

Module Descriptions

A **module** is a self-contained **learning unit** within a higher education program that includes thematically related courses and is assigned a **fixed number of credits**. It follows specific **learning objectives**, includes an **assessment component**, and contributes to achieving the qualifications of a degree program. In some countries, “modules” are also named “courses”.

Please provide a module description for each module. In addition to the compulsory and elective modules, this also includes credited internships and the final thesis.

Please summarize all module descriptions in one document (Module Handbook) and create a table of contents so that the modules can be found easily.

Module designation	<i>Plant Nutrition</i>
Semester(s) in which the module is taught	5
Person responsible for the module	<i>Prof. Dr. Ir. Nasaruddin</i>
Language	<i>Bahasa Indonesia</i>
Relation to curriculum	Compulsory / elective / specialisation
Teaching methods	<i>Face-to-face lectures and independent learning</i>
Workload (incl. contact hours, self-study hours)	1. Lectures: $2 \times 50 \times 16 = 1,600$ minutes (26.67 hrs) 2. Structured assignments: (total $2 \times 60 \times 16$) = 1,920 minutes (32 hrs) - Individual assignments: $2 \times 120 \times 3 = 720$ minutes (12 hrs) - Group assignments: $2 \times 120 \times 3 = 720$ minutes (12 hrs) - Quiz: $2 \times 15 \times 8 = 240$ minutes (4 hrs) - Discussion: $2 \times 30 \times 4 = 240$ minutes (4 hrs) 3. Independent study: (total $2 \times 60 \times 16$) = 1,920 minutes (32 hrs) - Accessing SIKOLA, participating in online discussion forums, reading materials, etc. 4. Practicum: (total: $1 \times 170 \times 16$) = 2,720 minutes (45.33 hrs) - Field work: $1 \times 170 \times 16 = 2,720$ minutes (45.33 hrs)
Credit points	3 credits equal to 4.86 ECTS
Required and recommended prerequisites for joining the module	-

Module objectives/intended learning outcomes	<i>In terms of knowledge:</i> - Student is able to explain the role of mineral nutrition for plants and the historical background of plant nutrition. - Student is able to understand the role of soil for plant growth and the characteristics of plant nutrients. - Student is able to understand the relationship between plant nutrition, heredity, and environmental factors. - Student is able to understand the function of mycorrhizae and beneficial microbes for plants. - Student is able to understand the mechanisms of nutrient absorption and translocation in plants.
Content	1. Role of Plant Nutrition 2. Classification of Nutrients 3. Soil as a Growth Medium 4. Root Morphology and the Rhizosphere 5. Nutrition and Environmental Heredity 6. Mycorrhiza and Other Microbes 7. Plant Interactions with Mycorrhiza and Microbes 8. Nutrient Absorption and Translocation 9. Metabolism and Fixation of Macro and Micronutrients
Examination forms	Quiz, individual assignment, group assignment, discussion
Study and examination requirements	To successfully pass the module, students must attend at least 80% of the classes, complete all assignments and exams, and obtain a final grade of at least 45% (minimum passing grade: D).
Reading list	1. Marschner, H. 1995. <i>Mineral Nutrition of Higher Plants</i>. 2nd Edition. Academic Press, San Diego. 2. Nasaruddin and Yunus Musa. 2012. <i>Plant Nutrition</i>. Masagena Press, Makassar. 3. Barker, A. V. and D. J. Pilbeam. 2007. <i>Handbook of Plant Nutrition</i>. CRC Press, Taylor & Francis Group. ISBN 0-8247-5904-4, p. 613. 4. Alex, C. W. 2006. <i>Plant Nutrition</i>. Edited by William G. H. Chelsea House, an imprint of Infobase Publishing, USA. 5. Sally, E. S. and D. Read. 2008. <i>Mycorrhizal Symbiosis</i>. 3rd Edition. Academic Press (Elsevier), Sydney. 6. Tisdale, McCrimmon, J. N. 2002. Macronutrient and micronutrient concentrations of seeded bermudagrasses. <i>Communications in Soil Science and Plant Analysis</i>, 33(15/18): 2739–2758.