Soil Microbial Ecology Course – 2023 1-2-5040 2 credits

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Modern soil microbiology represents an integration of microbiology with the concepts of soil science, chemistry, and ecology to understand the functions of microorganisms in the soil environment. The course introduces students with the requisite background in the sciences to the elements of soil ecology.

Objective: To provide students with the physiological bases for microbial activities in soil and translate those to ecological interactions and processes.

Lectures, field study tour and laboratory exercises will cover the soil as a habitat for microorganisms, their functions, their mediation processes, and the taxonomy and biology of soil microorganisms. Soil microbiology ecology also has traditionally focused on the study of soil bacteria, cyanobacteria, actinomycetes, fungi, and protozoa, and soil animals such as nematodes, mites, and other microarthropods, the fundamentals of the microbial ecology of nutrient cycles, symbiotic associations, and soil quality parameters.
Topics will include; A review of soil structure and characters as part of terrestrial ecosystems. Soil-water relationships. Methods for studying soil microorganisms. Classification of soil organisms. Components of soil biota. Diversity and abundance of soil fauna, the biological structure of soil food web. Interactions between soil. Water and microorganisms, and the interactions between plants, animals, humans, and microorganisms. The dynamics of organic matter, decomposition, biogeochemical cycles; N+C, transformations of minerals. The ecology of the rhizosphere. Biological soil crust. The effect of human activities.

Format: one lecture per week; one full day of a study tour to the field, including laboratory work. Students in the graduate course will be required to demonstrate a deeper understanding of fundamental concepts and details than undergraduate students.
The grade
The grade in the course consists of submitting a written project on the subject that will be included in the student's thesis and a seminar.

Literature:

Delgado-Baquerizo, M. et al. (2021). Global homogenization of the structure and function in the soil microbiome of urban greenspaces. *Science Advances.*

Eldor, P. 2015. Soil Microbiology, Ecology, and Biochemistry, 4th Ed. Academic Press. ISBN: 978-0-12-415955-6.

Gliessman RS. 2001. *Sustainability: Developing Practical Strategies*. In advances in agroecology. CRC Press. Boca Raton, Fla. pp. 210.

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Guerra, C.A. *et al.* Global hotspots for soil nature conservation. (2022). *Nature.*

Kirchman, DL. 2018. Processes in microbial ecology. 2^{edn}. Oxford University Press.

Metting FB. 1992. *Soil Microbial Ecology: Applications in Agricultural and Environmental Management*. Marcel Dekker, Inc. New York.

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Paul & Clark. 1996. *Soil microbiology & Biochemistry.* Academic Press, San Diego, CA. pp. 340.

Prosser, J., Bohannan, B., Curtis, T. et al. The role of ecological theory in microbial ecology. Nat Rev Microbiol 5, 384–392 (2007). https://doi.org/10.1038/nrmicro1643

Tat, RL. 2000. *Soil Microbiology*. 2nd ed John Wiley. New York. pp. 508.

Whitford, G.W. 2002. *Ecology of Desert Systems*. Academic Press, New York, pp. 343.

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Plant and Soil, Soil Biology & Biochemistry, Ecological Applications, Appl. Environmental Microbiology, FEMS Microbial Ecology, Nature Reviews Microbiology, Microbial Ecology.