UNDERGRADUATE PROGRAM **MODULE HANDBOOK**

Module designation	Practicum of Soil Chemistry (SSOL2023)
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	Prof. Dr. Ir. Sufardi, M.S.
Language	Indonesian, English
Relation to curriculum	Compulsory module for Soil Science Department
Teaching methods	Practice, lecture, presentation
Workload (incl. contact hours, self-study hours)	✔ 170 minutes of practice per week (field/laboratory 50 minutes; structured learning 60 minutes; 60 minutes self-study)
Credit points	1 SKS = 1.6 ECTS
Required and recommended prerequisites for joining the module	SSOL1002
Module objectives/intended learning outcomes	✔ Students are able to process soil samples administratively and prepare them for laboratory analysis. ✔ Students are able to distinguish between types of mixtures (solutions, suspensions, and colloids) and determine solution concentrations. ✔ Students are able to analyze several soil chemical properties in the laboratory and interpret the results effectively.
Content	This course introduces the fundamental concepts and principles of soil chemical composition and properties in both mineral soils and histosols (peat soils). Topics include solution chemistry, clay mineralogy, humic substances chemistry, surface (colloidal) chemistry, and various chemical processes in soils such as soil reactions, ionic strength, activity coefficients, ion selectivity, redox reactions, chemical equilibria, ion adsorption-desorption kinetics, complexation/chelation, cation exchange capacity, base saturation, and solubility. The course also explores ion distribution in soil solutions using Gouy-Chapman and Nernst theories. Detailed discussions focus on the structure of clay minerals and amorphous soil fractions influencing physicochemical properties. Principles of clay mineral identification using polarizing microscopes, X-ray diffraction, differential thermal analysis, and chemical analysis are covered, along with practical training in soil chemical property analysis in the laboratory.

Exams and assessment formats	Team based project, assignment, mid term exam, final exam
Study and examination requirements	✔ Team based project: 53% ✔ Assignment: 30% ✔ Mid term exam: 9% ✔ Final exam: 8%
Reading list	1. Sparks, D. L., Page, A. L., Helmke, P. A., & Loeppert, R. H. (Eds.). (2020). Methods of soil analysis, part 3: Chemical methods. John Wiley & Sons. 2. Strawn, D. G., Bohn, H. L., & O'Connor, G. A. (2019). Soil chemistry. John Wiley & Sons. 3. Sparks, D. L., Singh, B., & Siebecker, M. G. (2022). Environmental soil chemistry. Elsevier. 4. Bleam, W. F. (2016). Soil and environmental chemistry. Academic Press. 5. Greenland, D. J. (2015). The chemistry of soil processes (pp. 728-pp). 6. Jones, J. (2018). Soil analysis handbook of reference methods. CRC press. 7. Rayment, G. E., & Lyons, D. J. (2011). Soil chemical methods: Australasia (Vol. 3). CSIRO publishing. 8. Faithfull, N. T. (2002). Methods in agricultural chemical analysis: A practical handbook (pp. xxii+-266).