



Subject Module
 Department of Agrotechnology
 Faculty of Agriculture
 University of Islam Malang

Module Handbook

Module Title	Nutrient & Water Management
Module Level, if available	Undergraduate Study Program of Agrotechnology
Course Code	MKW 60615
Headings, if available	-
Course (MK)	Nutrient & Water Management
Semester	IV
Course Coordinator	Dr.Ir. Anis Sholihah, MP
Teaching Team	-
Language of instruction	Indonesian language/English
Linkages with the Curriculum	Study Program : Agrotechnology Specialization: Agrotechnology Type: Compulsory/elective
Learning Methods and Duration	<ol style="list-style-type: none"> 1. Lecture: 100 minutes/meeting (14 meetings) 2. Practicum 170 minutes/meeting (7 meetings) 3. Structured Assignments/individual and group Assignments presentation
Student Study Load	<ol style="list-style-type: none"> 1. Lecture: 100 minutes/meeting (14 meetings) 2. Practicum: 170 minutes/meeting (14 meetings) 3. Structured Assignments/quiz/group presentation 4. Attendance: 75% of total attendance
Credit Weight	3 credits or 5.1 ECTS
Requirements for Passing the Course	<ul style="list-style-type: none"> • Attendance >75% • The final score of all the components of the learning evaluation >44 <p>The final score component:</p> <ul style="list-style-type: none"> • 20% Midterm Exam • 20% Final Exam • 30% Practicum • 20% Structured Assignments (individual and group) • 10% Presence
Prerequisite Courses	Basic Soil Science
Learning Outcomes	<p>The expected learning outcomes are:</p> <ol style="list-style-type: none"> 1. Having a creative and innovative thinking attitude in their work in accordance with professional ethics in agriculture field (ILO 2) 2. Having the ability to identify and formulate problems that arise in the field of Agro-technology and science-related fields (ILO 3) 3. Able to know the technical implications, health and safety, and social activities of agricultural practices (ILO 5) 4. Able to plan, solve problems, and manage crop production

	<p>systems (ILO 6)</p> <p>5. Able to use suitable devices, processes, and methods to solve various field problems in agriculture (ILO 8)</p>
<p>Learning Content</p>	<p>After completing this course students are able to:</p> <ol style="list-style-type: none"> 1. Understand the concept of essential nutrients (macro and micro nutrients), function, mobility and nutrient uptake mechanisms as well as the factors that influence plant nutrient uptake. 2. Diagnose symptoms of deficiency and toxicity of macro and micro nutrients needed by plants and determining the solutions needed 3. Recommend types of fertilizers and fertilization methods based on the problems found in agricultural land and the need for plant nutrients to increase agricultural productivity 4. Understand the concept of water management and its scope for plant growth and production 5. Understand the concept of the relationship of water, soil, and plants in relation to water management in agricultural land 6. Calculate the water needs of plants and evaluating them with direct methods and approaches of empirical formulas and methods of providing water in agricultural land. <p>The topics include:</p> <ol style="list-style-type: none"> 1. Basic concepts of nutrient management <ul style="list-style-type: none"> • Definition and scope • The role of nutrient management in crop production systems 2. Macro nutrients: primary & secondary: behavior, deficiency & toxicity <ul style="list-style-type: none"> • Element N • Element P • Element K • Elements of Ca, Mg, and S 3. Micronutrients: behavior, deficiency & toxicity <ul style="list-style-type: none"> • The elements Fe, Mn, Cu • Elements B, Zn, Cl, • Functional nutrients (Na, Si, Co) 4. Plant nutrient uptake <ul style="list-style-type: none"> • Uptake and release of nutrients • Nutrient uptake mechanism • Factors affecting nutrient availability • Crop nutrient requirements 5. Fertilizer and Fertilization <ul style="list-style-type: none"> • Types of fertilizers • Calculation of fertilizer requirements • Recommendations and methods of fertilization 6. Basic concepts of water management <ul style="list-style-type: none"> • Definition and scope of water management • irrigation water sources and irrigation water quality 7. The relationship of water, soil and plants <ul style="list-style-type: none"> • Water absorption by roots • Distribution of plant roots • Water balance in cropland 8. Crop water requirements <ul style="list-style-type: none"> • Process of Transpiration and Evapotranspiration • Direct evapotranspiration measurement • An empirical approach to calculating evapotranspiration

	<ul style="list-style-type: none"> • Calculation of plant water requirements <p>9. Irrigation and drainage</p> <ul style="list-style-type: none"> • Irrigation methods • distribution of irrigation water • Irrigation and drainage building design <p>10. Efficiency of irrigation water</p> <ul style="list-style-type: none"> • Irrigation efficiency concept • Irrigation efficiency calculations • Factors affecting irrigation efficiency
	<p>Examination requirements: A minimum of 75 % attendance to attend the final exam</p> <p>Forms of examination:</p> <p>Essay</p>
Learning Media	Projector and screen, Zoom application, LMS of UNISMA (Daring UNISMA), e-book, WA Group, Practical guide book, plant and soil samples
References	<p>Main References :</p> <ol style="list-style-type: none"> 1. Nutrient Management.2005.Montana State University. 2. Soil and Water Management. 2005. Montana State University. 3. Danny H. Rogers , Jonathan Aguilar , Isaya Kisekka ,Philip L. Barnes and Freddie R. Lamm .2014. Soil, Water And Plant Relationship .Irrigation Management Series. Kansas State University Agricultural Experiment Station and Cooperative Extension Service. 4. Anis Sholihah 2005. Pengelolaan Air : Unisma Pres. Malang. <p>Supporting References :</p> <ol style="list-style-type: none"> 1. Eric Samling .1993.An agro ecological framework for integrated nutrient managemen with special reference to Kenya.Wageningen. 2. Lokesh Kumar Jat, Y.V. Singh, Santosh Kumar Meena, Sunita Kumari Meena, Manoj Parihar, H.S.Jatav, Raj Kumar Meena And Vijay Singh Meena.2015. Does Integrated Nutrient Management, Enhance Agricultural Productivity. Jounal of pure and applied microbiology.vol.9(2).1211-1221. 3. Fusuo Zhang, Zhenling Cui, Xinping Chen,Xiaotagju, Jianbo Shen, Qing Chen,Xuenjun Liu, Weifeng Zhang, Guohuami, Mingsheng Fan, And Rongfeng Jiang. 2012. Integrated Nutrient Management For Food Security And Environmental Quality In China. Departement Of Plant Nutrition, China Agriculture University, Beijing, PR China. Advances In Agronomy. Vol 116.ISSN 0065-2113,DOI 10.1016/B978-0-12-394277-7.00001-4. 4. Peter Gruhn,Franscesco Goleletti And Montague Yodelman.2000. Integrated Nutrient Management , Soil Fertility And Sustainable Agriculture.International Food Policy Research Institute 2033 K Street,N.W.Washington,D.C. 20006 U.S.A. September 2000. 5. Integrated Water Resources Management: Basic Concepts journal. https://www.iwapublishing.com/news/integrated-water-resources-management-basic-concepts 6. Video-video pembelajaran di yuoutube