Module designation	**Land Bioremediation**
Semester(s) in which the module is taught	*5th semester*
A person responsible for the module	Prof. Akhmad R. Saidy, SP., M.Ag.Sc., Ph.D Dr. Ir. Bambang Joko Priatmadi, M.P Dr. Ir. Fakhrur Razie, M.Si Dr. Gusti Irya Ichriani, M.P
Language	*Indonesia*
Relation to curriculum	*Preference course*
Teaching methods	*Teaching, discussion, exercise*
Workload (incl. contact hours, self-study hours)	- *Total workload: 79.24 hours* *Contact hours:* - *Lecture: 79.24 hours* - *Practice: 0 hours* *Private study including examination preparation: 36 hours*
Credit points	*2*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Students are able to:* *a. explain the role and importance of land bioremediation in supporting sustainable biomass production* *b. design and implement land bioremediation techniques that are in accordance with the characteristics of pollutants for land remediation to support sustainable biomass production* *c. explain the role of microbes in land bioremediation and implement techniques of isolation, identification, propagation and application of microbes in remediation of polluted land.* *d. carry out engineering on environmental factors to increase microbial activity in remediation of polluted land.* *e. distinguish the types of phytoremediation in polluted land remediation*

Content	*The Land Bioremediation course is an optional course for students of the Soil Science Study Program, Faculty of Agriculture, Lambung Mangkurat University, which is taken by students in the third year in the even semester (Semester 5th). This Land Bioremediation course is very important for students of the Soil Science Study Program to study because this course discusses how to restore contaminated land and then use the land for cultivation to support sustainable biomass production. The course also discusses the role and types of microbes in bioremediation of polluted land, techniques or methods of land bioremediation according to the characteristics of waste/pollutants. Details of how environmental factors affect microbial activity in land bioremediation will also be discussed in this course. In addition, phytoremediation as a technique in land bioremediation will also be discussed in this lecture.*
Examination forms	*Quiz, mid-semester exams, final exam, assignments (papers, posters, etc.)*
Study and examination requirements	*Overall score is above 70 (B)* *Minimum attendance is 80% for lectures.*

Reading list	1. *Hidayat, A. dan Siregar, C. A. 2017. Telaah Mendalam tentang Bioremediasi: Teori dan Aplikasinya dalam Upaya Konservasi Tanah dan Air. PT. Penerbit IPB Press, Bogor.* 2. *Waluyo, L. 2018. Bioremediasi Limbah. UMM Press, Jogyakarta.* 3. *Wignyanto. 2020. Bioremediasi dan Aplikasinya. UB Press, Malang.* 4. *Handayanto, E. 2017. Fitoremediasi dan Phytomining Logam Berat Pencemar Tanah. UB Press.* 5. *Fahrudin. 2014. Bioteknologi Lingkungan. CV. Alfabeta, Jakarta.* 6. *Prasad, R. dan Aranda, E. 2018. Approaches in Bioremediation: New Era of Environmental Microbiology and Nanobiotechnology. Springer International Publishing, New Delhi.* 7. *Singh, A. dan Ward, O. P. 2013. Biodegradation and Bioremediation. Springer-Verlag, Berlin.* 8. *Purnamawati, F. S., Soeprobowati, T. R. dan Izzati, M. 2015. Potensi Chlorella vulgaris Beijerinck dalam remediasi logam berat Cd dan Pb skala laboratorium. Bioma: Berkala Ilmiah Biologi 16(2), 102-113. https://doi.org/10.14710/bioma.16.2.102-113* 9. *De Fretes, C. E., Sutiknowati, L. I., & Falahudin, D. 2019. Isolasi dan identifikasi bakteri toleran logam berat dari sedimen mangrove di Pengudang dan Tanjung Uban, Pulau Bintan, Indonesia. OLDI (Oseanologi dan Limnologi di Indonesia), 4(2), 71-77. http://dx.doi.org/10.14203/oldi.2019.v4i2.244* 10. *Nuryana, D., 2017. Bioremediasi Pencemaran Minyak Bumi. Journal of Earth Energy Engineering, 6(2), pp.9-13.* 11. *Muthusaravanan, S., Sivarajasekar, N., Vivek, J.S., Paramasivan, T., Naushad, M., Prakashmaran, J., Gayathri, V. and Al-Duaij, O.K., 2018. Phytoremediation of heavy metals: mechanisms, methods and enhancements. Environmental Chemistry Letters 16(4), pp.1339-1359. https://doi.org/10.1007/s10311-018-0762-3* 12. *Mahar, A., Wang, P., Ali, A., Awasthi, M.K., Lahori, A.H., Wang, Q., Li, R. and Zhang, Z., 2016. Challenges and opportunities in the phytoremediation of heavy metals contaminated soils: a review. Ecotoxicology and Environmental Safety 126, pp.111-121. https://doi.org/10.1016/j.ecoenv.2015.12.023* 13. *Abatenh, E., Gizaw, B., Tsegaye, Z. and Wassie, M., 2017. The role of microorganisms in bioremediation-A review. Open Journal of Environmental Biology 2(1), pp.038-046. DOI: 10.17352/ojeb.000007* 14. *Joshi, P.K., Swarup, A., Maheshwari, S., Kumar, R. and Singh, N., 2011. Bioremediation of heavy metals in liquid media through fungi isolated from contaminated sources. Indian Journal of Microbiology, 51(4), pp.482-487. https://doi.org/10.1007/s12088-011-0110-9.*