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	*Soil Fertility and Fertilization*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Prof. Dr. Sikstus Gusli*
Language	*Bahasa Indonesia*
Relation to curriculum	*Compulsory ~~/ elective / specialisation~~*
Teaching methods	*Face-to-face lectures and independent learning*
Workload (incl. contact hours, self-study hours)	1. *Lectures: 2 × 50 × 16 = 1,600 minutes (26.67 hrs)* 2. *Structured assignments: (total 2 × 60 × 16) = 1,920 minutes (32 hrs)* - *Individual assignments: 2 × 120 × 3 = 720 minutes (12 hrs)* - *Group assignments: 2 × 120 × 3 = 720 minutes (12 hrs)* - *Quiz: 2 × 15 × 10 = 300 minutes (5 hrs)* - *Discussion: 2 × 30 × 3 = 180 minutes (3 hrs)* 3. *Independent study: (total 2 × 60 × 16) = 1,920 minutes (32 hrs)* - *Accessing SIKOLA, participating in online discussion forums, reading materials, etc.* 4. *Practicum: (total: 1 × 170 × 16) = 2,720 minutes (45.33 hrs)* - *Field work: 1 × 170 × 16 = 2,720 minutes (45.33 hrs)*
Credit points	*3 credits equal to 4.86 ECTS*
Required and recommended prerequisites for joining the module	*Basics of Soil Science*

Module objectives/intended learning outcomes	*In terms of knowledge:* *Student is able to explain chemical reactions in the soil, soil colloids, cation/anion retention and exchange, soil reaction, and liming.* - *Student is able to explain the types and forms of plant nutrients, factors affecting their availability, and fertilizer requirements—both organic and inorganic—as sources of macro- and micronutrients, including appropriate application methods.* - *Student is able to identify and solve soil fertility problems and manage nutrients to support sustainable agriculture.*
Content	1. *Definition of soil fertility and essential nutrients required by plants* 2. *Basic relationship between soil and plants* 3. *Soil reaction (pH) and liming* 4. *Macronutrient* 5. *Macronutrient* 6. *Macronutrients K and C* 7. *Macronutrients Mg and S* 8. *Micronutrients* 9. *Evaluation of soil fertility* 10. *Fertilizers and their classification, principle of limiting factors* 11. *Fundamentals of fertilization* 12. *Organic fertilizing*
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. *Tisdale, S.L., Nelson, W.L., & Beaton, J.D. (1990). Soil Fertility and Fertilizers (4th ed.). Macmillan Publishing Company, New York.* 2. *Tan, K.H. (1986). Degradation of Soil Minerals by Organic Acids. In Interaction of Soil Minerals with Organic Matter and Microorganisms (Eds. P.M. Huang & M. Schnitzer) (Transl. Didiek Hadjar Goenadi). Gadjah Mada University Press, Yogyakarta.* 3. *Tan, K.H. (1991). Basic Soil Chemistry (Transl. Didiek Hadjar Goenadi). Gadjah Mada University Press, Yogyakarta.* 4. *Weil, R.R., & Brady, N.C. (2017). The Nature and Properties of Soils (15th ed.). Pearson, Boston.* 5. *Foth, H.D. (1990). Fundamentals of Soil Science (8th ed.). John Wiley & Sons, New York.* 6. *Brady, N.C. (1990). The Nature and Properties of Soils. MacMillan Publishing Company, New York.* 7. *White, R.E. (2006). Principles and Practice of Soil Science (4th ed.). Blackwell Publishing, USA.*