can be hydrolyzed; and simple lipids, combined lipids, and derived lipids</li> <li>10. Understand and be able to explain the definition, characteristic, structure, function, classification, and source of carbohydrate</li> <li>11. Understand and be able to explain the structure of carbohydrates, reactions of monosaccharides, disaccharides, oligosaccharides, and polysaccharides</li> <li>12. Understand and be able to explain the introduction of secondary metabolites</li> <li>13. Understand and be able to explain of secondary metabolites (alkaloids and terpenoids)</li> <li>14. Understand and be able to explain categories, function and role, of secondary metabolites (alkaloids and terpenoids)</li> </ol>   |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction and Scope of Plant Biochemistry.</li> <li>2. Structure and Function of Cell.</li> <li>3. Cell Membrane and Cellular Transport 1.</li> <li>4. Cell Membrane and Cellular Transport 2.</li> <li>5. Enzyme, Characteristic and Function.</li> <li>6. Characteristic, Structure and Protein Function as well as Nucleic Acid and genetic Information 1.</li> <li>7. Characteristic, Structure and Protein Function as well as Nucleic Acid and genetic Information 2.</li> <li>8. Characteristic, Structure and Function of Lipid 1.</li> <li>9. Characteristic, Structure and Function of Lipid 2.</li> <li>10. Characteristic, Structure and Function of Carbohydrate 1.</li> <li>11. Characteristic, Structure and Function of Carbohydrate 2.</li> <li>12. Introduction of Secondary metabolites.</li> <li>13. Secondary Metabolites and Their Functions 1.</li> <li>14. Secondary Metabolites and Their Functions 2.</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed    | LCD, whiteboard, websites   |
| Reading list      | <ol style="list-style-type: none"> <li>1. Heldt H.W., B. Piechulla, F. Heldt, 2004. Plant Biochemistry. Elsevier Science.</li> <li>2. Bowsher, C. and A. Tobin. 2021. Plant Biochemistry. CRC Press.</li> <li>3. Dashek, W.V. 2018. Methods in Plant Biochemistry and Molecular Biology. CRC Press.</li> </ol>  |

4. Buchanan B.B., W. Gruissem, and R.L. Jones (eds). 2015. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists, Wiley Blackwell.
5. Lodish, H., Brek, A., Kaiser, C.A., Krieger, M., Scott, M.P., Bretscher, A., Ploegh, H., Matsudaira, P. 2007. Molecular Cell Biology. W.H Freeman and Company.
6. Buchanan, B.B., Gruissem, W., Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. Amer Society of Plant Physiologist Rock Maryland.
7. Davies, P.R. 2007. Plant Hormones Biosynthesis, Signal Transduction, Action. Springer.
8. Michael, F., Waxman. 1998. Agrochemical and Pesticide Safety Handbook. CRC Press.
9. Thillement, H., Zivy, M., Damerval, C., Mechin. 2006. Plant Proteomics Method and Protocol. Humana Press.
10. Knowles, D.A. 1998. Chemistry and Technology of Agrochemical Formulations. Springer Dordrecht.
11. Prasad, M.N.V. 2020. Agrochemicals Detection, Treatment and Remediation. Elsevier.
12. Plimmer, J.R., Gammon, D., Nancy, N., Ragsdale. 2002. Encyclopedia of Agrochemicals. Wiley Online Library.
13. Cremlyn, R.J.W. 1991. Agrochemicals: Preparation and Mode of Action. Wiley; 2nd edition.
14. Goodwin., Mercer. 1988. Introduction to Plant Biochemistry. Pergamon Press.
15. Prasad, M.N.V., Strzalka, K. 2002. Physiology and Biochemistry of Metal Toxicity and Tolerance in Plants. Kluwer Academic Publishers.
16. Lhninger, A.L., Khan, N.A. 2006. Ethylene Action in Plants. Springer.
17. Denniston, K.J., Topping, J.J., Caret, R.L. 2007. General Organic, and Biochemistry. Higher Education.
18. Pfannschmidt, T. 2009. Plant Signal Transduction Methods and Protocols. Humana Press.
19. Research publications related to plant biochemistry.

Date of last amendment

July 21, 2021

## Weed Science PAG 402216

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| Module Designation   | Weed Science  |
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| Code   | PAG 402216  |
| Semester (s) in which the module is taught                   | 3 <sup>rd</sup> semester/2 <sup>st</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Yakup, M.S.<br>2. Dr. Ir. Erizal Sodikin<br>3. Ir. Teguh Achadi, M.P.  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to the definition, scope, as well as the conception and development of weed control.<br>2. Understand and be able to explain the meaning of preventive control and its kinds.<br>3. Understand and be able to explain the meaning of mechanical weed control and its types.<br>4. Understand and be able to explain the meaning of control in terms of technical culture and its kinds.<br>5. Understand and be able to explain the meaning of biological control and its types.<br>6. Understand and be able to explain the meaning of chemical control and various classifications of herbicides.<br>7. Understand and be able to explain the selectivity and properties of herbicides in plants, as well as the herbicide application process.<br>8. Understand and be able to explain Weed control techniques on upland rice and upland rice plants.<br>9. Understand and be able to explain weed control techniques in lowland rice and tidal lowland rice.<br>10. Understand and be able to explain weed control techniques on crops. |

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|                   | <ol style="list-style-type: none"> <li>11. Understand and be able to explain weed control techniques in horticultural crops.</li> <li>12. Understand and be able to explain the weed control techniques in plantation crops.</li> <li>13. Understand and be able to explain the implementation of integrated weed control (PGT).</li> <li>14. Understand and be able to explain the economic threshold (AE) of weed control and its application.</li> </ol>  |
| Content           | <ol style="list-style-type: none"> <li>1. Definition of weeds and the history of weed science.</li> <li>2. The role and economic meaning of weeds.</li> <li>3. Weed classification.</li> <li>4. Weed dispersal.</li> <li>5. Sexual reproduction of weeds.</li> <li>6. Reproduction of weeds vegetatively.</li> <li>7. Weed dormancy and its role.</li> <li>8. Kinds of weed dormancy.</li> <li>9. Weed adaptation to environmental conditions.</li> <li>10. Weed life strategy (R-Selection, and K-Selection).</li> <li>11. Definition of competition, and the elements contested in competition.</li> <li>12. Factors that influence the competition between weeds and plants.</li> <li>13. Critical period in weed competition.</li> <li>14. Definition of allelopathy, allelopathic substances, and things related to allelopathy.</li> <li>15. Definition of control, various types of control and integrated weed control.</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Akobundu, I. O. 1987. Weed Science in The Tropic. A. Wiley Interscience Publication. New York. 522 p.</li> <li>2. Anderson, W. P. 1996. Weed Science, Principles and Applications. West Publishing Company. Minnesota, US. 388 p.</li> <li>3. Monaco T.J., S. C. Weller and Ashton FM. 2002. Weed Science, Principles and Practices. John Willey &amp; Sons Inc. New Jersey, US. 688 p.</li> <li>4. Naidu, V. S. G. R. 2012. Hand Book on Weed Identification. Directorate of Weed science Research. Jabalpur, India. 354 p.</li> </ol>  |

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|                        | <ol style="list-style-type: none"> <li>5. Radosevich, S. R., J. S. Holt and C. Ghera. 1997. Weed Ecology, Implications for Vegetations Management. John Wiley and Sons. New York. 589 p.</li> <li>6. Rao VS. 2002. Principles of Weed Science. 2<sup>nd</sup> Edition. CRC Press. Boca Ratoon, Florida. 566 p.</li> <li>7. Ross, M. A. and C. A. Lembi. 2008. Applied Weed Science Including the Ecology and Management of Invasive Plants. 3<sup>rd</sup> Edition. Pearson. 576 p.</li> <li>8. Soerjani, M., A.J.G.H. Kostermans and G. Tjitrosoepomo. 1987. Weed of rice in Indonesia. Balai Pustaka. Jakarta. 716 p.</li> <li>9. Veeramani, A. 2019. Textbook on Weed Science, Principles and Practices. New India Publishing Agency. New Delhi. 330 p.</li> <li>10. Zimdahl, R. L. 2018. Fundamentals of Weed Science 5<sup>th</sup> Edition. Academic Press. Cambridge, Massachusetts. 758 p.</li> <li>11. Research publications related to weed science.</li> </ol> |
| Date of last amendment | July 21, 2021   |

**Fundamentals of Seed Science and Technology PAG 301216**

| Module Designation   | <b>Fundamentals of Seed Science and Technology</b>   |
|--|--|
| Code   | PAG 301216   |
| Semester (s) in which the module is taught                   | 3 <sup>rd</sup> semester/2 <sup>st</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>2. Dr. Ir. Mery Hasmeda, M.Sc.<br>3. Dr. Ir. Firdaus Sulaiman, M.Si.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 34.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain describes terms in seed science and technology and the importance of using quality seeds</li> <li>2. Understand and be able to explain explains the names of global and national seed companies.</li> <li>3. Understand and be able to explain type of seed produced</li> <li>4. Understand and be able to explain the theoretical concept of plant reproduction from the spore stage to the formation of fruits and seeds</li> <li>5. Understand and be able to explain Theoretical concepts explain the types of fruit and their structure, the differences in the structure of angiosperm and gymnosperm seeds</li> <li>6. Understand and be able to explains the various chemical contents of seeds and the ratio between carbohydrates, proteins and fats between different seeds</li> <li>7. Understand and be able to explain the meaning of germination, stages of germination events and environmental conditions for seed germination</li> <li>8. Understand and be able to explain the organization and regulation of seed testing</li> </ol> |



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|                   | <ol style="list-style-type: none"> <li>9. Understand and be able to explain the importance of sampling, types and methods of sampling</li> <li>10. Understand and be able to explain the rules and procedures for standard seed testing and evaluation of the results</li> <li>11. Understand and be able to explain the difference between the vigor test and the viability test</li> <li>12. Understand and be able to describe the various vigor tests and their implementation procedures</li> <li>13. Understand and be able to explain outlines procedures for producing certified seeds</li> <li>14. Understand and be able to explain the meaning and implementation of seed production between fields and between time</li> <li>15. Understand and be able to explain the meaning and factors that cause dormancy</li> <li>16. Understand and be able to explain the procedure and implementation of several methods of breaking seed dormancy</li> <li>17. Understand and be able to explain the factors that affect the quality of seeds in storage, the process of aging and deterioration of seeds leading to death</li> </ol> |
| Content           | <ol style="list-style-type: none"> <li>1. Definition and scope of seed technology.</li> <li>2. Definition of seeds, and seedlings.</li> <li>3. Definition of orthodox seeds and recalcitrant.</li> <li>4. Biology of seeds.</li> <li>5. Seed structure and function.</li> <li>6. Sprout structure.</li> <li>7. Seed chemistry.</li> <li>8. Seed chemical reshuffle process.</li> <li>9. Seed germination, physiology of germination, factors affecting germination.</li> <li>10. Seed, viability and vigor testing.</li> <li>11. Dormancy, definition, causes of seed dormancy and treatment of dormancy breaking.</li> <li>12. Seed storage, seed deterioration and its control.</li> </ol>  |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed    | LCD, whiteboard, websites   |
| Reading list      | <ol style="list-style-type: none"> <li>1. George, R.A.T. 2009. Vegetable Seed Production. Cobbi.</li> <li>2. Basra, A.S. 2006. Seed Science and Technology. FPP.</li> <li>3. Loewer, P. 2005. Seeds the Definitive Guide to Growing, History and Lore. Timber Press.</li> </ol>   |

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|                        | 4. Research publications related to seed science technology. |
| Date of last amendment | July 21, 2021  |

## Principles of Crop Protection PPT 21116

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| Module Designation   | Principles of Crop Protection   |
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| Code   | PPT 21116   |
| Semester (s) in which the module is taught                   | 3 <sup>rd</sup> semester/2 <sup>st</sup> year   |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Dr. Ir. Suparman SHK</li> <li>2. Prof. Dr. Ir. Siti Herlinda, M. Si.</li> <li>3. Ir. Bambang Gunawan, M. Si.</li> <li>4. Arsih, S.P., M. Si.</li> </ol>   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 34 hours per semester</li> </ol>  |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>   |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain scope of crop protection; insect as crop pest and the impact of their attack to crops</li> <li>2. Understand and be able to explain mite and mice as crop pest and the impact of their attack to crops</li> <li>3. Understand and be able to explain wild pig, bird and snail as crop pest and the impact of their attack to crops</li> <li>4. Understand and be able to explain cultural and biological techniques</li> <li>5. Resistant variety, physical control and mechanical control techniques</li> <li>6. Understand and be able to explain plant quarantine and chemical control technique</li> <li>7. Understand and be able to explain the use of sterile male and integrated pest management</li> <li>8. Understand and be able to explain plant disease: how pathogen cause disease on plants</li> <li>9. Understand and be able to explain plant disease symptoms</li> <li>10. Understand and be able to explain fungi as plant pathogen</li> </ol> |

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|                   | <ol style="list-style-type: none"> <li>11. Understand and be able to explain bacteria as plant pathogen</li> <li>12. Understand and be able to explain virus and nematode as plant pathogen</li> <li>13. Understand and be able to explain exclusion, eradication, physical and cultural techniques</li> <li>14. Understand and be able to explain chemical control of plant diseases</li> </ol>   |
| Content           | <ol style="list-style-type: none"> <li>1. Scope of crop protection; insect as crop pest and the impact of their attack to crops.</li> <li>2. Mite and mice as crop pest and the impact of their attack to crops.</li> <li>3. Wild pig, bird and snail as crop pest and the impact of their attack to crops.</li> <li>4. Cultural and biological techniques</li> <li>5. Resistant variety, physical control and mechanical control techniques.</li> <li>6. Plant quarantine and chemical control technique.</li> <li>7. The use of sterile male and Integrated Pest Management.</li> <li>8. Introducing plant disease: how pathogen cause disease on plants.</li> <li>9. Plant disease symptoms.</li> <li>10. Fungi as plant pathogen.</li> <li>11. Bacteria as plant pathogen.</li> <li>12. Virus and nematode as plant pathogen.</li> <li>13. Exclusion, eradication, physical and cultural techniques.</li> <li>14. Chemical control of plant diseases.</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination<br><ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Chandrasekaran B, Annadurai K and Somasundaram. 2010. A Textbook of Agronomy. New Age International Publishers New Delhi.</li> <li>2. Pareek A, Sopory SK, Bohnert HJ, and Govindjee. 2010. Abiotic Stress in Plants. Springer, Dordrecht, Nederland.</li> <li>3. Kethan SK. 2001. Microbial Pest Control. Markel Dekker, Inc. New York.</li> <li>4. Levine MJ. 2007. Pesticides; A toxic time bomb in our midst. Praeger, London.</li> <li>5. Agrios GN. 2005. Plant Pathology 5th Ed. Elsevier Academic Press, New York.</li> <li>6. Ebbels DL. 2003. Principles of Plant Health and Quarantine. CABI Publishing, Cambridge.</li> </ol>  |

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|                        | 7. Research publications related to crop protection. |
| Date of last amendment | June 30, 2021  |

## Soil Fertility PTN 20116

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| Module Designation   | Soil Fertility   |
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| Code   | PTN 20116  |
| Semester (s) in which the module is taught                   | 3 <sup>rd</sup> semester/2 <sup>st</sup> year  |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Prof. Dr. Ir. Dedik Budianta, MS.</li> <li>2. Ir, Marsi, M.Sc, Ph.D.</li> <li>3. Dr. Ir. A. Napoleon, M.P.</li> <li>4. Dr. Ir. Agus Hermawan, M.S.</li> <li>5. Prof. Dr. Ir. Nuni Gofar, M.S.</li> <li>6. Dr. Ir. Madjid Rohim, M.S.</li> <li>7. Ir. Sabarudin, MSc. Ph.D.</li> <li>8. Ir. Siti Nurul Aidil Fitri, M.S.</li> <li>9. Dr. Ir. Madjid Rohim, M.S.</li> </ol>  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 34.00 hours per semester</li> </ol>  |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>  |
| Credit points  | 3 credits (equivalent with 48.36 ECTS)   |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain definition of soil fertility for agriculture</li> <li>2. Understand and be able to explain function of soil fertility for agriculture</li> <li>3. Understand and be able to explain history of soil fertility</li> <li>4. Understand and be able to explain factors affecting the plant growth</li> <li>5. Understand and be able to explain factors affecting the plant measurement</li> <li>6. Understand and be able to explain macro elements of soil nutrients for agriculture</li> <li>7. Understand and be able to explain micro elements of soil nutrients for agriculture</li> <li>8. Understand and be able to explain soil nutrients role for plant growth</li> </ol> |

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|                        | <p>9. Understand and be able to explain mechanisms nutrient uptake for plant growth</p> <p>10. Understand and be able to explain SOM to improve soil fertility</p> <p>11. Understand and be able to explain liming efforts to improve soil fertility</p> <p>12. Understand and be able to explain symptoms of nutrient deficiency</p> <p>13. Understand and be able to explain soil fertility management</p> <p>14. Understand and be able to explain soil fertility evaluation</p>  |
| Content                | <p>1. Introduction of soil fertility for agriculture (definition, function, history of soil fertility).</p> <p>2. Factors affecting the plant growth and its measurements.</p> <p>3. Principles of soil and plant relationship for plant growth.</p> <p>4. Soil nutrients for agriculture (Macro and micro elements and its role for plant growth).</p> <p>5. Mechanisms nutrient uptake for plant growth.</p> <p>6. Efforts to improve soil fertility (SOM and liming).</p> <p>7. Soil fertility evaluation.</p> <p>8. Examination.</p>   |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <p>1. Essays questions</p> <p>2. Practical works</p> <p>3. Writing Case Paper</p> <p>4. Oral presentation</p>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <p>1. Adams, F. 1984. Soil Acidity and Liming. Soil Sci. Soc. Am. Inc. Madison. USA.</p> <p>2. Marschner, H. 1986. Mineral nutrition in Higher Plants. Academic. Press Inc. London. 674. P.</p> <p>3. Mengel, K. and E.A. Kirkby. 1987. Principles of plant nutrition. International Potash Institute. Bern, Switzerland. 687 p.</p> <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.</p> <p>5. Tisdale, S.L., W.L. Nelson, and J.D. Beaton. 1984. Soil Fertility and Fertilizer. Macmillan Pub. Co., New York.</p> <p>6. Budianta, D and D. Ristiani. 2013. Pengelolaan Kesuburan Tanah. Unsri Press.</p> <p>7. Stevenson, F.J. 1994. Humus Chemistry: Genesis, composition and reaction. 2nd edition. Wiley.</p> <p>8. Research publications related to soil fertility.</p> |
| Date of last amendment | June 30, 2021  |

Semester 4

Experimental Design PER 24116

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| Module Designation   | Experimental Design   |
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| Code   | PER 24116   |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year   |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Siti Herlinda, M.Si.<br>2. Prof. Ir. Suwandi, M.Agr., Ph.D.<br>3. Dr. Rahmat Pratama, S.Si.<br>4. Arsi, S.P., M.Si.  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PER 21115  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain basic principle, assumption, application, and experimental design models<br>2. Understand and be able to explain single factor experimental design: Completely random design<br>3. Understand and be able to explain single factor experimental design: Randomized complete<br>4. Understand and be able to explain mean comparison methods: LSD, HSD. Duncann, and Contrast analysis, Application and Calculation example<br>5. Understand and be able to explain factorial design in agriculture. Application and Calculation examples<br>6. Understand and be able to explain factorial spit plot design in agriculture. Application and Calculation exmples<br>7. Understand and be able to explain simple regression, and correlation analysis in agricultural<br>8. Understand and be able to explain general problem, precision, accuracy, and bias in agricultural research; preventon and remediatin (case study) |



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|                   | 9. Understand and be able to explain general example in calculation of ANOVA, LSD, HSD, Duncann, and contrast analysis by using computer program (Excel and SAS)   |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction: Basic principle, assumption, application, and experimental design models.</li> <li>2. Single factor experimental design: Completely random design.</li> <li>3. Single factor experimental design: Randomized complete</li> <li>4. Mean comparison methods: LSD, HSD, Duncann, and Contrast analysis. Application and calculation example</li> <li>5. Factorial design in agriculture. Application and calculation examples.</li> <li>6. Factorial split plot design in agriculture. Application and calculation examples</li> <li>7. Simple regression, and correlation analysis in agricultural</li> <li>8. General problem, precision, accuracy, and bias in agricultural research; prevention and remediation (case study)</li> <li>9. General example in calculation of ANOVA, LSD, HSD, Duncann, and contrast analysis by using computer program (Excel and SAS)</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Casler, M.D. 2014. Fundamentals of Experiment Design: Guidelines for Designing successful Experiments. Agronomy Journal 107 (2): 692 – 705.</li> <li>2. Gaspersz, V. 1995. Teknik analisis dalam penelitian percobaan 2. Transito. Bandung. 718 h.</li> <li>3. Gomez, K.A. and A.A. Gomez. 1984. Statistical Procedures for Agricultural Research. A Wiley Interscience Publication, John Wiley and Sons. New York. 680 p.</li> <li>4. Hashmand, R. 2017. Design Experiments for Agricultural and The Natural Sciences. Chapman and Hall/CRC. New York. 456 p.</li> <li>5. Petersen, R.G. 1994. Agricultural Field Experiments, Design and Analysis. CRC Press. 426 p.</li> <li>6. Kwanchai A. Gomez, Arturo A. Gomez. 1984. Statistical Procedures for Agricultural Research. A Wiley-Interscience publication.</li> </ol>  |

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|                        | <ol style="list-style-type: none"> <li>7. McDonald, J.H. 2014. Handbook of Biological Statistics (3rd ed.). Sparky House Publishing, Baltimore, Maryland.</li> <li>8. Bender, F.E., L.W. Douglass, and A. Kramer. 1989. Statistical Methods for Food and Agriculture. FPP Press, London, UK.</li> <li>9. Gomez, K.A. and A.A. Gomez. 2015. Statistical Procedures for Agricultural Research. UI Press, Jakarta.</li> <li>10. Milliken, G.A. and D.E. Johnson. 1992. Analysis of Messy Data. Chapman and Hall, New York, USA.</li> <li>11. Saefuddin, A., K.A. Notodipuro, A. Alamudi, dan K. Sadik. 2009. Statistika Dasar. PT. Grasindo, Jakarta.</li> <li>12. Supardi, U.S. 2011. Aplikasi Statistika dalam Penelitian. PT. Prima Ufuk Semesta, Jakarta.</li> <li>13. SAS Institute. 1983. SAS Program and User Guides. SAS Institute, NC, USA.</li> <li>14. Steel, R.G.D and J.H. Torrie. 1980. Principles and Procedures of Statistics. McGraw Hill Book Co., New York, USA.</li> <li>15. Research publications related to experimental design.</li> </ol> |
| Date of last amendment | June 30, 2021  |

## Plant Breeding PAG 110216

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| Module Designation   | Plant Breeding   |
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| Code   | PAG 110216   |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year  |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Dr. Ir. E. S. Halimi, M.Sc.</li> <li>2. Dr. Ir. Dwi Putro Priadi, M.Sc.</li> <li>3. Dr. Ir. Mery Hasmeda, M.Sc.</li> <li>4. Dr. Fikri Adriansyah, S.Si.</li> </ol>   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 19.83 hours per semester</li> </ol>  |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | Passed PAG 108116  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the definition and role of plant breeding in crop production</li> <li>2. Understand and be able to explain the Introduction, review in modern genetic, role, general conceit in plant breeding procedures.</li> <li>3. Understand and be able to explain basic concept, understanding, dan creating variation as basic capital in plant breeding</li> <li>4. Understand and be able to explain the Introduction of plants and genetic diversity</li> <li>5. Understand and be able to explain principles of genetics in plant breeding. Methods of plant reproduction.</li> <li>6. Understand and be able to explain Cumulative trait inheritance and heritability Genotype x environment interactions; Inbreeding and heterosis</li> <li>7. Understand and be able to explain the Parent selection</li> <li>8. Understand and be able to explain establishment of a selection population through crosses</li> <li>9. Understand and be able to explain Various methods for conducting advanced selection</li> </ol> |

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|                          | <ol style="list-style-type: none"> <li>10. Understand and be able to explain Several methods of plant breeding to obtain varieties based on the character of the plant</li> <li>11. Understand and be able to explain the Capita selecta in screening methods, selection methods utilized in modern plant breeding for abiotic stress tolerance (case study)</li> <li>12. Understand and be able to explain Capita selecta in screening methods, selection methods utilized in modern plant breeding for biotic stress tolerance (case study)</li> <li>13. Understand and be able to explain Capita selecta and case study in plant breeding program for cross pollinated plants for abiotic stress tolerance (case study)</li> <li>14. Understand and be able to explain Capita selecta in screening methods, selection methods utilized in modern plant breeding for biotic stress tolerance (case study)</li> </ol>  |
| <p>Content</p>           | <ol style="list-style-type: none"> <li>1. Definition and role of plant breeding in crop production.</li> <li>2. Introduction, review in modern genetic, role, general conceit in plant breeding procedures.</li> <li>3. Basic concept, understanding, dan creating variation as basic capital in plant breeding.</li> <li>4. Introduction of plants and genetic diversity.</li> <li>5. Principles of genetics in plant breeding.</li> <li>6. Methods of plant reproduction.</li> <li>7. Cumulative trait inheritance and heritability.</li> <li>8. Genotype x environment interactions; Inbreeding and heterosis.</li> <li>9. Parent selection.</li> <li>10. Establishment of a selection population through crosses.</li> <li>11. Various methods for conducting advanced selection.</li> <li>12. Several methods of plant breeding to obtain varieties based on the character of the plant.</li> <li>13. Capita selecta in screening methods, selection methods utilized in modern plant breeding for abiotic stress tolerance (case study).</li> <li>14. Capita selecta in screening methods, selection methods utilized in modern plant breeding for biotic stress tolerance (case study).</li> <li>15. Capita selecta and case study in plant breeding program for cross pollinated plants for abiotic stress tolerance (case study).</li> <li>16. Capita selecta in screening methods, selection methods utilized in modern plant breeding for biotic stress tolerance (case study).</li> </ol> |
| <p>Examination forms</p> | <p>Quiz, Mid-terms and Final Examination</p>  |

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|                        | <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Nduat. 1996. Physiology of Stress Tolerance in Rice. IRRI.</li> <li>2. Prasad, M.N.V., Strzalka, K. 2002. Physiology and Biochemistry of Metal Toxicity and Tolerance in Plants. Kluwer Academic Publishers.</li> <li>3. Morot-Gaudry, J.F., Lea, P., Briat, J-F. 2004. Functional Plant Genomics. Science Publishers.</li> <li>4. Buchanan., Gruissem., Jones. 2000. Biochemistry &amp; Molecular Biology of Plants. American Society of Plant Physiology.</li> <li>5. Kang, M.S., Priyadarshan, P.M. 2007. Breeding Major Food Staples. Blackwell Publishing.</li> <li>6. Acquaah, G. 2012. Principles of Plant Genetics and Breeding, 2nd Edition. Wiley-Blackwell.</li> <li>7. Janick, J. 2008. Plant Breeding Reviews. Wiley-Blackwell.</li> <li>8. Bharadwaj, D.N. 2019. Advanced Molecular Plant Breeding; Meeting the Challenge of Food Security. Apple Academic Press.</li> <li>9. Brown, J., Caligari, P. 2008. An Introduction to Plant Breeding 1st Edition. Wiley-Blackwell; 1st edition.</li> <li>10. Allard, R.W. 1999. Principles of Plant Breeding. John Wiley &amp; Sons.</li> <li>11. Koelling, C. 2018. Principles of Plant Breeding. Syrawood Publishing House.</li> <li>12. Research publications related to plant breeding.</li> </ol> |
| Date of last amendment | July 21, 2021   |

## Annual Crops Cultivation PAG 204216

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| Module Designation   | Annual Crops Cultivation  |
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| Code   | PAG 204216  |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year   |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Rujito Agus Suwignyo, M.Agr.<br>2. Ir. Teguh Achadi, M.P.<br>3. Fitra Gustiar, S.P., M.Si.<br>4. Ir. Sri Sukarmi, M.P.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 34.00 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand about annual crops boundaries.<br>2. Understand and able to explain the economic value of annual crops and their functions.<br>3. Understand and able to explain the development of annual crops in Indonesia.<br>4. Understand and able to explain the classification of annual crops.<br>5. Understand and able to explain the growth factors and yield of annual crops.<br>6. Understand and able to explain internal factors determining growth and yield of annual crops.<br>7. Understand and able to explain external factors determining growth and yield of annual crops.<br>8. Understand and able to explain cultivation stages of annual crops.<br>9. Understand and able to explain sugarcane cultivation.<br>10. Understand and able to explain tobacco cultivation.<br>11. Understand and able to explain cereal crops cultivation.<br>12. Understand and able to explain bean crops cultivation.<br>13. Understand and able to explain tuber cultivation. |
| Content  | 1. Annual crops boundaries.   |

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|                        | <ol style="list-style-type: none"> <li>2. The economic value of annual crops and their functions.</li> <li>3. The development of annual crops in Indonesia.</li> <li>4. The classification of annual crops.</li> <li>5. The growth factors and yield of annual crops.</li> <li>6. Internal factors determining growth and yield of annual crops.</li> <li>7. External factors determining growth and yield of annual crops.</li> <li>8. Cultivation stages of annual crops.</li> <li>9. Sugarcane cultivation.</li> <li>10. Tobacco cultivation.</li> <li>11. Cereal crops cultivation.</li> <li>12. Bean crops cultivation.</li> <li>13. Tuber cultivation.</li> </ol> |
| Examination forms      | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Morachan, Y.B. 1978. Crop Production and Management. Oxford &amp;Ibh Publishing Co., 268 P.</li> <li>2. Matheson, E.M., Lovet, J.V., Blair, G.Y. &amp; R.Y. Lawn, 1975. Annual Crop Production. A Course Manual in Annual Crop Production Academy Press. Pty. Ltd. Brisbane. 139 P.</li> <li>3. Kuswanto, H. 1996. Dasar-Dasar Teknologi Produksi Tanaman Pangan. Penerbit Andi. Yogyakarta.</li> <li>4. Research publications related to annual crops cultivation.</li> <li>5. Research publications related to annual crops cultivation.</li> </ol>   |
| Date of last amendment | July 21, 2021   |

## Perennial Crops Cultivation PAG 205216

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| Module Designation   | Perennial Crops Cultivation  |
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| Code   | PAG 205216   |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. M. Umar Harun, M.S.<br>2. Dr. Ir. Erizal Sodikin<br>3. Dr. Ir. Yakup, M.S.<br>4. Dr. Ir. Marlina, M.Si.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 34.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and able to explain introduction to perennial crops cultivation.<br>2. Understand and able to explain plant breeding and superior clone of Rubber.<br>3. Understand and able to explain cultivation of rubber plant.<br>4. Understand and able to explain plant breeding and superior variety of oil palm.<br>5. Understand and able to explain cultivation of Oil palm.<br>6. Understand and able to explain plant breeding and superior clone of Coffee.<br>7. Understand and able to explain cultivation of Coffee.<br>8. Understand and able to explain plant breeding and superior variety of coconut.<br>9. Understand and able to explain cultivation of Coconut.<br>10. Understand and able to explain cultivation of Pepper.<br>11. Understand and able to explain cultivation of Cacao.<br>12. Understand and able to explain cultivation of Clove.<br>13. Understand and able to explain cultivation of Areca palm. |
| Content  | 1. Cultivation of Aren   |



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|                        | <ol style="list-style-type: none"> <li>2. Introduction to perennial crops cultivation.</li> <li>3. Plant breeding and superior clone of Rubber.</li> <li>4. Cultivation of rubber plant.</li> <li>5. Plant breeding and superior variety of oil palm.</li> <li>6. Cultivation of Oil palm.</li> <li>7. Plant breeding and superior clone of Coffee.</li> <li>8. Cultivation of Coffee.</li> <li>9. Plant breeding and superior variety of coconut.</li> <li>10. Cultivation of Coconut.</li> <li>11. Cultivation of Pepper.</li> <li>12. Cultivation of Cacao.</li> <li>13. Cultivation of Clove.</li> <li>14. Cultivation of Areca palm.</li> <li>15. Cultivation of Aren.</li> </ol> |
| Examination forms      | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Tyasmoro S.Y., P.N. Permanasari, dan A. Saitama. 2021. Teknologi Produksi Tanaman Perkebunan. Universitas Brawijaya Press. 168 pp.</li> <li>2. Sunarko. 2014. Budidaya Kelapa Sawit di Berbagai Jenis Lahan. Agromedia. 208 pp.</li> <li>3. Corley, R.H.V. and P.B.H. Tinker. 2015. The Oil Palm. Wiley Blackwell. 680 pp.</li> <li>4. Research publications related to perennial crops cultivation.</li> <li>5. Research publications related to perennial crops cultivation.</li> </ol>  |
| Date of last amendment | July 21, 2021  |

**Horticultural Crops Cultivation PAG 206216**
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| <b>Module Designation</b>                                    | <b>Horticultural Crops Cultivation</b>  |
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| Code   | PAG 206216  |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year   |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Benyamin Lakitan, M.Sc.<br>2. Dr. Ir. Muhammad Ammar, M.P.<br>3. Dr. Ir. Susilawati, M.Si.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 34.00 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and able to explain definition, development, nutritional and economic value of horticultural crops.<br>2. Understand and able to explain horticultural plant classification.<br>3. Understand and able to explain growth factors and development of horticultural crops: Vegetables, Fruits, Ornamental and Biopharmaceuticals. |
| Content  | 1. Definition, development, nutritional and economic value of horticultural crops.<br>2. Horticultural plant classification.<br>3. Growth factors and development of horticultural crops: Vegetables, Fruits, Ornamental and Biopharmaceuticals.  |
| Examination forms  | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works<br>3. Writing Case Paper<br>4. Oral presentation   |
| Media employed   | LCD, whiteboard, websites   |
| Reading list   | 1. Badan Pusat Statistik.2012. Konsep dan Definisi Baku Statistik Pertanian 2012. Subdirektorat Pengembangan.   |

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|                        | <ol style="list-style-type: none"> <li>2. Standardisasi dan Klasifikasi Statistik Direktorat Pengembangan Metodologi Sensus dan Survei. 478 hal. ISBN: 978-979-064-592-9.</li> <li>3. Lakitan, B. 1995. Hortikultura Teori, Budidaya dan Pasca Panen. PT Raja Grafindo Persada. Jakarta. 220 hal.</li> <li>4. Susilawati. 2017. Mengenal Tanaman Sayuran (Prospek dan pengelompokkan). Unsri Press. Palembang. 114 hal</li> <li>5. Syukur, M., S.Sujiprihati., R.Yunianti. 2012. Teknik Pemuliaan Tanaman. Penebar Swadaya. Bogor. 348 hal.</li> <li>6. Adams, C., Early, M., Brook, J., Bamford, K. 2014. Principles of Horticulture: Level 2 1st Edition. Routledge.</li> <li>7. Dawson, P. 2011. A Handbook for Horticultural Students. Peter Dawson.</li> <li>8. Capon, B. 2010. Botany for Gardeners, 3rd Edition. Timber Press.</li> <li>9. Bird, C. 2014. The Fundamentals of Horticulture: Theory and Practice 1st Edition. Cambridge university Press.</li> <li>10. Pollan, M. 2001. The Botany of Desire: A Plant's-Eye View of the World. Random House Trade Paperbacks.</li> <li>11. Hodge, G. 2013. Practical Botany for Gardeners: Over 3,000 Botanical Terms Explained and Explored. University of Chicago Press.</li> <li>12. Poerwanto, R., Susula, A.D. 2021. Teknologi Hortikultura. PT Penerbit IPB Press.</li> <li>13. Jain, S.M., Ochatt, S.J. 2010. Protocols for In Vitro Propagation of Ornamental Plants. Humana Press.</li> <li>14. Research publications related to horticultural crops cultivation.</li> </ol> |
| Date of last amendment | July 21, 2021   |

## Plant Nutrition PAG 303216

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| Module Designation   | Plant Nutrition  |
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| Code   | PAG 303216   |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. M. Umar Harun, M.S.<br>2. Dr. Ir. Susilawati, M. Si.<br>3. Dr. Irmawati, S.P., M. Si., M.Sc.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain about essential nutrients: classification, function and nutrients mobility in plants.</li> <li>2. Understand and be able to explain absorption mechanism by roots and nutrients transport through xylem and phloem.</li> <li>3. Understand and be able to explain the roles and functions of nutrients in photosynthesis, respiration, plant growth and yield production.</li> <li>4. Understand and be able to explain about nitrogen and phosphorus cycles.</li> <li>5. Understand and be able to explain about macro nutrients: N, P, K, Ca, Mg, S.</li> <li>6. Understand and be able to explain about micro nutrients: Mn, Cu, Zn, Fe, Cl, B, Mo.</li> <li>7. Understand and be able to explain about beneficial nutrients: Na, Si, Al, Co, Se, V.</li> <li>8. Understand and be able to explain about nutrient deficiency and toxicity in plants.</li> <li>9. Understand and be able to explain about endosymbiosis of plants and rhizobium</li> </ol> |

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|                        | <ol style="list-style-type: none"> <li>10. Understand and be able to explain about endosymbiosis of plants and mycorrhizae.</li> <li>11. Understand and be able to explain about foliar fertilization: the application and absorption mechanism.</li> <li>12. Understand and be able to explain about nutrients analysis in soil and plant tissues.</li> <li>13. Understand and be able to explain about fertilizer and fertilization.</li> <li>14. Understand and be able to explain about nutrient management in hydroponic system</li> </ol>  |
| Content                | <ol style="list-style-type: none"> <li>1. Classification and function of plant nutrients.</li> <li>2. Mechanism of nutrient transport.</li> <li>3. Plant nutrients, Photosynthesis and respiration.</li> <li>4. Assimilation of N and P.</li> <li>5. Assimilation of S, Mg, Ca and K.</li> <li>6. Micronutrient assimilation.</li> <li>7. Beneficial plant nutrients.</li> <li>8. Fixation of N.</li> <li>9. Mycorrhizae.</li> <li>10. Foliar fertilizer.</li> <li>11. Sampling of plant nutrients.</li> <li>12. Fertilizer and fertilizing plants.</li> <li>13. Hydroponics.</li> <li>14. Fertilization recommendation.</li> </ol>  |
| Examination forms      | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Kiss, S., Simihaian. 2002. Improving Efficiency of Urea Fertilizers by Inhibition of Soil Urease Activity. Kluwer Academic Publishers.</li> <li>2. Marschner, H. and P. Marschner. 1995. Mineral Nutrition of Higher Plants. Academic Press. 889 pp.</li> <li>3. Barker, A.V. and D.J. Pilbeam. 2016. Handbook of Plant Nutrition. CRC Press. 632 pp.</li> <li>4. Mengel, K., Kirkby, E.A. 1982. Principles of Plant Nutrition International Potash Institute.</li> <li>5. Epstein, E., Bloom, A.J. 2005. Mineral Nutrition of Plants: Principles and Perspective, Sinauer.</li> <li>6. Amanco, S., Stule, I. 2009. Nitrogen Acquisition and Assimilation in Higher Plants. Kulwer Academic Publishers.</li> <li>7. Research publications related to plant nutrition.</li> </ol> |
| Date of last amendment | July 21, 2021  |

## Organic Agriculture PAG 602216

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| Module Designation   | Organic Agriculture   |
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| Code   | PAG 602216  |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Muhammad Ammar, M.P.<br>2. Dr. Ir. Susilawati, M.Si.<br>3. Dr. Ir. Maria Fitriana, M.Sc.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the definition of organic agriculture.<br>2. Understand and be able to explain history, role and development of organic agriculture.<br>3. Understand and be able to explain sustainable agriculture system.<br>4. Understand and be able to identify the difference between organic and inorganic products.<br>5. Understand and be able to explain the integrated agriculture system.<br>6. Understand and be able to explain SRI rice cultivation system.<br>7. Understand and be able to explain the usage of agricultural waste, livestock, and garbage as the source of organic fertilizer.<br>8. Understand and be able to explain about compost and composting<br>9. Understand and be able to explain the role of compost in improving the quality and nutrient of organic fertilizer<br>10. Understand and be able to identify various types of compost. |

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|                   | <ol style="list-style-type: none"> <li>11. Understand and be able to explain fertilizers in organic agriculture</li> <li>12. Understand and be able to explain the various types of organic fertilizer.</li> <li>13. Understand and be able to explain nutrient management in organic agriculture and the role of organic matter in providing nutrients.</li> <li>14. Understand and be able to explain the benefits of green manure on soil fertility.</li> <li>15. Understand and be able to identify various types of cropping patterns in organic agriculture system.</li> <li>16. Comprehend product certification in organic agriculture system.</li> </ol>  |
| Content           | <ol style="list-style-type: none"> <li>1. The definition of organic agriculture.</li> <li>2. The history, role and development of organic agriculture.</li> <li>3. Sustainable agriculture system.</li> <li>4. Differences of organic and inorganic products.</li> <li>5. Integrated agriculture system.</li> <li>6. SRI rice cultivation system.</li> <li>7. The usage of agricultural waste, livestock, and garbage as the source of organic fertilizer.</li> <li>8. Compost and composting.</li> <li>9. The role of compost in improving the quality and nutrient of organic fertilizer.</li> <li>10. Various types of compost.</li> <li>11. Fertilization in organic agriculture.</li> <li>12. The various types of organic fertilizer.</li> <li>13. Nutrient management in organic agriculture and the role of organic matter in providing nutrients.</li> <li>14. The benefits of green manure on soil fertility.</li> <li>15. Various types of cropping patterns in organic agriculture system.</li> <li>16. Product certification in organic agriculture system</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Solomons, T.W.G., Fryhle, C.B. 2011. Organic Farming. John Wiley &amp; Sons Inc.</li> <li>2. Newton, J. 2004. Profitable Organic Farming Second Edition. Blackwell Publishing.</li> <li>3. Mengel, K., Kirkby, E.A. 2001. Principles of Plant Nutrition. Kluwer Academic Publishers.</li> </ol>  |

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|                        | <ol style="list-style-type: none"> <li>4. Altieri, M. A. 1996. Agroecology: The science of Sustainability Agriculture, West View Press. Colorado.</li> <li>5. Francis, C.H. 2009. Organic Farming; the Ecological System. Agronomy Monograph 54. Amsoc Agron Inc.</li> <li>6. Reijntjes, C., Bertus Havenkort dan Waters Bayer. 2003. Pertanian Masa Depan. Pengantar untuk Pertanian Berkelanjutan dengan Input Luar Rendah. Penerbit Kanisius, Yogyakarta.</li> <li>7. Sutanto Rachman, 2002. Penerapan Pertanian Organik (Pemasyarakatan dan Pengembangannya). Penerbit Kanisius. Yogyakarta. 219 pp.</li> <li>8. Green manure (Pupuk hijau). <a href="http://www.lestarimandiri.org.id/pupuk-organik/pupuk-hijau/273-tanaman-pupuk-hijau.html">http://www.lestarimandiri.org.id/pupuk-organik/pupuk-hijau/273-tanaman-pupuk-hijau.html</a></li> <li>9. Research publications related to organic agriculture.</li> </ol> |
| Date of last amendment | July 21, 2021   |



## Farm Management\* ABI 24216

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| Module Designation   | Farm Management*  |
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| Code   | ABI 24216   |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year   |
| Person responsible for the module                            | 1. Dr. Yunita, S.P., M.Si<br>2. Henny Malini, S.P., M.Si<br>3. Ir. Yulius, M.M.<br>4. Dr. Erni Purbiyanti, S.P., M.Si   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the definition of farm management.<br>2. Understand and be able to explain about farming and agribusiness.<br>3. Understand and be able to identify farm classification.<br>4. Understand and be able to explain farming pattern.<br>5. Understand and be able to identify types and patterns of farming.<br>6. Understand and be able to explain farming structure.<br>7. Understand and be able to explain farm planning.<br>8. Understand and be able to explain farm production factors.<br>9. Understand and be able to explain land management in farming.<br>10. Understand and be able to explain the role of capital in farming.<br>11. Understand and be able to explain the role of human resources in farming.<br>12. Understand and be able to explain about farming costs.<br>13. Understand and be able to explain about farming income.<br>14. Understand and be able to conduct farming research. |

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| Content                | <ol style="list-style-type: none"> <li>1. Definition Farm Management.</li> <li>2. Farming and Agribusiness.</li> <li>3. Farm Classification.</li> <li>4. Farming Pattern.</li> <li>5. Types and Patterns of Farming.</li> <li>6. Farming Structure.</li> <li>7. Farm Planning.</li> <li>8. Farm Production Factors.</li> <li>9. Land Management in Farming.</li> <li>10. The Role of Capital in Farming.</li> <li>11. The Role of Human Resources in Farming.</li> <li>12. Farming Costs.</li> <li>13. Farming Income.</li> <li>14. Farming Research.</li> </ol>   |
| Examination forms      | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Writing Project Paper</li> <li>3. Oral presentation</li> </ol>  |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Tohir, A.K. 1993. A strand of Indonesian Farming Knowledge. Rineka Cipta. Jakarta.</li> <li>2. Soekartawi, et al. 1990. Farming Science and Research for Small Farmer Development, UI Press. Jakarta.</li> <li>3. Soekarno. 2002. Farming Analysis. University of Indonesia (UI-Press). Jakarta.</li> <li>4. Mubyarto. 2000. Introduction to Agricultural Economics. LP3ES.</li> <li>5. Ken Suratiyah. 2002. Agricultural Science. Penebar Swadaya.</li> <li>6. Suwardie. 2008. Farm Management. Wimaya Press UPN “Veteran” Yogyakarta.</li> <li>7. Kay. D. Ronald, Edwards, M. William, Duff, A., Patricia. Farm Management (Text Book). Hill Education.</li> <li>8. Research publications related to farm management.</li> </ol> |
| Date of last amendment | July 16, 2021  |

## Tissue Culture\* PAG 605216

| Module Designation   | Tissue Culture*  |
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| Code   | PAG 605216   |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Mery Hasmeda, M.Sc.<br>2. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>3. Dr. Irmawati, S.P., M.Si., M.Sc.<br>4. Dr. Ir. Lidwina Ninik S, M.Si.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Elective Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain basic knowledge and term used in tissue culture.<br>2. Understand and be able to explain about cell totipotency, proliferation, cell differentiation and dedifferentiation, growth factors that benefit tissue culture.<br>3. Understand and be able to explain about tissue culture laboratory requirements and principle of sterilization.<br>4. Understand and be able to prepare tissue culture media.<br>5. Understand and be able to explain the influence of explant to the growth and development of tissue.<br>6. Understand and be able to master several techniques of tissue culture.<br>7. Understand and be able to explain about micropropagation.<br>8. Understand and be able to explain the benefit of tissue culture for producing the plants with new traits.<br>9. Understand and be able to explain about embryo culture.<br>10. Understand and be able to explain about anther and pollen culture. |

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|                        | 11. Understand and be able to master the application of tissue culture  |
| Content                | <ol style="list-style-type: none"> <li>1. Introduction to tissue culture.</li> <li>2. Cell totipotency, proliferation, cell differentiation and dedifferentiation, growth factors that benefit tissue culture.</li> <li>3. Tissue culture laboratory requirements and principle of sterilization.</li> <li>4. Tissue culture media.</li> <li>5. The influence of explant to the growth and development of tissue.</li> <li>6. Several techniques of tissue culture.</li> <li>7. Micropropagation.</li> <li>8. Tissue culture for producing the plants with new traits.</li> <li>9. Embryo culture.</li> <li>10. Anther and pollen culture.</li> <li>11. Application of tissue culture in vitro I.</li> <li>12. Application of tissue culture in vitro II.</li> <li>13. Application of tissue culture in vitro III.</li> <li>14. Application of tissue culture in vitro IV.</li> </ol> |
| Examination forms      | Quiz, Mid-terms and Final Examination<br><ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Kruse Jr., P.F. and M.K. Patterson Jr. (eds). 1973. Tissue Culture: Methods and Application. Academic Press Inc.</li> <li>2. Smith, R.H. 1992. Plant Tissue Culture: Techniques and Experiments. Academic Press, Inc.</li> <li>3. Razdan, M.K. 2003. Introduction to Plant Tissue Culture. Science Publishers, Inc.</li> <li>4. Research publications related to plant tissue culture.</li> <li>5. Ibaraki, Y., Gupta, S.D. 2006. Plant Tissue Culture Engineering. Springer.</li> <li>6. Cassells, A.C., Gahan, P.B. 2006. Dictionary of Plant Tissue Culture. FPP,</li> <li>7. George, E.F., Hall, M.A., Klerk, G-J.D. 2008. Plant Propagation by Tissue Culture. Springer.</li> <li>8. Laimer, M., Rucker, W. 2003. Plant Tissue Culture. Springer.</li> <li>9. Research publications related to tissue culture.</li> </ol>              |
| Date of last amendment | July 21, 2021   |

## Hydroponics\* PAG 606216

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| Module Designation   | Hydroponics*  |
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| Code   | PAG 606216  |
| Semester (s) in which the module is taught                   | 4 <sup>th</sup> semester/2 <sup>nd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Susilawati, M.Si.<br>2. Dr. Ir. Muhammad Ammar, M.P.<br>3. Dr. Ir. Irmawati, S.P., M.Sc., M.Sc.<br>4. Fitra Gustiar, S.P., M.Si.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand the basic knowledge of hydroponics.<br>2. Understand the history and development of hydroponics.<br>3. Understand and be able to identify the hydroponic systems.<br>4. Understand the types and requirements for hydroponics media.<br>5. Understand and be able to explain the production system of hydroponics.<br>6. Understand and be able to explain the role of nutrient elements (macro and micro) and nutrient managements in hydroponics<br>7. Understand and be able to formulate the nutrients for hydroponics.<br>8. Understand and be able to explain the factors affecting plants cultivated using hydroponic system.<br>9. Understand and be able to explain hydroponics cultivation techniques.<br>10. Understand about hydroponics equipment.<br>11. Understand and be able to master the application of hydroponics. |
| Content  | 1. Introduction to hydroponics.   |

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|                        | <ol style="list-style-type: none"> <li>2. Hydroponics development.</li> <li>3. Hydroponic systems.</li> <li>4. Medium of hydroponics.</li> <li>5. Production system of hydroponics.</li> <li>6. Macro nutrients for hydroponics</li> <li>7. Micro nutrients for hydroponics</li> <li>8. Nutrients formulation in hydroponics.</li> <li>9. Growth factor.</li> <li>10. Hydroponics cultivation techniques.</li> <li>11. Hydroponics equipment.</li> <li>12. Application of hydroponics.</li> </ol>   |
| Examination forms      | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Bridgewood, L. 2008. Hydroponics soilless gardening explained. The Crowood Press.</li> <li>2. Resh, H.M. 2002. Hydroponic for Food Production: A definitive guidebook for the advanced home gardener and the commercial hydroponic grower. 6<sup>th</sup> Ed. CRC Press, New Jersey. 568 pp.</li> <li>3. Jones Jr., J.B. 1997. Hydroponics: A Practical Guide for the Soilless Grower. CRC Press, Florida. 248 pp.</li> <li>4. Peckenpaugh, D. 2004. Hydroponic Solutions: Hydroponic Growing Tips, Volume 1. New Moon Publishing, Inc. 121 pp.</li> <li>5. Roberto, K. 2003. How-to Hydroponics. Futuregarden, Inc. 104 pp.</li> <li>6. Research publications related to hydroponics.</li> </ol> |
| Date of last amendment | July 21, 2021   |

Semester 5

Advanced Annual Crops Cultivation PAG 207316

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| Module Designation   | Advanced Annual Crops Cultivation   |
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| Code   | PAG 207316  |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Prof. Dr. Ir. Rujito Agus Suwignyo, M.Agr.</li> <li>2. Dr. Ir. Firdaus Sulaiman, M.Si</li> <li>3. Dr. Ir. Munandar, M.Agr.</li> <li>4. Ir. Teguh Achadi, MP</li> <li>5. Fitra Gustiar, S.P., M.Si</li> </ol>  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 34.00 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>   |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PAG 204216   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the scope, benefit, and basic knowledge of several important annual crops.</li> <li>2. Understand and be able to identify the morphology of rice plant and its cultivation technology.</li> <li>3. Understand and be able to identify the morphology of corn and the cultivation system</li> <li>4. Understand and be able to identify the morphology of soybean and master the cultivation system.</li> <li>5. Understand and be able to identify the morphology of cassava and its cultivation system.</li> <li>6. Understand and be able to explain about <i>surjan</i> cultivation system.</li> <li>7. Understand and be able to explain about wetlands cultivation technology – especially in agrosylvofishery system.</li> <li>8. Understand and be able to explain about crop cultivation at high land.</li> </ol> |
| Content  | <ol style="list-style-type: none"> <li>1. Introduction of the lecture.</li> </ol>   |

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|                        | <ol style="list-style-type: none"> <li>2. Environmental factors of plant growth in seasonal crop cultivation systems.</li> <li>3. Morphology of rice plant.</li> <li>4. Rice cultivation technology.</li> <li>5. Morphology and cultivation technology of corn.</li> <li>6. Group discussion 1.</li> <li>7. Group discussion 2.</li> <li>8. Morphology and cultivation technology of soybean.</li> <li>9. Morphology and cultivation technology of cassava.</li> <li>10. Surjan system of cultivation technology.</li> <li>11. Wetlands cultivation technology – agrosylvofishery.</li> <li>12. Crop cultivation at high land.</li> <li>13. Group discussion 3.</li> <li>14. Group discussion 4.</li> </ol> |
| Examination forms      | Quiz, Mid-terms and Final Examination<br><ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Morachan, Y.B. 1978. Crop Production and Management. Oxford &amp;Ibh Publishing Co., 268 P.</li> <li>2. Matheson, E.M., Lovet, J.V., Blair, G.Y. &amp; R.Y. Lawn, 1975. Annual Crop Production. A Course Manual in Annual Crop Production Academy Press. Pty. Ltd. Brisbane. 139 P.</li> <li>3. Kuswanto, H. 1996. Dasar-Dasar Teknologi Produksi Tanaman Pangan. Penerbit Andi. Yogyakarta.</li> <li>4. Research publications related to advanced annual crops cultivation.</li> </ol>   |
| Date of last amendment | July 21, 2021   |



## Advanced Perennial Crops Cultivation PAG 208316

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| Module Designation   | Advanced Perennial Crops Cultivation   |
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| Code   | PAG 208316   |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. M. Umar Harun, M.S.<br>2. Dr. Erizal Sodikin<br>3. Dr. Ir. Yakup, M.S.<br>4. Dr. Ir. Marlina, M.Si.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 34.00 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 4.36 ECTS)  |
| Required and recommended prerequisite for joining the module | Passed PAG 205216  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain about the scopes, benefit, and some basic knowledge of several important perennial crops.<br>2. Understand and be able to explain about the optimization of oil palm plantations.<br>3. Understand and be able to explain about oil palm plantation management.<br>4. Understand and be able to explain about the impact of drought on oil palm.<br>5. Understand and be able to explain the concept of ISPO for oil palm plantation.<br>6. Understand and be able to explain about good agricultural practice of coffee plantation.<br>7. Understand and be able to explain about the impact of drought on coffee flowering.<br>8. Understand and be able to explain about rubber plant production.<br>9. Understand and be able to explain about rubber tapping and stimulant.<br>10. Understand and be able to identify nutrient deficiency in rubber plant. |

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|                   | <ol style="list-style-type: none"> <li>11. Understand and be able to identify nutrient deficiency in pepper plant.</li> <li>12. Understand and be able to explain about stimulants for tea plants.</li> <li>13. Understand and be able to explain about pruning and harvesting of tea plants.</li> <li>14. Understand and be able to explain about polyculture system for cocoa plantation.</li> </ol>  |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction of lecture.</li> <li>2. Optimization of oil palm plantations.</li> <li>3. Oil palm plantation management.</li> <li>4. Impact of drought on oil palm.</li> <li>5. Oil Palm and ISPO.</li> <li>6. Good Agricultural Practice of coffee.</li> <li>7. Drought and coffee flowering.</li> <li>8. Leaf fall and rubber plant production.</li> <li>9. Rubber tapping and stimulant.</li> <li>10. Nutrient deficiency in rubber.</li> <li>11. Nutrient deficiency in pepper plant.</li> <li>12. Stimulants for tea plants.</li> <li>13. Pruning and harvesting tea plants.</li> <li>14. Cocoa plant polyculture.</li> </ol>  |
| Examination forms | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites   |
| Reading list      | <ol style="list-style-type: none"> <li>1. Basra, A.S. 2006. Seed Science and Technology. FPP.</li> <li>2. Anac, D., Matin-Prevel, P. 1999. Improved Crop Quality by Nutrient Management. Kluwer Academic Publishers.</li> <li>3. Dick, J.S. 2009. Rubber Technology Compounding and Testing for Performance. Hanser</li> <li>4. Luttge, U. 1997. Physiological Ecology of Tropical Plants. Springer.</li> <li>5. Loewer, O.J., Bridges, T.C., Bucklin, R.A. 1994. On Farm Drying and Storage Systems. American Society of Agricultural Engineers.</li> <li>6. Tyasmoro S.Y., P.N. Permanasari, dan A. Saitama. 2021. Teknologi Produksi Tanaman Perkebunan. Universitas Brawijaya Press. 168 pp.</li> <li>7. Sunarko. 2014. Budidaya Kelapa Sawit di Berbagai Jenis Lahan. Agromedia. 208 pp.</li> <li>8. Corley, R.H.V. and P.B.H. Tinker. 2015. The Oil Palm. Wiley Blackwell. 680 pp.</li> </ol> |

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|                        | 9. Research publications related to advanced perennial crops cultivation. |
| Date of last amendment | July 21, 2021   |

## Vegetable Crops Cultivation PAG 209316

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| Module Designation   | Vegetable Crops Cultivation  |
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| Code   | PAG 209316   |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year  |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Benyamin Lakitan, M.Sc.<br>2. Dr. Ir. Susilawati, M.Si.<br>3. Dr. Ir. Muhammad Ammar, M.P.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | Passed PAG 206216  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain the meaning of vegetable</li> <li>2. Understand and be able to explain the role and development of potential vegetables in Indonesia</li> <li>3. Understand the basics of grouping vegetable crops.</li> <li>4. Understand and be able to explain the characteristics of vegetable plant groups.</li> <li>5. Understand and be able to explain the definition and role of vegetable plant breeding.</li> <li>6. Understand and be able to explain the procedure and development of vegetable plant breeding techniques</li> <li>7. Understand and be able to explain about vegetable crops growth and development.</li> <li>8. Understand the abiotic and biotic factors of growth and development of vegetable crops</li> <li>9. Understand the meaning and stages of vegetable cultivation techniques.</li> <li>10. Understanding the origin, development and nutritional content of chili and potato plants.</li> <li>11. Understanding the types of chili and potato plants based on botany and growing conditions.</li> </ol> |

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|                   | <p>12. Understand and be able to explain the types of flavorant, proper understand the origin, development and nutritional content of cucumber and cabbage plants.</p> <p>13. Understand the types of cucumber and cabbage plants based on botany and growing conditions.</p>   |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction (Limitation and scope of vegetable crops)</li> <li>2. Nutritional content and benefits of vegetable crops</li> <li>3. Vegetable plant breeding</li> <li>4. Patterns of growth and development of vegetable crops</li> <li>5. Grouping of vegetable crops</li> <li>6. Vegetable plant growth factors</li> <li>7. Vegetable cultivation techniques in macro and micro fields</li> <li>8. Chili and potato cultivation techniques</li> <li>9. Cucumber and cabbage cultivation techniques.</li> </ol>   |
| Examination forms | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites   |
| Reading list      | <ol style="list-style-type: none"> <li>1. AVRDC. 1990. Vegetable Production Training Manual. Asian Vegetable Research and Development Centre. Shanhua, Tainan. 447 p.</li> <li>2. Daliway, M.S. 2017. Classification of Vegetable Crops. Punjab Agriculture University. Punjab, India. 7 p.</li> <li>3. Rana, M.K. 2021. Fundamentals of Vegetable Production. New India Publishing Agency (NIPA). 300 p.</li> <li>4. Shinha, N.K., Y.H. Hui and E.Q Evranuz. 2011. Handbook of Vegetables and Vegetable Processing. Blackwell Publishing Ltd. Iowa. 772 p.</li> <li>5. Badan Pusat Statistik.2012. Konsep dan Definisi Baku Statistik Pertanian 2012. Subdirektorat Pengembangan.</li> <li>6. Standardisasi dan Klasifikasi Statistik Direktorat Pengembangan Metodologi Sensus dan Survei. 478 hal. ISBN: 978-979-064-592-9.</li> <li>7. Lakitan, B. 1995. Hortikultura Teori, Budidaya dan Pasca Panen. PT RajaGrafindo Persada. Jakarta. 220 hal.</li> <li>8. Susilawati. 2017. Mengenal Tanaman Sayuran (Prospek dan pengelompokkan). Unsri Press. Palembang. 114 hal</li> <li>9. Syukur, M., S.Sujiprihati., R.Yunianti. 2012. Teknik Pemuliaan Tanaman. Penebar Swadaya. Bogor. 348 hal.</li> <li>10. Maynard, D.N., Hochmuth, G.J. 2007. Vegetable Growers. Wiley.</li> <li>11. Adams, C., Early, M., Brook, J., Bamford, K. 2014. Principles of Horticulture: Level 2 1st Edition. Routledge.</li> </ol> |

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|                        | <p>12. Dawson, P. 2011. A Handbook for Horticultural Students. Peter Dawson.</p> <p>13. Capon, B. 2010. Botany for Gardeners, 3rd Edition. Timber Press.</p> <p>14. Bird, C. 2014. The Fundamentals of Horticulture: Theory and Practice 1st Edition. Cambridge university Press.</p> <p>15. Pollan, M. 2001. The Botany of Desire: A Plant's-Eye View of the World. Random House Trade Paperbacks.</p> <p>16. Hodge, G. 2013. Practical Botany for Gardeners: Over 3,000 Botanical Terms Explained and Explored. University of Chicago Press.</p> <p>17. Poerwanto, R., Susula, A.D. 2021. Teknologi Hortikultura. PT Penerbit IPB Press.</p> <p>18. Jain, S.M., Ochatt, S.J. 2010. Protocols for In Vitro Propagation of Ornamental Plants. Humana Press.</p> <p>19. Research publications related to vegetable crops cultivation.</p> |
| Date of last amendment | July 21, 2021  |

## Fruit Crops Cultivation PAG 210316

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| Module Designation   | Fruit Crops Cultivation   |
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| Code   | PAG 210316  |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | <ol style="list-style-type: none"> <li>1. Dr. Ir. Zaidan Panji Negara, M.Sc.</li> <li>2. Dr. Ir. Muhammad Ammar, M.P.</li> <li>3. Dr. Ir. Susilawati, M.Si.</li> <li>4. Ir. Sri Sukarmi, M.P.</li> </ol>  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Lectures (explanation, discussion)</li> <li>2. Structured assignment (i.e.: article reading and review)</li> <li>3. The class size 30-75 students per class</li> <li>4. Contact hours for lecture are 23.33 hours per semester</li> <li>5. Total hours practical is 19.83 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester</li> <li>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>3. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PAG 206216   |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Able to explain the boundaries and development of fruit plants in Indonesia.</li> <li>2. Able to explain the nutritional content and benefits of fruit plants.</li> <li>3. Able to explain aspects of fruit plant breeding.</li> <li>4. Able to explain generative propagation of fruit plants</li> <li>5. Able to explain the vegetative propagation of fruit plants.</li> <li>6. Able to explain boundaries, descriptions and division of plants based on flower organs</li> <li>7. Able to explain boundaries, descriptions and division of plants based on fruit organs.</li> <li>8. Able to explain the flowering process in fruit plants.</li> <li>9. Able to explain the process of fertilization in fruit plants.</li> <li>10. Able to explain the stages of development of commercial fruit orchards.</li> <li>11. Able to explain the cultivation techniques of the Rutaceaea family (stages and growing conditions).</li> <li>12. Able to explain the cultivation techniques of the Meliaceae family (stages and growing conditions).</li> </ol> |

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|                   | <p>13. Able to explain the cultivation techniques of the Bromeliaceae family (stages and growing conditions).</p> <p>14. Able to explain the cultivation techniques of the Bombaceae family (stages and growing conditions).</p>  |
| Content           | <ol style="list-style-type: none"> <li>1. RPS explanation and contract lectures.</li> <li>2. Limitations of fruit crops, economic meaning and nutritional value of fruit plants, development of fruit crops.</li> <li>3. Fruit plant propagation techniques.</li> <li>4. Duku cultivation and cultivation techniques.</li> <li>5. Fruit plant classification.</li> <li>6. Watermelon plants and cultivation techniques.</li> <li>7. Citrus plants and cultivation techniques.</li> <li>8. Fruit plant growth factors.</li> <li>9. Papaya plants and cultivation techniques.</li> <li>10. Strawberry plants and cultivation techniques.</li> <li>11. Pineapple plants and cultivation techniques.</li> </ol>   |
| Examination forms | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites   |
| Reading list      | <ol style="list-style-type: none"> <li>1. Bal, J.S. 2007. Fruit Growing. Kalyani Publishers. Ludhiana, India. 425 p.</li> <li>2. Naik, B.H. and D. Thippesh. 2014. Fundamentals of Horticulture and Production Technology of Fruit Crops. University of Agricultural and Horticultural Science. Shimago. 181 p.</li> <li>3. Blancke, R. 2016. Tropical Fruits and Other Edible Plants of the World: An Illustrated Guide. <a href="https://www.pdfdrive.com/tropical-fruits-and-other-edible-plants-of-the-world-an-illustrated-guide-e183892675.html">https://www.pdfdrive.com/tropical-fruits-and-other-edible-plants-of-the-world-an-illustrated-guide-e183892675.html</a>.</li> <li>4. Sinha, N., Sidhu, J., Barta, J., Wu, J., Cano, M.P. 2012. Handbook of Fruits and Fruit Processing. Wiley-Blackwell. <a href="https://www.perlego.com/book/1012115/handbook-of-fruits-and-fruit-processing-pdf">https://www.perlego.com/book/1012115/handbook-of-fruits-and-fruit-processing-pdf</a>.</li> <li>5. Crichton., Alexanter, D. 2007. Fruit in General. <a href="http://www.archive.org/details/australasianfrui00cricrich">http://www.archive.org/details/australasianfrui00cricrich</a>.</li> <li>6. Dimitrov, S., Pieri, T.F.A. 2017. Tropical Fruits. <a href="https://www.pdfdrive.com/tropical-fruits-from-cultivation-to-consumption-and-health-benefits-fruits-from-the-amazon-e158273935.html">https://www.pdfdrive.com/tropical-fruits-from-cultivation-to-consumption-and-health-benefits-fruits-from-the-amazon-e158273935.html</a>.</li> <li>7. Research publications related to fruit crops</li> </ol> |



Date of last amendment

July 21, 2021

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## Agricultural Machinery and Equipment PTE 33316

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| Module Designation   | Agricultural Machinery and Equipment   |
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| Code   | PTE 33316  |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Hersyamsi, M.Agr.<br>2. Ir. R. Mursidi, M.Si.<br>3. Dr.Ir. Tri Tunggal, M.Agr.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain about the terminology, definition, objectives, and scope area of agricultural machinery.<br>2. Understand and be able to explain about primary tillage and secondary tillage.<br>3. Understand and be able to identify mold board plow, disk plow and rotary plow.<br>4. Understand and be able to identify disk harrow, chisel, and spike tooth harrow.<br>5. Understand and be able to explain about subsoiler and special tillage tools.<br>6. Understand and be able to explain about row crop planter.<br>7. Understand and be able to explain about transplanter.<br>8. Understand and be able to explain about cultivating tools (traditional and modern).<br>9. Understand and be able to explain about sprayer, knapsack sprayer, boom sprayer, the function of parts and spraying mechanism.<br>10. Understand and be able to explain about harvesting concept.<br>11. Understand and be able to explain about traditional harvester. |

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|                        | 12. Understand and be able to explain about semi-mechanical harvester.<br>13. Understand and be able to explain about combine harvester.   |
| Content                | 1. Introduction (terminology, definition, objectives, scope area, course contract).<br>2. Primary tillage and Secondary tillage.<br>3. Mold board plow, disk plow and rotary plow.<br>4. Disk harrow, chisel, and spike tooth harrow.<br>5. Subsoiler and special tillage tools.<br>6. Row crop planter.<br>7. Transplanter.<br>8. Cultivating tools (traditional and modern).<br>9. Sprayer, knapsack sprayer, boom sprayer. Function of parts and spraying mechanism.<br>10. Harvesting concept.<br>11. Traditional harvester.<br>12. Semi-mechanical harvester.<br>13. Combine harvester. |
| Examination forms      | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works<br>3. Writing Case Paper<br>4. Oral presentation  |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | 1. Persson, S. 1987. Mechanics of Cutting Plant Material. American Society of Agricultural Engineers.<br>2. Research publications related to agricultural machinery and equipment.   |
| Date of last amendment | July 21, 2021  |

## Weed Control PAG 403316

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| Module Designation   | Weed Control   |
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| Code   | PAG 403316   |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Yakup, M.S.<br>2. Dr. Ir. Erizal Sodikin<br>3. Ir. Teguh Achadi, M.P.<br>4. Dr. Ir. Maria Fitriana, M.Sc.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | Passed PAG 114216  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to the definition, scope, as well as the conception and development of weed control.<br>2. Understand and be able to explain the meaning and classification of preventive control.<br>3. Understand and be able to explain the meaning and classification of mechanical weed control.<br>4. Understand and be able to explain the meaning and classification of control in terms of technical culture.<br>5. Understand and be able to explain the meaning and classification of biological control.<br>6. Understand and be able to explain the meaning of chemical control and various classifications of herbicides.<br>7. Understand and be able to explain the selectivity and properties of herbicides in plants, as well as the herbicide application process.<br>8. Understand and be able to explain Weed control techniques on upland rice and upland rice plants.<br>9. Understand and be able to explain weed control techniques in lowland rice and tidal lowland rice. |

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|                   | <ol style="list-style-type: none"> <li>10. Understand and be able to explain weed control techniques on crops.</li> <li>11. Understand and be able to explain weed control techniques in horticultural crops.</li> <li>12. Understand and be able to explain the weed control techniques in plantation crops.</li> <li>13. Understand and be able to explain the implementation of integrated weed management (IWM).</li> <li>14. Understand and be able to explain the economic threshold (ET) of weed control and its application.</li> </ol>  |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction.</li> <li>2. Preventive control.</li> <li>3. Mechanical control.</li> <li>4. Control in technical culture.</li> <li>5. Biological control.</li> <li>6. Chemical control (Role, classification and formulation of herbicides).</li> <li>7. Chemical control (Selectivity, properties and effects on the environment).</li> <li>8. Chemical control (Herbicide application process).</li> <li>9. Weed control in rice plants (upland and upland rancah).</li> <li>10. Weed control in rice crops (paddy fields and tidal fields).</li> <li>11. Weed control in secondary crops.</li> <li>12. Weed control in horticultural crops.</li> <li>13. Weed control in plantation crops.</li> <li>14. Integrated weed control (IWM).</li> <li>15. Economic threshold (ET) in weed control.</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Akobundu, I. O. 1987. Weed Science in The Tropics. John Wiley and Sons. New York. 522 p.</li> <li>2. Ampong-Nyarko, K. and S.K. De Datta. 1991. A Handbook for Weed Control in Rice. IRRI. Manila, Phillipines. 112 p.</li> <li>3. Auld, D.A., K.M. Menz and C.A. Tisdell. 1987. Weed Control Economics. Academic Press Inc. London. 177 p.</li> <li>4. Chauhan, B.S. and G. Mahajan. 2014. Recent Advances in Weed Management. Springer. 411 p.</li> <li>5. Crafts, A.S. 2020. Modern Weed Control. University of California Press. California, US. 450 p.</li> </ol>   |

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|                        | <ol style="list-style-type: none"> <li>6. Dodge AD. 2008. <i>Herbicides and Plant Metabolism</i>. Cambridge University Press. 277 p.</li> <li>7. Radosevich, S. R., J. S. Holt and C. Ghera. 1997. <i>Weed Ecology, Implications for Vegetations Management</i>. John Wiley and Sons. New York. 589 h.</li> <li>8. Rao, A.N. and H. Matsumoto (Ed.). 2017. <i>Weed Management in Rice in the Asian-Pacific Region</i>. Asian-Pacific Weed Science Society (APWSS). 284 p.</li> <li>9. Singh, C.M., N.N. Aagiras and S. Kumar. 1996. <i>Weed Management</i>. M.D. Publications, Ltd. 152 p.</li> <li>10. Stoyanova, S. 2013. <i>Application of The Modern Herbicides in weed Control in Sprange Rape</i>. LAP LAMBERT Academic Publishing. 104 p.</li> <li>11. Tu, M., C. Hurt and J.M. Randall. 2001. <i>Weed Control Methods Handbook: Toos and Technique for Use in Natural Areas</i>. The Nature Conservation, Wildland Invasive Species Team. 219 p.</li> <li>12. Upadhyaya, M.K. and R.E. Blackshaw. 2007. <i>Non-Chemical weed Management: Principles, Concepts and Technology</i>. CABI. 239 p.</li> <li>13. Research publications related to weed control.</li> </ol> |
| Date of last amendment | July 21, 2021   |

## Plant Biotechnology PAG 306316

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| Module Designation   | Plant Biotechnology  |
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| Code   | PAG 306316   |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Mery Hasmeda, M.Sc.<br>2. Dr. Ir. E. S. Halimi, M.Sc.<br>3. Dr. Fikri Adriansyah, S.Si.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain about the definition, scope and application of biotechnology.</li> <li>2. Understand and be able to explain about the concept of DNA, function, structure and isolation.</li> <li>3. Understand and be able to explain about enzymes of DNA modification.</li> <li>4. Understand and be able to explain about principles of genetic engineering.</li> <li>5. Understand and be able to explain about cloning vector.</li> <li>6. Understand and be able to master the technique of DNA analysis.</li> <li>7. Understand and be able to explain about tissue culture and hybrid technique.</li> <li>8. Understand and be able to explain about cell and protoplasm fusion.</li> <li>9. Understand and be able to explain about marker method for plant breeding.</li> <li>10. Understand and be able to explain about the use of marker method for plant breeding.</li> <li>11. Understand and be able to explain about the application of biotechnology in agriculture.</li> </ol> |

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|                   | <p>12. Understand and be able to explain about transgenic plant for yield and quality improvement.</p> <p>13. Understand and be able to explain about transgenic plant for technology and increase of chemical compound.</p> <p>14. Understand and be able to explain about consequences of using genetic engineering.</p>  |
| Content           | <p>1. Definition, scope and application of biotechnology.</p> <p>2. DNA, Function, Structure and Isolation.</p> <p>3. Enzymes of DNA modification.</p> <p>4. Principles of genetic engineering.</p> <p>5. Cloning vector.</p> <p>6. Technique of DNA Analysis.</p> <p>7. Tissue culture and hybrid technique.</p> <p>8. Cell and protoplasm fusion.</p> <p>9. Introduction of marker method for plant breeding.</p> <p>10. Introduction of marker method for plant breeding.</p> <p>11. Application of biotechnology in agriculture</p> <p>12. Transgenic plant for yield and quality improvement.</p> <p>13. transgenic plant for technology and increase of chemical compound.</p> <p>14. Consequences of using genetic engineering.</p>  |
| Examination forms | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites   |
| Reading list      | <ol style="list-style-type: none"> <li>1. Lodish, H., Brek, A., Kaiser, C.A., Krieger, M., Scott, M.P., Bretscher, A., Ploegh, H., Matsudaira, P. 2007. Molecular Cell Biology. W.H Freeman and Company.</li> <li>2. Hawkersfored, M.J., Buchner, P. 2001. Molecular Analysis of Plant Adaption to the Environment. Kluwer Academic Publishers.</li> <li>3. Daniell, H., Chase, C. 2004. Molecular Biology and Biotechnology of Plant Organelles Chloroplast and Mitochondria. Springer.</li> <li>4. Kang, M.S., Priyadarshan, P.M. 2007. Breeding Major Food Staples. Blackwell Publishing.</li> <li>5. Acquaah, G. 2012. Principles of Plant Genetics and Breeding, 2nd Edition. Wiley-Blackwell.</li> <li>6. Xu, Y. 2010. Molecular Plant Breeding. International Maize and Wheat Improvement Centre (CIMMYT), China.</li> <li>7. Kang, M.S. 2002. Quantitative Genetics, Genomics and Plant Breeding. CABI; 2nd edition.</li> </ol> |



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|                        | <ol style="list-style-type: none"> <li>8. Bharadwaj, D.N. 2019. Advanced Molecular Plant Breeding; Meeting the Challenge of Food Security. Apple Academic Press.</li> <li>9. Prasad, M.N.V., Strzalka, K. 2002. Physiology and Biochemistry of Metal Toxicity and Tolerance in Plants. Kluwer Academic Publishers.</li> <li>10. Kole, C. 2007. Genome Mapping and Molecular Breeding in Plants. Technical Crops. Spinger.</li> <li>11. Kahl, G., Meksem, K. 2004. The Handbook of Plant Functional Genomics. Willey-Blackwell.</li> <li>12. Research publications related to plant biotechnology.</li> </ol> |
| Date of last amendment | July 21, 2021  |

## Spice, Medicinal and Industrial Crops Cultivation\* PAG 211316

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| Module Designation   | Spice, Medicinal and Industrial Crops Cultivation*  |
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| Code   | PAG 211316  |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Muhammad Ammar, M.P.<br>2. Ir. Sri Sukarmi, M.P.<br>3. Ir. Teguh Achadi, M.P.<br>4. Dr. Ir. Susilawati, M.Si.<br>5. Dr. Ir. Mery Hasmeda, M.Sc.<br>6. Dr. Ir. Lidwina Niniek S, M.Si.  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the definition of herbs, drugs and phytopharmacology as well as logos and labeling.<br>2. Understand and be able to explain about the grouping and benefits of spice, medicinal and industrial plants.<br>3. Understand and be able to explain brief history, systematics, morphology, benefits of Turmeric, Clove and Ginger plant.<br>4. Understand and be able to explain brief history, systematics, morphology, benefits of Aloe Vera and Temulawak plants.<br>5. Understand and be able to explain brief history, systematics, morphology, benefits of the Mahkota Dewa, Kumis Kucing and Dlingo plants.<br>6. Understand and be able to explain brief history, systematics, morphology, benefits of the Fragrant Lemongrass, Quinine and Gambir plants.<br>7. Understand and be able to explain cultivation techniques of Turmeric, Clove and Ginger. |

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|                   | <ol style="list-style-type: none"> <li>8. Understand and be able to explain the cultivation techniques of Aloe Vera and Temulawak.</li> <li>9. Understand and be able to explain the cultivation techniques of the God Crown, Cat Whiskers (<i>kumis kucing</i>) and Dlingo.</li> <li>10. Understand and be able to explain the cultivation techniques of Citronella, Quinine and Gambir plants</li> <li>11. Understand and be able to explain post-harvest techniques and farming analysis of Turmeric, Clove, Ginger, Aloe Vera and Temulawak plants.</li> <li>12. Understand and be able to explain post-harvest techniques and farming analysis of Mahkota Dewa, Kumis Kucing and Dlingo plants.</li> <li>13. Understand and be able to explain post-harvest techniques and farming analysis of Citronella, Cinnamon and Gambir plants</li> </ol>  |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction: definition of herbs, drugs and phytopharmacology as well as logos and labeling.</li> <li>2. The grouping and benefits of spice, medicinal and industrial plants.</li> <li>3. History, systematics, morphology, benefits of Turmeric, Clove and Ginger plant.</li> <li>4. History, systematics, morphology, benefits of Aloe Vera and Temulawak plants.</li> <li>5. History, systematics, morphology, benefits of the Mahkota Dewa, Kumis Kucing and Dlingo plants.</li> <li>6. History, systematics, morphology, benefits of the Fragrant Lemongrass, Quinine and Gambir plants.</li> <li>7. Cultivation techniques of Turmeric, Clove and Ginger.</li> <li>8. Cultivation techniques of Aloe Vera and Temulawak.</li> <li>9. Cultivation techniques of the God Crown, Cat Whiskers (<i>kumis kucing</i>) and Dlingo.</li> <li>10. Cultivation techniques of Citronella, Quinine and Gambir plants</li> <li>11. Post-harvest techniques and farming analysis of Turmeric, Clove, Ginger, Aloe Vera and Temulawak plants.</li> <li>12. Post-harvest techniques and farming analysis of Mahkota Dewa, Kumis Kucing and Dlingo plants.</li> <li>13. Post-harvest techniques and farming analysis of Citronella, Cinnamon and Gambir plants</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |

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| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Duke, J.A. 2015. Handbook of Medicinal Herbs. CRC Press. <a href="https://www.pdfdrive.com/handbook-of-medicinal-herbs-e6646387.html">https://www.pdfdrive.com/handbook-of-medicinal-herbs-e6646387.html</a>.</li> <li>2. Herb &amp; spice companion : the complete guide to over 100 herbs &amp; spices. <a href="https://www.pdfdrive.com/herb-spice-companion-the-complete-guide-to-over-100-herbs-spices-e158313947.html">https://www.pdfdrive.com/herb-spice-companion-the-complete-guide-to-over-100-herbs-spices-e158313947.html</a>.</li> <li>3. Simone, M. 2012. The Herb Handbook: A Practical Guide To Using And Growing Herbs. <a href="https://www.pdfdrive.com/the-herb-handbook-a-practical-guide-to-using-and-growing-herbs-e156645056.html">https://www.pdfdrive.com/the-herb-handbook-a-practical-guide-to-using-and-growing-herbs-e156645056.html</a>.</li> <li>4. Rosemary, G. 2016. Rosemary Gladstar's Medicinal Herbs: A Beginner's Guide: 33 Healing Herbs to Know, Grow, and Use. <a href="https://www.pdfdrive.com/rosemary-gladstars-medicinal-herbs-a-beginners-guide-33-healing-herbs-to-know-grow-and-use-e175318578.html">https://www.pdfdrive.com/rosemary-gladstars-medicinal-herbs-a-beginners-guide-33-healing-herbs-to-know-grow-and-use-e175318578.html</a>.</li> <li>5. Research publications related to spice, medicinal and industrial crops cultivation.</li> </ol> |
| Date of last amendment | July 21, 2021  |

## Ornamental Plants Cultivation\* PAG 212316

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| Module Designation   | Ornamental Plants Cultivation*  |
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| Code   | PAG 212316  |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>2. Dr. Ir. Muhammad Ammar, M.P.<br>3. Dr. Susilawati, S.P., M.Si.<br>4. Ir. Sri Sukarmi, M.P.  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PAG 206216   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain about the scope, limitation, benefit and various types of ornamental plants.<br>2. Understand and be able to explain the commercial aspect of ornamental plants as highly demanded plants in both national and world-wide.<br>3. Understand and be able to explain the infrastructures and facilities required to support the ornamental plant business.<br>4. Understand and be able to identify the problems and explain basic culture of ornamental plant – media, propagation, shading.<br>5. Understand and be able to explain about the botany of various orchids.<br>6. Understand and be able to explain about cultivation and maintenance of orchids.<br>7. Understand and be able to explain about the theory and different types of Bonsai.<br>8. Understand on how to start to prepare a bonsai tree.<br>9. Understand and be able to explain the cultivation of cut flower. |

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|                   | <ol style="list-style-type: none"> <li>10. Understand and be able to explain about the harvest, transport and handling of cut flowers.</li> <li>11. Understand and be able to explain about various types of potted plants and the cultivation.</li> <li>12. Understand and be able to explain about the maintenance of potted plants.</li> <li>13. Understand and be able to explain about different types of bedding plants and bedding preparation.</li> <li>14. Understand and be able to explain about the cultivation and maintenance of bedding plants.</li> <li>15. Understand the concept of hanging plants and be able to identify various types of hanging plants and the cultivation.</li> <li>16. Understand and be able to explain the botany and cultivation of chrysanthemum.</li> </ol>   |
| Content           | <ol style="list-style-type: none"> <li>1. Course introduction and various types of ornamental plants.</li> <li>2. Agribusiness of ornamental plants; Highly demanded plants national and world-wide.</li> <li>3. Infrastructures and facilities required to support the ornamental plant business.</li> <li>4. Problems and basic culture of ornamental plant – media, propagation, shading.</li> <li>5. Introduction to botany and various orchids.</li> <li>6. Cultivation and maintenance of orchids.</li> <li>7. Theory and different types of Bonsai.</li> <li>8. Starting a bonsai tree.</li> <li>9. Cutt flower and cultivation.</li> <li>10. Cut flower: post harvest, transport and handling.</li> <li>11. Various types of potted plants and cultivation.</li> <li>12. Maintenance of potted plants.</li> <li>13. Different types of bedding plants, Bedding preparation.</li> <li>14. Cultivation and maintenace of bedding plants.</li> <li>15. Hanging plants – various types and cultivation.</li> <li>16. Botany and cultivation of chrysanthemum.</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Jain, S.M., Ochatt, S.J. 2010. Protocols for In Vitro Propagation of Ornamental Plants. Humana Press.</li> <li>2. Kalauni, K., Joshi, A. 2018. A Textbook of Ornamental Horticulture October 2018 Publisher: Heritage Publishers and Distributors Pvt. Ltd.:</li> </ol>  |

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|                        | <ol style="list-style-type: none"> <li>3. Wait, D.D. Ornamental Plants: Their Care, Use, Propagation, and Identification - E.H.C; Revised edition.</li> <li>4. Brickell, C. 1997. The American Horticultural Society A-Z Encyclopedia of Garden Plants Hardcover; DK ADULT</li> <li>5. Handreck, K., Black, N. 2010. Growing Media for Ornamental Plants and Turf Paperback – University of New South Wales Press; Fourth Edition, Fourth edition.</li> <li>6. Comber, J.B. 1990. Orchids of Java Published December 1st 1990 by American Orchid Society.</li> <li>7. Research publications related to ornamental plants cultivation.</li> </ol> |
| Date of last amendment | July 21, 2021  |

## Irrigation and Drainage\* PTN 36516

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| Module Designation   | Irrigation and Drainage*   |
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| Code   | PTN 36516  |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Bakri, M.P.<br>2. Dr. Momon Sodik Imanudin, S.P., M.Sc,<br>3. Dr. Ir, Satria Jaya Priatna, M.S.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Elective Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the scope, definition, types and benefits of irrigation and drainage in agriculture.<br>2. Understand and be able to explain about the statistics and groundwater dynamics<br>3. Understand and be able to explain about irrigation water source / storage<br>4. Understand and be able to explain about irrigation water quality.<br>5. Understand and be able to explain about plant water needs.<br>6. Understand and be able to explain about irrigation water delivery method.<br>7. Understand and be able to explain about planting and irrigation scheduling<br>8. Understand and be able to explain the preparation of irrigated land.<br>9. Understand and be able to explain the operation & maintenance of irrigation network reclamation / drainage project planning phase identification & feasibility study phase. |



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|                   | <ol style="list-style-type: none"> <li>10. Understand and be able to explain about the drainage system plan / drainage reclamation to control water level.</li> <li>11. Understand and be able to explain about soil (general system, special system) project preparation, installation and maintenance (final project preparation and specifications, installation, operation and maintenance)</li> <li>12. Understand and be able to explain about the reclamation of <i>lebak</i> swamp and tidal swamp in Indonesia</li> <li>13. Understand and be able to explain the equipment / construction of flowing irrigation/pumping water irrigation / irrigation efficiency.</li> <li>14. Understand and be able to explain about water resources management / forestry and environment policy</li> </ol>   |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. Statistics / Groundwater Dynamics</li> <li>3. Irrigation Water Source / Storage</li> <li>4. Irrigation Water Quality</li> <li>5. Plant Water Needs</li> <li>6. Irrigation Water Delivery Method</li> <li>7. Planting and Irrigation Scheduling</li> <li>8. Preparation of Irrigated Land</li> <li>9. Operation &amp; Maintenance of Irrigation Network<br/>Reclamation / Drainage Project Planning Phase<br/>Identification &amp; Feasibility Study Phase</li> <li>10. Drainage System Plan / Drainage Reclamation to Control Water Level</li> <li>11. Soil (General System, Special System) Project Preparation, Installation and Maintenance (Final Project Preparation and Specifications, Installation, Operation and Maintenance)</li> <li>12. Reclamation of Lebak Swamp and Tides in Indonesia</li> <li>13. Equipment / Construction of Flowing Irrigation/Pumping Water Irrigation / Irrigation Efficiency</li> <li>14. Water Resources Management / Forestry and Environment Policy</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Hansen, V. E., O. W. Israelsen, dan G.E. Stringham. 1986. Dasar-dasar dan Praktek Irigasi (terjemahan ke</li> </ol>  |

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|                        | <p>Bahasa Indonesia oleh E.P. Tachyan dan Soetjipto). Penerbit Air Langga.</p> <ol style="list-style-type: none"> <li>2. Teknik Konservasi Tanah dan Air. 1997. Robiyanto H. Susanto dan Rahmad H. Purnomo (terjemahan : Soil and Water Concervation, Gleen O. Scwab dkk. 1990).</li> <li>3. Ochs, W. J. dan B. G. Bishay. 1992. Drainage Guideline. World Bank Technical Paper No. 194.</li> <li>4. Bardan, M. 2014. Irigasi. Graha Ilmu Yogyakarta.</li> <li>5. Rosadi, R. A. B. 2015. Dasar-dasar Teknik Irigasi. Graha Ilmu Yogyakarta.</li> <li>6. Sangsongko, D. 1985. Alih Bahasa. Ray. K. L. and Joseph. B. F. Teknik Sumber Daya Air. Penerbit Air Langga.</li> <li>7. Mawardi, M. 2016. Irigasi Asas dan Praktek. Penerbit Bursa Ilmu. Research publications related to irrigation and drainage.</li> </ol> |
| Date of last amendment | July 21, 2021   |

## Fertilizer and Fertilization Technology\* PTN 36216

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| Module Designation   | Fertilizer and Fertilization Technology *   |
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| Code   | PTN 36216   |
| Semester (s) in which the module is taught                   | 5 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Nuni Gofar, M.S.<br>2. And Teaching Team   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PTN 20116  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Understand and be able to explain about nutrients, fertilizers, development history and fertilization concepts.</li> <li>2. Understand and be able to explain about the definition, availability of nutrients and the basic problems of fertilization, the history and concept of fertilization.</li> <li>3. Understand and be able to explain about the manufacture of N fertilizer and the reactions in the soil.</li> <li>4. Understand and be able to explain about the manufacture, properties, and reactions of P fertilizers.</li> <li>5. Understand and be able to explain about the manufacture, properties and use of K fertilizer.</li> <li>6. Understand and be able to explain about the importance of organic fertilizers and organic fertilizer technology.</li> <li>7. Understand and be able to explain about the properties and reactions of fertilizers containing primary and secondary macro nutrients in the soil (macro fertilizers Ca, Mg, S).</li> <li>8. Understand and be able to explain about the properties and reactions of micro fertilizers in the soil (Fe, Mn, Zn, Cu, B and Mo).</li> </ol> |

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|                   | <ol style="list-style-type: none"> <li>9. Understand and be able to explain about the manufacture, properties and reactions of compound fertilizers.</li> <li>10. Understand and be able to explain about the method of evaluating soil nutrient status.</li> <li>11. Understand and be able to explain about plant analysis method.</li> <li>12. Understand and be able to explain about the basics of applying fertilizer and recommendations for fertilizing/liming.</li> <li>13. Understand and be able to explain about the basic economic considerations and the efficiency of fertilization and liming</li> </ol>  |
| Content           | <ol style="list-style-type: none"> <li>1. Nutrients, fertilizers, development history and fertilization concepts.</li> <li>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.</li> <li>3. The manufacture of N fertilizers, reactions in the soil.</li> <li>4. The manufacture, properties, reactions of P fertilizers.</li> <li>5. The manufacture, properties and use of K fertilizer.</li> <li>6. The importance of organic fertilizers and organic fertilizer technology: Understanding of organic and inorganic fertilizers and organic fertilizer technology.</li> <li>7. Topics 1-6 Discussion.</li> <li>8. The properties and reactions of fertilizers containing primary and secondary macro nutrients in the soil: Understanding of secondary macro fertilizers Ca, Mg, S.</li> <li>9. The properties and reactions of micro fertilizers in the soil: 1. Understanding micro-fertilizers, 2. Fe fertilizers, 3. Mn fertilizers, 4. Zn fertilizers, 5. Cu fertilizers, 6. B and Mo fertilizers.</li> <li>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.</li> <li>11. The method of evaluating soil nutrient status.</li> <li>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.</li> <li>13. The basics of applying fertilizer and recommendations for fertilizing/liming.</li> <li>14. The basic economic considerations and the efficiency of fertilization and liming</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination   |

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|                        | <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Gofar, N. 2015. Teknologi Pupuk dan Pemupukan di Lahan Suboptimal. Polimedia Publishing, Jakarta.</li> <li>2. Havlin, J.L., Tisdale, S.L., Nelson, W.L., Beaton, J.D. 2013. Soil Fertility and Fertilizers: an introduction to nutrient management (6th Ed). Macmillan Publishing Company. New York, NY.</li> <li>3. Jones, J.B. 2012. Plant Nutrition and Soil Fertility Manual. 2nd Ed. CRC Press.</li> <li>4. Research publications related to fertilizer and fertilization.</li> </ol> |
| Date of last amendment | July 21, 2021  |

Semester 6

Research Methods PER 31116

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| Module Designation   | Research Methods  |
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| Code   | PER 31116   |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Rujito Agus Suwignyo, M.Agr.<br>2. Prof. Dr. Ir. Benyamin Lakitan, M.Sc.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to analyze three cardinal sins in research & scientific writings.<br>2. Understand and be able to utilize systematic steps in searching of research topics.<br>3. Understand and be able to explain the concept of research & publication as a continuum.<br>4. Understand and be able to analyze publications and academic profession.<br>5. Understand and be able to analyze through doing discussion on scientific papers of student-selected issues. |
| Content  | 1. Three cardinal sins in research & scientific writings.<br>2. Systematic steps in searching of research topics.<br>3. Research & publication as a continuum.<br>4. Publications and academic profession.<br>5. Discussion of student-selected issues.   |
| Examination forms  | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works<br>3. Writing Case Paper<br>4. Oral presentation   |
| Media employed   | LCD, whiteboard, websites   |
| Reading list   | Research publications related to reseach methods.   |
| Date of last amendment                                       | June 30, 2021   |

Entrepreneurship PER 37116

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| Module Designation   | Entrepreneurship  |
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| Code   | PER 37116   |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. E. S. Halimi, M.Sc.<br>2. Ir. Teguh Achadi, M.P.<br>3. Dr. Ir. Susilawati, M.Si.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 2 credits (equivalent with 3.00 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand entrepreneurship and technopreneurship, and their role in economic development.<br>2. Understand and be able to analyze best practices of several professional entrepreneurship in agriculture created and managed by young generation.<br>3. Understand the definition of role and source of innovation and creativity to build and improve entrepreneurship.<br>4. Understand and be able to explain capita selecta in creativity and innovation developed by young generation.<br>5. Understand and be able to identify entrepreneurship creation, characters, steps, and challenges to develop entrepreneurship in agriculture.<br>6. Understand and be able to analyze the explanation and example on administration, organization, operational, and financial balance sheet in agriculture entrepreneurship.<br>7. Understand and be able to analyze the explanation and example of procedures and documents required to build agricultural entrepreneurship.<br>8. Understand and be able to analyze best practices on innovation, creativity, and its characters to develop entrepreneurship. |

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|                   | 9. Understand and be able to analyze the explanation and examples of business proposal to develop agricultural entrepreneurship to get financial support from the bank.<br>10. Understand and be able to prepare business proposal.  |
| Content           | 1. Understanding entrepreneurship and technopreneurship, and their role in economic development.<br>2. Best practices of several professional entrepreneurship in agriculture created and managed by young generation.<br>3. Understanding and definition of role and source of innovation and creativity to build and improve entrepreneurship.<br>4. Capita selecta in creativity and innovation developed by young generation.<br>5. Entrepreneurship creation, characters, steps, and challenges to develop entrepreneurship in agriculture; Pre-proposal creation: Inspiration, innovation, and creativity to initiate entrepreneurship unit in agriculture<br>6. Explanation and example on administration, organization, operational, and financial balance sheet in agriculture entrepreneurship.<br>7. Explanation and example of procedures and documents required to built agricultural entrepreneurship.<br>8. Explanation best practices on innovation, creativity, and its characters to develop entrepreneurship.<br>9. Explanation and examples of business proposal to develop agricultural entrepreneurship to get financial support from the bank.<br>10. Practice, discussion, and report to make business proposal; Instructional task to visit local entrepreneurship unit.<br>11. Group discussion on innovation and creativity to improve visited entrepreneurship unit.<br>12. Report and presentation on innovation and creativity to improve visited entrepreneurship unit (1).<br>13. Report and presentation on innovation and creativity to improve visited entrepreneurship unit (2). |
| Examination forms | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works<br>3. Writing Case Paper<br>4. Oral presentation  |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | 1. Kasali, R. 2010. Modul kewirausahaan untuk strata S1. Bank Mandiri, Jakarta.<br>2. Lembang, A. 2002. Who wants to be options entrepreneur, Gramedia. Jakarta.   |



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|                        | <ol style="list-style-type: none"> <li>3. Rhonda, A. 2008. Business plant in a day. Kanisius, Jakarta.</li> <li>4. Suharno B. 2006. Langkah jitu memulai bisnis dari nol. Penebar Swadaya Jakarta</li> <li>5. Suharyadi et al. 2007. Membangun usaha sukses sejak usia muda. Salemba EMPat, Jakarta.</li> <li>6. Suryo,A. 2008. Tata cara mengurus Ijin Usaha. Pustaka Yustisia. Yogyakarta.</li> <li>7. Sutomo, D. 2007. Menjadi Entrepreneur jempolan. Republika. Jakarta</li> <li>8. Widyatmoko A. 2006. Seratus peluang usaha. Agromedia Pustaka. Tangerang</li> <li>9. Research publications related to entrepreneursip.</li> </ol> |
| Date of last amendment | June 30, 2021  |

## Field Study PAG 116316

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| Module Designation   | Field Study   |
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| Code   | PAG 116316  |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Firdaus Sulaiman, M.Si.<br>2. Dr. Ir. Yakup, M.S.<br>3. Dr. Ir. Zaidan, M.Sc.  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | 1. Structured assignment (i.e.: article reading and review)<br>2. The class size 30-75 students per class<br>3. Contact hours for lecture are 0.00 hours per semester<br>4. Total hours practical is 34.00 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>2. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 1 credit (equivalent with 1.51 ECTS)  |
| Required and recommended prerequisite for joining the module | Passed 75% of all courses belong to Agronomy (PAG code)   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to describe and apply the knowledge obtained from office/agency that handles the agricultural sector, research institutes dealing with agricultural studies, laboratories engaged in agriculture, plantation, horticulture cultivation.<br>2. Gain experience and build network through the visit to agricultural agencies for food and horticulture crops, research institutes dealing with agricultural studies, and other related fields.<br>3. Observe and analyze the application of agricultural sciences in the work field.    |
| Content  | 1. Introduction and explanation Office/Agency that handles the agricultural sector.<br>2. Introduction and explanation Research Institutes dealing with agricultural studies.<br>3. Introduction and explanation laboratories engaged in agriculture.<br>4. Introduction and explanation of land for food and horticulture cultivation.<br>5. Introduction and explanation of land for plantation and industrial crops.<br>6. Visit to agricultural land for food and horticulture crops.<br>7. Visit to agricultural land for plantation and industrial crops. |

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|                        | <p>8. Visit to Office/Agency that handles the agricultural sector.</p> <p>9. Visit to Research Institutes dealing with agricultural studies.</p> <p>10. Visit to Research Institute engaged in food horticulture crops.</p> <p>11. Visit to Research Institute engaged in plantation and industrial crops.</p> <p>12. Visit to laboratories engaged in agriculture.</p> <p>13. Preparation of reports and analysis of the results of field visits.</p>   |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Brochures and document that given by researchers</li> <li>2. Chandrasekaram, B., K. Annadurai and E. Somasundaran. 2010. A Textbook of Agronomy. New Age International (P) Limited, Publishers. New Delhi. 835 p.</li> <li>3. Kandamby, G.W.T.C. 2018. Enhancement of Learning Through Field Study. Journal of Technology and Science Education (8) 4: 408 – 419.</li> <li>4. Pattacim, L. 2008. Experiential Learning: The Field Study Trip, A Student Centred Curriculum. Journal of Learning and Teaching 11 (2): 1 – 16.</li> <li>4. Pratley, J. 2003. Principles of Field Crop Production. 4<sup>th</sup> Edition. Oxford University Press. 576 p.</li> <li>5. Shakil, A.F., W. Faizi and S. Hfeez. 2011. The Need and Importance of Field Trips at Higher Level in Karachi. International Journal of Academic Research in Business and social Sciences 2 (1): 11 – 16.</li> <li>6. Sharma, R.K., A.K.Soni, R. Bhagat, N. Pandey and U.K. Pandey. 2014. Basic Agriculture for Engineers. Daya Publishing House. New Delhi. 117 p.</li> <li>7. Singh, Y.K. 2006. Environmental Science. New Age International Publishers. New Delhi. 310 p.</li> <li>8. Vastala, P. 2006. The Field Study as An Educational Technique in Open and Distance Learning. Turkish Online Journal of Distance Education 7 (4): 10 – 17.</li> <li>9. Vero, S. E. 2021. Fieldwork Ready, An Introductory Guide to Field Research for Agriculture, Environment, and Soil Scientists. Wiley. 272 p.</li> </ol> |
| Date of last amendment | July 21, 2021  |

## Advanced Plant Breeding\* PAG 111316

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| Module Designation   | Advanced Plant Breeding*  |
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| Code   | PAG 111316  |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. E. S. Halimi, M.Sc.<br>2. Dr. Ir. Dwi Putro Priadi, M.Sc.<br>3. Dr. Ir. Mery Hasmeda, M.Sc.<br>4. Dr. Fikri Adriansyah, S.Si.  |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PAG 110216   |
| Module objectives/intended learning outcomes                 | 1. Understand the general review in theory, procedures, and field plot in plant breeding research.<br>2. Understand the definition of sub-optimal land.<br>3. Understand and be able to explain plant breeding for resistance to environmental stresses: submerged stress, drought stress, salinity stress, aluminum stress.<br>4. Understand and be able to explain how to release and distribute the cultivars.<br>5. Understand and be able to explain plant breeding concept and procedures in several important plants in Indonesia: Genetic sources, hybridization, screening, and selection methods. |
| Content  | 1. Introduction, general review in theory, procedures, and field plot in plant breeding research.<br>2. Definition of sub-optimal land.<br>3. Plant breeding for resistance to environmental stresses: submerged stress, drought stress, salinity stress, aluminum stress.<br>4. Release and distribution of cultivars. Controversy over germplasm patents.   |

5. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in maize breeding program (case study).
6. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in maize breeding program (case study).
7. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in rice breeding program (case study).
8. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in rice breeding program (case study).
9. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in soybean breeding program (case study).
10. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in palm oil breeding program (case study).
11. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in palm oil breeding program (case study).
12. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in vegetable breeding program (case study).
13. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in vegetable breeding program (case study).
14. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in ornamental plant breeding program (case study).
15. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources, hybridization, screening, and selection methods in ornamental plant breeding program (case study).
16. Capita selecta: Plant breeding concept and procedures in important plant in Indonesia: Genetic sources,

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|                        | hybridization, screening, and selection methods in fruit plant breeding program (case study).   |
| Examination forms      | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works<br>3. Writing Case Paper<br>4. Oral presentation   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Nduat. 1996. Physiology of Stress Tolerance in Rice. IRRI.</li> <li>2. Stacey, G. 2008. Genetics and Genomics of Soybean. Springer.</li> <li>3. Hallauer, A.R., Carena, M.J., Filho, J.B.M. 2010. Quantitative Genetics in Maize Breeding. Springer.</li> <li>4. Prasad, M.N.V., Strzalka, K. 2002. Physiology and Biochemistry of Metal Toxicity and Tolerance in Plants. Kluwer Academic Publishers.</li> <li>5. Morot-Gaudry, J.F., Lea, P., Briat, J-F. 2004. Functional Plant Genomics. Science Publishers.</li> <li>6. Buchanan., Gruissem., Jones. 2000. Biochemistry &amp; Molecular Biology of Plants. American Society of Plant Physiology.</li> <li>7. Kang, M.S., Priyadarshan, P.M. 2007. Breeding Major Food Staples. Blackwell Publishing.</li> <li>8. Acquah, G. 2012. Principles of Plant Genetics and Breeding, 2nd Edition. Wiley-Blackwell.</li> <li>9. Xu, Y. 2010. Molecular Plant Breeding. International Maize and Wheat Improvement Centre (CIMMYT), China.</li> <li>10. Kang, M.S. 2002. Quantitative Genetics, Genomics and Plant Breeding. CABI; 2nd edition.</li> <li>11. Bharadwaj, D.N. 2019. Advanced Molecular Plant Breeding; Meeting the Challenge of Food Security. Apple Academic Press.</li> <li>12. Prasad, M.N.V., Strzalka, K. 2002. Physiology and Biochemistry of Metal Toxicity and Tolerance in Plants. Kluwer Academic Publishers.</li> <li>13. Research publications related to research advanced plant breeding.</li> </ol> |
| Date of last amendment | July 21, 2021   |

## Seed Production Techniques\* PAG 603316

| Module Designation   | Seed Production Techniques*   |
|--|---|
| Code   | PAG 603316  |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>2. Dr. Ir. Firdaus Sulaiman, M.Si.<br>3. Dr. Ir. Mery Hasmeda, M.Sc.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | Passed PTN 20115  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the legislation and seed production terminology.<br>2. Understand and be able to explain about plant reproduction: types and characteristics of plants based on their mode of reproduction (cross-pollination and self-pollination).<br>3. Understand and be able to explain government regulations on seeds: Certified seed production requirements and processes.<br>4. Understand and be able to explain about certified seed grade: Seed production between fields and between seasons.<br>5. Understand and be able to explain genetic integrity: Techniques to protect genetic purity in field seed production.<br>6. Understand and be able to explain purity analysis and determination of seed moisture content.<br>7. Understand and be able to analyze land requirements and selection for seed production.<br>8. Understand and be able to explain several plants (rice, soybean, oil palm) seed production. |



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|                        | <p>9. Understand and be able to explain about seed harvesting and conditioning.</p> <p>10. Understand and be able to explain about threshing and cleaning of seeds.</p> <p>11. Understand and be able to explain about seed drying and storage</p>   |
| Content                | <ol style="list-style-type: none"> <li>1. Legislation and seed production terminology.</li> <li>2. Plant reproduction: types and characteristics of plants based on their mode of reproduction (cross-pollination and self-pollination).</li> <li>3. Government regulations on seeds: Certified seed production requirements and processes.</li> <li>4. Certified seed grade: Seed production between fields and between seasons.</li> <li>5. Genetic integrity: Techniques to protect genetic purity in field seed production.</li> <li>6. Purity analysis and determination of seed moisture content.</li> <li>7. Land requirements and selection for seed production.</li> <li>8. Rice seed production.</li> <li>9. Field study to BPSB, Rambutan village.</li> <li>10. Soybean seed production.</li> <li>11. Oil palm seed production.</li> <li>12. Lectures on the garden field and Sampoerna Agro's seed processing unit.</li> <li>13. Seed harvesting and conditioning.</li> <li>14. Threshing and cleaning of seeds.</li> <li>15. Seed drying and storage</li> </ol> |
| Examination forms      | <p>Quiz, Mid-terms and Final Examination</p> <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>1. Basra, A.S. 2006. Seed Science and Technology. FPP.</li> <li>2. Copeland, L.O., McDonald, M.B. 2001. Seed Science and Technology. Kluwer Academic Publishers.</li> <li>3. Loewer, O.J., Bridges, T.C., Bucklin, R.A. 1994. On Farm Drying and Storage Systems. American Society of Agricultural Engineers.</li> <li>4. Research publications related to seed production techniques.</li> </ol>   |
| Date of last amendment | July 21, 2021  |



## Swampland Agriculture\* PAG 213316

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| Module Designation   | Swampland Agriculture*   |
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| Code   | PAG 213316   |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year  |
| Person responsible for the module                            | 1. Prof. Dr. Ir. Rujito Agus Suwignyo, M.Agr.<br>2. Dr. Ir. Firdaus Sulaiman, M.Si.<br>3. Dr. Ir. Irmawati, S.P., M.Si., M.Sc.   |
| Language   | Indonesian   |
| Relation to curriculum                                       | Elective Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the scope, limitation, classification and typology of swamplands and the benefits for agriculture.<br>2. Understand and be able to identify the typology of tidal swamps and its soil characteristics.<br>3. Understand and be able to explain about nontidal swamp typology and its soil characteristics.<br>4. Understand and be able to explain about pyrite formation and effects of pyrite oxidation.<br>5. Understand and be able to explain about formation of peat soil, characteristics and damage impact.<br>6. Understand and be able to explain the water management in tidal and nontidal swamplands.<br>7. Understand and be able to explain the reclamation of water management network in swamplands.<br>8. Understand and be able to explain the crop management in tidal swampland.<br>9. Understand and be able to explain the crop management in nontidal swampland.<br>10. Understand and be able to prepare nursery system in nontidal swampland. |

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|                   | <ol style="list-style-type: none"> <li>11. Understand and be able to explain plant management on peat.</li> <li>12. Understand and be able to explain about mangrove ecosystem on the coastal area.</li> <li>13. Understand and be able to explain about mangrove ecosystem restoration.</li> <li>14. Understand and be able to explain about restoration of degraded peatland ecosystem.</li> </ol>   |
| Content           | <ol style="list-style-type: none"> <li>1. Introduction of agriculture in swamplands</li> <li>2. Typology of tidal swamps and its soil characteristics.</li> <li>3. Nontidal swamp land typology and its soil characteristics.</li> <li>4. Pyrite pyrite formation and effects of pyrite oxidation.</li> <li>5. Formation of peat soil, characteristics and damage impact.</li> <li>6. Water management in tidal and nontidal swamplands.</li> <li>7. Reclamation of water management network in swamplands.</li> <li>8. Crop management in tidal swampland.</li> <li>9. Crop management in nontidal swampland.</li> <li>10. Nursery system in nontidal swampland.</li> <li>11. Plant management on peat.</li> <li>12. Mangrove ecosystem on the coastal area.</li> <li>13. Mangrove ecosystem restoration.</li> <li>14. Restoration of degraded peatland ecosystem.</li> </ol> |
| Examination forms | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed    | LCD, whiteboard, websites  |
| Reading list      | <ol style="list-style-type: none"> <li>1. Haryono. 2013. Lahan Rawa: Lumbung Pangan Masa Depan Indonesia. Badan Penelitian dan Pengembangan Pertanian Kementerian Pertanian.</li> <li>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.</li> <li>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</li> <li>4. Reddy, K.R. and R.D. DeLaune. 2008. Biogeochemistry of Wetland: Science and Application. CRC Press. 806 pp.</li> </ol>  |

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|                        | <ol style="list-style-type: none"> <li>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.</li> <li>6. Richardson, J.J. and M.J. Vepraskas (Eds). 2001. Wetland Soils: Genesis, Hydrology, Landscapes and Classification. Lewis Publishers. 432 pp.</li> <li>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</li> <li>8. Kadlec, R.H. and S.D. Wallace. 2009. Treatment Wetland. 2nd Ed. CRC Press. 1048 pp.</li> <li>9. Research publications related to swampland agriculture.</li> </ol> |
| Date of last amendment | July 21, 2021   |

## Forest Crops Cultivation\* PAG 214316

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| Module Designation   | Forest Crops Cultivation*  |
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| Code   | PAG 214316   |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year  |
| Person responsible for the module                            | 1. Dr. Ir. Erizal Sodikin<br>2. Dr. Ir. M. Umar Harun, M.S.<br>3. Dr. Ir. Yakup, M.S.  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Elective Course  |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester  |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester  |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)  |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain the scope, limitation, benefit, and classification of forestry plants.<br>2. Understand and be able to explain the ecology and cultivation of Acacia.<br>3. Understand and be able to explain the ecology and cultivation of Eucalyptus.<br>4. Understand and be able to explain the ecology and cultivation of teak plant.<br>5. Understand and be able to explain the ecology and cultivation of Jelutung.<br>6. Understand and be able to explain the cultivation of Mahogani.<br>7. Understand and be able to explain the cultivation of Bamboo.<br>8. Understand and be able to explain the cultivation of Merbau.<br>9. Understand and be able to explain the cultivation of Kemenyan.<br>10. Understand and be able to explain the cultivation of Sengon.<br>11. Understand and be able to explain the development of silviculture in Indonesia. |

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| Content                | <ol style="list-style-type: none"> <li>1. Introduction.</li> <li>2. Ecology of Acacia.</li> <li>3. Cultivation of Acacia.</li> <li>4. Ecology of Eucalyptus.</li> <li>5. Cultivation of Eucalyptus.</li> <li>6. Ecology of Teak plant.</li> <li>7. Cultivation of Teak plant.</li> <li>8. Cultivation of Jelutung.</li> <li>9. Cultivation of Mahogani.</li> <li>10. Cultivation of Bamboo.</li> <li>11. Cultivation of Merbau.</li> <li>12. Cultivation of Kemenyan.</li> <li>13. Cultivation of Sengon.</li> <li>14. Development of silviculture in Indonesia.</li> </ol>   |
| Examination forms      | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>  |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | <ol style="list-style-type: none"> <li>1. Agus A.P., D. Sudrajad, Nurhasyby dan Danu. 2016. Pembibitan Tanaman hutan. Penebar swadaya. ISBN; 9789790027268</li> <li>2. Ariyanto. H. 2006. Budidaya tanaman kehutanan. Citra aji parama. ISBN; 978-979-3483-77</li> <li>3. Bratawinata, AA. 2018. Ekologi Hutan Hujan Tropis. Mulawarman University Press. ISBN: 978-602-6834-19-5</li> <li>4. Chandra, A.S.A., S. Manusi., Heriyanto, dan C. Sibagariang. 2011. Pohon-pohon hutan alam rawa gambut merang. REED_GIZ. Palembang</li> <li>5. Dirjen Bina Pembangunan kemendagri daerah. 2013. Tanaman Hutan untuk lahan kritis dan sumber daya air. Jakarta</li> <li>6. Irwanto. 2007. Budidaya Tanaman Kehutanan. Yogyakarta</li> <li>7. Julian, E. 2004. Plantation forestry in the tropic. Oxford university. ISBN; 0198509472</li> <li>8. Mark. S.A., and M. J. Kelly. 2018. The practice of silviculture. Tenth edition. Wiley &amp; son. NY. USA</li> <li>9. Philip. W.N., 2006. Growing plantation forest. Springer-verlag. Heidelberg. E book. ISBN: 978-3-540-32479-9</li> <li>10. Triyono, P., Y. Mile., E. Fauziah, dan D. Darusman. 2014. Hutan Rakyat. Kanisius. Yogyakarta</li> <li>11. Research publications related to forest crops cultivation.</li> </ol> |
| Date of last amendment | July 21, 2021   |

## Landscape Architecture\* PAG 603316

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| Module Designation   | Landscape Architecture*   |
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| Code   | PAG 603316  |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Yakup, M.S.<br>2. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>3. Dr. Ir. E. S. Halimi, M.Sc.<br>4. Dr. Ir. Lidwina Niniek S, M.Si.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand the definition and profession in the field of landscape architecture.<br>2. Understand and be able to explain the history of the development of landscape architecture.<br>3. Understand and be able to identify garden classification, garden forms and styles.<br>4. Understand and be able to identify types of gardens based on their nature.<br>5. Understand and be able to analyze the art in landscape architecture.<br>6. Understand and be able to analyze the aspects of forming space, circulation, and visual aspects of landscape architecture.<br>7. Understand and be able to explain about design elements and their uses.<br>8. Understand and be able to explain design principles, balance, rhythm, repetition and emphasis.<br>9. Understand and be able to analyze the design in landscape architecture.<br>10. Understand and be able to analyze the arrangement of various forms of open space. |

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|                   | 11. Understand and be able to explain about garden elements.<br>12. Understand and be able to analyze ornamental plants in landscape architecture.<br>13. Understand and be able to plan a garden design.<br>14. Understand and be able to manage a park cost budget plan analysis.<br>15. Understand and be able to explain various garden designs and analyze their designs.  |
| Content           | 1. Definition and profession in the field of landscape architecture.<br>2. History of the development of landscape architecture.<br>3. Garden classification, garden forms and styles.<br>4. Types of gardens based on their nature.<br>5. Getting to know art in landscape architecture.<br>6. Aspects of forming space, circulation, and visual aspects of landscape architecture.<br>7. Introduction to design elements and their uses.<br>8. Design principles, balance, rhythm, repetition and emphasis.<br>9. Design in landscape architecture.<br>10. Introduction and arrangement of various forms of open space.<br>11. Introduction to garden elements.<br>12. Ornamental plants in landscape architecture.<br>13. Green planning in garden design.<br>14. Park cost budget plan analysis.<br>15. Get to know various garden designs and analyze their designs. |
| Examination forms | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works<br>3. Writing Case Paper<br>4. Oral presentation   |
| Media employed    | LCD, whiteboard, websites   |
| Reading list      | 1. Cantor, S. L. 2020. Professional and Practical Considerations for Landscape Design. Oxford University Press, Inc. New York, US. 512 p.<br>2. Chen, G. 2011. Landscape Architecture, Planting Design Illustrated. 2 <sup>nd</sup> Edition. Architeg, Inc. California, US. 290 p.<br>3. Chisholen, L. A. 2018. History of Landscape Design in 100 Gardens. Timber Press. Portland, OR, US. 400 p.<br>4. Clark, E. 2011. The Art of The Islamic Garden. The Crowood Press Ltd. Ramsbury, United Kingdom. 208 p.   |

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|                        | <ol style="list-style-type: none"> <li>5. DK. 2017. Encyclopedia of Landscape Design Planning, Building, and Planting Your Perfect Outdoor Space. 392 p.</li> <li>6. Ingels, J.E. 2009. Ornamental Horticulture: Science, Operations, and Management. Cengage Learning. 687 p.</li> <li>7. Laurie, M. 1985. An Introduction to Landscape Architecture. 2<sup>nd</sup> edition. Pearson College Div. 926 p.</li> <li>8. Oudolf, P. and H. Gerritsen. 2019. Planting The Natural Garden. Timber Press. Portland, OR, US. 300 p.</li> <li>9. Ruggles, D.E. 2008. Ilamics Gardens and Landscapes. University of Pennsylvania Press. Pennsylvania, US. 296 p.</li> <li>10. Simmonds, J.O. 1977. Landscape Architecture, A Manual of Site Planning and Design. McGraw-Hill Education, 3<sup>rd</sup> edition. 384 p.</li> <li>11. Starke, B. and J.O. Simmonds. 2013. Landscape Architecture, A Manual of environmental Planning and design. Fifth Edition. McGraw Hill. 432 p.</li> <li>12. Research publications related to landscape architecture.</li> </ol> |
| Date of last amendment | July 21, 2021  |



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## Plant Propagation\* PAG 307316

| Module Designation   | Plant Propagation*  |
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| Code   | PAG 307316  |
| Semester (s) in which the module is taught                   | 6 <sup>th</sup> semester/3 <sup>rd</sup> year   |
| Person responsible for the module                            | 1. Dr. Ir. Zaidan Panji Negara, M.Sc.<br>2. Dr. Ir. Mery Hasmeda, M.Sc.<br>3. Dr. Ir. Muhammad Ammar, M.P.<br>4. Dr. Ir. Marlina, M.Si.   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Elective Course   |
| Teaching methods   | 1. Lectures (explanation, discussion)<br>2. Structured assignment (i.e.: article reading and review)<br>3. The class size 30-75 students per class<br>4. Contact hours for lecture are 23.33 hours per semester<br>5. Total hours practical is 19.83 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Lectures (2 x 50 minutes) per week or 23.33 hours per semester<br>2. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>3. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 3.79 ECTS)   |
| Required and recommended prerequisite for joining the module | -   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to explain about the scope, definition, and basic knowledge of several plant propagation techniques.<br>2. Understand and be able to explain the values of plant propagation and aspects of plant propagation.<br>3. Understand and be able to analyze the principles of plant propagation (generative and vegetative).<br>4. Understand and be able to analyze anatomy and physiology of plant propagation (by cuttings, grafting, grafting and grafting).<br>5. Understand and be able to explain the principles of propagation by tissue culture.<br>6. Understand and be able to explain the propagation of plants by using special organs. |
| Content  | 1. Introduction and definition.<br>2. Values of plant propagation and aspects of plant propagation.<br>3. Principles of plant propagation (generative and vegetative).<br>4. Anatomy and physiology of plant propagation (by cuttings, grafting, grafting and grafting).  |

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|                        | 5. Principles of propagation by tissue culture.<br>6. Propagation of plants by special organs.  |
| Examination forms      | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works<br>3. Writing Case Paper<br>4. Oral presentation   |
| Media employed         | LCD, whiteboard, websites   |
| Reading list           | 1. Jain, S.M., Ochatt, S.J. 2010. Protocols for In Vitro Propagation of Ornamental Plants. Humana Press.<br>2. George, E.F., Hall, M.A., Klerk, G-J.D. 2008. Plant Propagation by Tissue Culture. Springer.<br>3. Research publications related to plant propagation. |
| Date of last amendment | July 21, 2021   |

Semester 7

Community Service Program UNI 40116

| Module Designation   | Community Service Program  |
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| Code   | UNI 40116  |
| Semester (s) in which the module is taught                   | 7 <sup>th</sup> semester/4 <sup>th</sup> year  |
| Person responsible for the module                            | Advisor Lecturers  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Structured assignment (i.e.: article reading and review)<br>2. The class size 30-75 students per class<br>3. Total hours practical is 272.00 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>2. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 4 credits (equivalent with 10.88 ECTS)   |
| Required and recommended prerequisite for joining the module | -  |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to upholding human values based on morals and ethics.<br>2. Capable of conducting process of self-evaluation of the work group under their responsibility, and able to manage learning independently.<br>3. Capable of adapting quickly to the world of work and the environment.<br>4. 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. Preparation for implementation which includes site selection and registration.<br>2. Debriefing in the form of providing knowledge and training skills in the field of agriculture, health, education, economy an employment, rural socio-cultural, and village government.<br>3. Work practices within the programmed period of time in the South Sumatera regional and/or other areas that have been determined.<br>4. Collection of data and documentation of work practices that have been carried out.<br>5. Making reports of work practices based on the data and documentation collected. |
| Examination forms  | Quiz, Mid-terms and Final Examination<br>1. Essays questions<br>2. Practical works   |
| Media employed   | LCD, whiteboard, websites  |

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| <p>Reading list</p>           | <ol style="list-style-type: none"> <li>1. Reading list Anonymous. 2007. Planning Your Community Service Project Based on A Community Service – Learning Model. Michigan State University. All Right Reserved. Michigan. 20 p.</li> <li>2. Antonio, A.L., H.S. Astin and C. Cross. 2000. Community Service in Higher Education : A Look at The Faculty. The Review of Higher Education. 23 : 373 – 398.</li> <li>3. Bonnet, J. 2008. Engaging in Community Service and Citizenship : A Comparative Study of Undergraduate Students Based Upon Community Service Participation Prior College.University of Maryland, USA. 171 p.</li> <li>4. Butin, D. W. 2006. The Limits of Service – Learning in Higher Education. The Review of Higher Education 29 : 473 – 498.</li> <li>5. Hermanto. 2019. ITS Community Service Program as Medium to Empower Community in Facing The Era of Revolution 4.0. IPTEK Journal Proceeding Series 6 : 78 – 83.</li> <li>6. LPM Unsri. 2015. Pedoman Pelaksanaan Kuliah Kerja Nyata (KKN). Lembaga Pengabdian Kepada Masyarakat Unsri. Indralaya. 35 h.</li> <li>7. Prastowo, J. dan E.A. Suyono. 2007. Buku Pedoman Kuliah Kerja Nyata Pembelajaran Pemberdayaan Masyarakat (KKN PPM) Perguruan Tinggi di Indonesia. Direktorat Penelitian dan Pengabdian Kepada Masyarakat, Ditjen Dikti, Depdiknas. Jakarta. 127 h.</li> <li>8. Research publications related to community service program.</li> </ol> |
| <p>Date of last amendment</p> | <p>June 30, 2021</p>  |

## Field Practice PER 49216

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| Module Designation   | Field Practice   |
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| Code   | PER49216   |
| Semester (s) in which the module is taught                   | 7 <sup>th</sup> semester/4 <sup>th</sup> year  |
| Person responsible for the module                            | Advisor Lecturers  |
| Language   | Indonesian   |
| Relation to curriculum                                       | Compulsory Course  |
| Teaching methods   | 1. Structured assignment (i.e.: article reading and review)<br>2. The class size 30-75 students per class<br>3. Total hours practical is 204.00 hours per semester   |
| Workload (incl. Contact hours, self-study hours)             | 1. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester<br>2. Self-study: 2 x 60 minutes per week or 24 hours per semester   |
| Credit points  | 3 credits (equivalent with 8.31 ECTS)  |
| Required and recommended prerequisite for joining the module | Passed PER 31116   |
| Module objectives/intended learning outcomes                 | 1. Understand and be able to master the theoretical concepts of plant cultivation problems and be able to manage and solve problems in the field.<br>2. Capable of conducting plant cultivation practices and collaborating with teams from various scientific backgrounds.<br>3. Capable of conducting basic research on the development and implementation of plant cultivation science and technology based on scientific methodologies to generate specific plant cultivation ideas or recommendations.<br>4. Capable of writing research results as mentioned above in the form of scientific articles and present them in scientific forums.                     |
| Content  | 1. Choose of field practice crop commodities (annual crops, or perennial crops).<br>2. Get the location of field practice activities (agricultural/plantation institutions, agro-industrial companies, agrochemical companies, or the location of certain plant cultivation).<br>3. Choose the aspects of plant cultivation that will become the topic of field practice activities.<br>4. Preparation of proposals for the implementation of field practice activities.<br>5. Collect early data and information related to the topic of field practice activities.<br>6. Conducting interviews with competent respondents on the topic of field practice activities. |

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|                        | <ol style="list-style-type: none"> <li>7. Following hands-on practice in the field regarding the topic of field practice activities.</li> <li>8. Collect and analyze data and information, interview results, and documentation of field practice activities.</li> <li>9. Preparation of reports on field practice activities</li> <li>10. Completion of field practice activity reports.</li> </ol>   |
| Examination forms      | Quiz, Mid-terms and Final Examination <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> <li>3. Writing Case Paper</li> <li>4. Oral presentation</li> </ol>   |
| Media employed         | LCD, whiteboard, websites  |
| Reading list           | <ol style="list-style-type: none"> <li>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.</li> <li>2. Dris, R., I.A. Khan and R. Niskanen. 2002. Environment and Crop Production. CRC Press. 360 p.</li> <li>3. Jones, Jr., J. B. 2003. Agronomic Handbook, Management of Crops, Soils, and Their Fertility. CRC Press. 450 p.</li> <li>4. Krishnaprabu, S. 2020. Agronomic Management Practices for Field Crop Production. Satish Serial Publishing House. 436 p.</li> <li>5. Pratley, J. 2003. Principles of Field Crop Production. 4<sup>th</sup> Edition. Oxford University Press. 576 p.</li> <li>6. Singh, S. S. and R. Singh. 2015. Principles and Practices of Agronomy. Kalyani Publishers. 348 p.</li> <li>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.</li> <li>8. Vero, S. E. 2021. Fieldwork Ready, An Introductory Guide to Field Research for Agriculture, Environment, and Soil Scientists. Wiley. 272 p.</li> <li>9. Research publications related to field research.</li> </ol> |
| Date of last amendment | June 30, 2021  |

## Research Project PER49316

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| Module Designation   | Research Project  |
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| Code   | PER49316  |
| Semester (s) in which the module is taught                   | 7 <sup>th</sup> semester/4 <sup>th</sup> year   |
| Person responsible for the module                            | Advisor Lecturers   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Structured assignment (i.e.: article reading and review)</li> <li>2. The class size 30-75 students per class</li> <li>3. Total hours practical is 408.00 hours per semester</li> </ol>  |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>2. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>  |
| Credit points  | 6 credits (equivalent with 16.47 ECTS)  |
| Required and recommended prerequisite for joining the module | Passed PER 31116  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Capable to browse and study the literature to gain insight into research topic and determine the research topic to be carried out based on the interests.</li> <li>2. Capable to prepare the research plan proposals.</li> <li>3. Capable to present the research plan proposal in a discussion forum followed by conducting the research experiment in accordance with the proposals that have been prepared.</li> <li>4. Capable to solve the problems occurred during the research, perform data analysis, and analyze the research data result and prepare research report in the form of a thesis.</li> <li>5. Capable to present thesis in the forum and defend and it in front of the examiner.</li> </ol> |
| Content  | <ol style="list-style-type: none"> <li>1. Study the literature to gain insight into research topic.</li> <li>2. Determining the research topic to be carried out.</li> <li>3. Study the literature to deepen knowledge about the topic of research to be carried out.</li> <li>4. Preparation of the research plan proposals to be carried out.</li> <li>5. Implementation of research plan proposal discussion.</li> <li>6. Carrying out research in accordance with the proposals that have been prepared.</li> <li>7. Processing and analysis of research data.</li> <li>8. Presenting research reports in the form of a thesis and defending it in front of the examiner.</li> </ol>  |
| Examination forms  | <ol style="list-style-type: none"> <li>1. Essays questions</li> <li>2. Practical works</li> </ol>   |

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| Reading list           | 1. Research publications related to research project. |
| Date of last amendment | June 30, 2021   |

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## Seminar PER 49416

| Module Designation   | Seminar   |
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| Code   | PER 49416   |
| Semester (s) in which the module is taught                   | 7 <sup>th</sup> semester/4 <sup>th</sup> year   |
| Person responsible for the module                            | Advisor Lecturers   |
| Language   | Indonesian  |
| Relation to curriculum                                       | Compulsory Course   |
| Teaching methods   | <ol style="list-style-type: none"> <li>1. Structured assignment (i.e.: article reading and review)</li> <li>2. The class size 30-75 students per class</li> <li>3. Contact hours for lecture are 1.67 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Total hours practical is 408.00 hours per semester</li> </ol>   |
| Workload (incl. Contact hours, self-study hours)             | <ol style="list-style-type: none"> <li>1. Structured assignment (i.e.: article reading and review): 2 x 60 minutes per week or 24 hours per semester</li> <li>2. Self-study: 2 x 60 minutes per week or 24 hours per semester</li> </ol>  |
| Credit points  | 1 credit (equivalent with 1.03 ECTS)  |
| Required and recommended prerequisite for joining the module | Passed PER 31116  |
| Module objectives/intended learning outcomes                 | <ol style="list-style-type: none"> <li>1. Capable to gather information and knowledge through a scientific forum.</li> <li>2. Capable to study literature, analyze research data and prepare article manuscript based on the data.</li> <li>3. Capable to prepare presentation slides based on research result to present it in front of the forum.</li> <li>4. Capable to have critical thinking and sharpen public speaking skills through presenting in a scientific forum.</li> </ol>                           |
| Content  | <ol style="list-style-type: none"> <li>1. Attend and participate in a number of seminars conducted by other students.</li> <li>2. Study research literatures.</li> <li>3. Prepare articles from the results of research that has been carried out.</li> <li>4. Present the research result in a students' forum attended by advisor and examiner.</li> <li>5. Evaluate articles based on suggestions and input given during the forum.</li> </ol>   |
| Examination forms  | Presentation  |
| Reading list   | <ol style="list-style-type: none"> <li>1. Anonymous. 2018. Seminar Presentation, Intensive Academic Program. Higher Education Language and Presentation support (HELPS). University of Technology Sidney. NSW, Australia. 55 p</li> <li>2. Bhavan, A. 2016. Guideline for Planning and Conducting Seminar. Development Circle, Directorate of Forests, Government of West Bengal. 12 p.</li> <li>3. Notohadiprawiro, T. 1984. Hakekat Seminar dan Tesis dalam Kurikulum Pendidikan Tinggi Untuk Landasan</li> </ol> |

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|                        | <p>Penyusunan Metode dan Teknik Pembimbingan. Makalah Kegiatan PPPT – UGM Sub-Perbaikan Metode Mengajar Th 1982/1983, 12 Mei 1984. 23 h.</p> <ol style="list-style-type: none"> <li>4. Russel, L. and M. Munter. 2011. Guide Presentations. Third Edition. Prentice Hall, Upper Saddle River. New Jersey, USA.</li> <li>5. Somebody, M. 2020. Seminar Paper, How to Write Academic Paper. Dresden University Technology. Dresden. 28 p.</li> <li>6. Tiberius, R. and I. Silver. 2001. Guidelines for Conducting Workshops and Seminars That Activity Engage Participants. University of Toronto, Canada. 40 p.</li> <li>7. Yuzal, I., A. Wardhana, H. Hasan, J. Jebusua dan W. Nikson. 2011. Panduan Praktis Seminar. Raja Grafindo Persada. Jakarta. 230 h.</li> <li>8. Research publications related to research project.</li> </ol> |
| Date of last amendment | June 30, 2021  |