USK UNIVERSITAS SYIAH KUALA

FACULTY OF AGRICULTURE

DEPARTMENT OF SOIL SCIENCE

UNDERGRADUATE PROGRAM **MODULE HANDBOOK**

Module designation	Soil Biology (SSOL2025)
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	Dr. Ir. Hifnalisa, M.Si.
Language	Indonesian, English
Relation to curriculum	Compulsory module for Soil Science Department
Teaching methods	Lecture, presentation, focus group discussion
Workload (incl. contact hours, self-study hours)	✔ Lecture and discussion 100 minutes per week per semester ✔ Structured tasks 120 minutes per week per semester ✔ Personal tasks 120 minutes per week per semester
Credit points	2 SKS = 3.2 ECTS
Required and recommended prerequisites for joining the module	SSOL1002
Module objectives/intended learning outcomes	✔ Students are able to understand and explain the role and importance of soil biology in agricultural production and soil ecology, recognize soil organisms, and describe their functions within agricultural and ecological systems. Students are able to understand and explain the concept of soil ecology and the role of soil organisms in ecosystems and agriculture. ✔ Students are able to understand and explain methods for studying soil microorganisms, identify microbial taxa, and perform microbial preservation and propagation techniques. ✔ Students are able to understand and explain microbial interactions and functions, and apply them in nutrient cycling, biofertilizer production, and the biodegradation of xenobiotic compounds.

Content	This course examines the life, characteristics, and types of selected soil microorganisms, particularly those related to soil fertility, as well as the chemical and physical changes induced by microbial metabolic activities, and microbial ecology. It also covers plant diseases caused by toxicity and root damage from pathogenic organisms, along with their control measures. Furthermore, it discusses the mechanisms of symbiosis between plants and beneficial soil microorganisms such as nitrogen-fixing microbes, phosphate-solubilizing microbes, cellulolytic microbes, and others. The course provides practical and in-depth training on techniques for media preparation, isolation, selection, and propagation of soil microorganisms, fermentation processes, biofertilizers, and biodegradation of xenobiotic compounds.
Exams and assessment formats	Case method, quiz, assignment, mid term exam, final exam
Study and examination requirements	✔ Case method: 50% ✔ Quiz: 12.5% ✔ Assignment: 12.5% ✔ Mid term exam: 12.5% ✔ Final exam: 12.5%
Reading list	1. Van Elsas J.D. et al. (Ed) 2019. Modern Soil Microbiology. Third Edition. CRC Press Taylor & Francis Group. 2. Datta, R. et al. (Ed). 2020. Carbon and Nitrogen Cycling in Soil. Springer Nature Singapore Pte Ltd. 3. Souza T. 2022. Soil Biology in Tropical Ecosystem. Springer International Publishing AG. 4. Paul, E., & Frey, S. (Eds.). (2023). Soil microbiology, ecology and biochemistry. Elsevier. 5. Coleman, D. C., Callaham, M. A., & Crossley Jr, D. A. (2017). Fundamentals of soil ecology. Academic press. 6. Zou, Y. N. (2017). Arbuscular mycorrhiza and stress tolerance of plants (pp. 25-41). Q. S. Wu (Ed.). Singapore: Springer. 7. Singh, D. P., Singh, H. B., & Prabha, R. (Eds.). (2016). Microbial inoculants in sustainable agricultural productivity (Vol. 2, p. 308). New Delhi: Springer. 8. Bach, E. M., Williams, R. J., Hargreaves, S. K., Yang, F., & Hofmockel, K. S. (2018). Greatest soil microbial diversity found in micro-habitats. Soil biology and Biochemistry, 118, 217-226. 9. Ahammed, G. J. & Hajiboland, R. (Ed). 2024. Arbuscular Mycorrhizal Fungi and Higher Plants. Fundamentals and Applications. Springer Nature Singapore Pte Ltd.