

[Campus: UPM- Ciudad Universitaria]	[School of Forestry and Natural Environment Engineering]
Program	13AD – [Master’s Degree in Forest Engineering]

Course number and name	
Number	[133000235]
Name	[MONITORING AND CONTROL OF POLLUTION IN SOILS, WATER AND VEGETATION]
Semester	S8 [(February-June)]

Credits and contact hours	
ECTS Credits	3
Contact hours	36

Coordinator's name	[Prof. Carlos CALDERON-GUERRERO] [carlos.calderon@upm.es]
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Specific course information
<p>Description of course content</p> <p>[The course “Monitoring and Control of Soil, Water and Vegetation Contamination” is an elective course that is taught in the fourth quarter of the second year of the Master in Forestry Engineering. This course consists of 3 ECTS credits and is integrated in the orientation: Environmental Management of this master's degree. The course, based on the knowledge previously developed in module subjects taken previously in the degrees together with the knowledge acquired in the subject of Pollution of the Natural Environment in the previous course of the master's degree, deepens in the basic knowledge necessary to know and propose solutions, from a technical perspective, of environmental problems related to soil and water pollution, once they have been generated, or to prevent them before they become more acute. The faculty is highly specialized in the subject, having among its merits the publication of their studies in specialized scientific journals, stays in international centers and a doctoral thesis.</p> <p>It addresses in a global and integrated manner the causes, effects, control treatments and management of soil and water pollution, emphasizing the different control systems related to water treatment and wastewater treatment, waste management and treatment, contaminated soil treatment and treatment of atmospheric emissions, since the latter are usually one of the main long-term factors involved in this type of environmental problems]</p>

List of topics to be covered

1. Soil and water pollution: causes and effects. Effects on vegetation.
2. Analysis and practical control of soil and water pollution. Analysis techniques on the vegetation.
3. Management of soil and water pollution. More efficient plant species for the reduction or mitigation of pollution.
4. Case studies on vegetation monitoring and corrective measures for soil and water pollution.

Prerequisites or co-requisites

None

-It is advisable to have a background or at least basic knowledge of Hydrology, Chemistry and Soil science / Climatology / Ecology, as well as computer skills at user level.

Course category in the program

R (required)

E (elective)
(elective courses may not be offered every year)

Specific for course objectives

Specific learning outcomes

- CB06 - Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context.
- CB07 - Ability to acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to student's field of study.
- CB08 - Ability to integrate knowledge and deal with the complexity of formulating judgements on the basis of incomplete or limited information, contemplating the social and ethical responsibilities associated to the application of their knowledge and judgements.
- CB10 - Possess the learning skills that will enable them to continue studying manly in a way self-directed or autonomous.
- CE 2.5 - Ability to control pollution of the natural environment due to industrial activity and waste management.
- CE 6.2 - Knowledge and skills for the environmental improvement of the environment.
- CG 02 - Ability to design, direct, elaborate, implement and interpret projects and integral action plans in the natural environment.
- CT04 - Critical capacity for analysis, synthesis and learning through the exchange of opinions, presenting solid and structured arguments.
- CT06 - Bibliographic search, analysis of documentation and treatment of information from several sources and its analysis and synthesis, applying it to the resolution of complex problems.
- CT07 - Improve oral and written knowledge of the English language.
- CT08 - Creativity, observation skills, hypothesis generation and experimental problem

statement.

RA74 - Apply procedures for the control and correction of atmospheric, soil and water pollution at local, regional and global scales.

RA72 - Analyze and apply the legal framework concerning soil and water pollution, as well as air pollution at local and transboundary level.

RA73 – Assess, from an integrated perspective, possible pollutants and sources of pollution in the agroforestry and urban environment.

Further reading and supplementary materials

- Main book: Calderon Guerrero, Carlos (2014). Urban trees and atmospheric pollutants in big cities: Effects in Madrid. Tesis dissertation. E.T.S.I. Montes, Forestal y del Medio Natural (UPM).
- Aboal, J., Real, C., Fernández, J., & Carballeira, A. (2006). Mapping the results of extensive surveys: the case of atmospheric biomonitoring and terrestrial mosses. *Science of The Total Environment*, 356(1), 256-274.
- Alfani, A., Maisto, G., Iovieno, P., Rutigliano, F. A., & Bartoli, G. (1996). Leaf contamination by atmospheric pollutants as assessed by elemental analysis of leaf tissue, leaf surface deposit and soil. *Journal of Plant Physiology*, 148(1), 243-248.
- Alloway, B. J. (2013). *Environmental Pollution Heavy Metals in Soils* (3rd ed. Vol. Volume 22): Springer Science.
- Bargagli, R. (1993). Plants as biomonitors: indicators for heavy metals in the terrestrial environment. In B. Markert (Ed.), (pp. 461-484). Weinheim: VCH.
- Beckett, K., Freer-Smith, P., & Taylor, G. (1998). Urban woodlands: their role in reducing the effects of particulate pollution. *Environmental Pollution*, 99(3), 347-360.
- Beckett, K., Freer Smith, P., & Taylor, G. (2000). Effective tree species for local air quality management. *Journal of Arboriculture*, 26(1), 12-19.
- Biasioli, M., Barberis, R., & Ajmone-Marsan, F. (2006). The influence of a large city on some soil properties and metals content. *Science of The Total Environment*, 356(1), 154-164.
- Brunekreef, B., & Forsberg, B. (2005). Epidemiological evidence of effects of coarse airborne particles on health. *European Respiratory Journal*, 26(2), 309-318.
- Calace, N., Caliandro, L., Petronio, B., Pietrantonio, M., Pietroletti, M., & Trancalini, V. (2012). Distribution of Pb, Cu, Ni and Zn in urban soils in Rome city (Italy): effect of vehicles. *Environmental Chemistry*, 9(1), 69-76.
- CCME. (2012). *Canadian Environmental Quality Guidelines. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Summary Tables.*, from Canadian Council of Ministers of the Environment <http://st-ts.ccme.ca/>
- Chronopoulos, J., Haidouti, C., Chronopoulou-Sereli, A., & Massas, I. (1997). Variations in plant and soil lead and cadmium content in urban parks in Athens, Greece. *Science of The Total Environment*, 196(1), 91-98.
- De Miguel, E., Iribarren, I., Chacon, E., Ordonez, A., & Charlesworth, S. (2007). Riskbased evaluation of the exposure of children to trace elements in playgrounds in

Madrid (Spain). *Chemosphere*, 66(3), 505-513.

- De Miguel, E., Jiménez de Grado, M., Llamas, J., Martín-Dorado, A., & Mazadiego, L. (1998). The overlooked contribution of compost application to the trace element load in the urban soil of Madrid (Spain). *Science of The Total Environment*, 215(1), 113- 122.
- De Miguel, E., Jiménez de Grado, M., Llamas, J., Martín -Dorado, A., & Mazadiego, L. (1998). The overlooked contribution of compost application to the trace element load in the urban soil of Madrid (Spain). *Science of The Total Environment*, 215(1–2), 113- 122. doi: [http://dx.doi.org/10.1016/S0048-9697\(98\)00112-0](http://dx.doi.org/10.1016/S0048-9697(98)00112-0)
- De Miguel, E., Llamas, J., Chacón, E., Arrojo Fernández, C., Ordóñez, A., Callaba, A. Charlesworth, S. (2002). Caracterización geoquímica de los ciclos de elementos traza en ambientes urbanos. *Boletín Geológico y Minero (Madrid)*, 133(1), 35-43.
- Dora, C. (2007). Health burden of urban transport: The technical challenge. *Sadhana*, 32(4), 285-292.
- EPA, U. S. E. P. A. (1996). *Soil Screening Guidance: Technical Background Document*.
- EPA, U. S. E. P. A. (2003). *Guidance for Developing Ecological Soil Screening levels*. OSWER Directive 9285.7-55.
- EUMETSAT. (2014). Dust storm. Earth Observation Portal Retrieved 02/09/2014 <http://www.eumetsat.int/website/home/index.html>
- Kabata-Pendias, A. (2010). *Trace elements in soils and plants*: CRC press.
- Kabata-Pendias, A., & Pendias, K. (1992). *Trace elements in soils and plants*. CRC Press Ann. Arbor, MI.
- Madrid, L., Díaz-Barrientos, E., & Madrid, F. (2002). Distribution of heavy metal contents of urban soils in parks of Seville. *Chemosphere*, 49(10), 1301-1308.
- Manning, W., & Feder, W. (1980). *Biomonitoring air pollution with plants* (A. S. P. Ltd Ed.). London.
- Manta, D. S., Angelone, M., Bellanca, A., Neri, R., & Sprovieri, M. (2002). Heavy metals in urban soils: a case study from the city of Palermo (Sicily), Italy. *Science of The Total Environment*, 300(1), 229-243.
- Markert, B. (1992). Establishing of ‘Reference Plant’ for inorganic characterization of different plant species by chemical fingerprinting. *Water, Air, and Soil Pollution*, 64(3- 4), 533-538. doi: 10.1007/BF00483363.

Teaching methodology

<u> X </u> lectures	<u> _ _ </u> problem solving sessions	<u> X </u> collaborative actions	<u> X </u> laboratory sessions
Other:			