UNIVERSITA' DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA

Subject Code	**schedainsegnamento_16159**
Subject Name	**Environmental Chemistry of Urban and Forest Ecosystems**
Professor	**Prof. Maurizio Badiani**
Department:	**Agriculture**
Degree course:	**Forestry and Environmental Sciences**
Class:	**LM-73**
Type of educational activity:	**Characterizing**
Disciplinary Area:	**Forestry and Environmental Disciplines**
Scientific-Disciplinary Sector:	**AGR/13 - Agricultural Chemistry**
Compulsory preliminary exams:	**None**
Course Year:	**1st**
Semester:	**1st**
ECTS:	**6**
Hours:	**60**

Synthetic description:

Water pollution – Air pollution – Pollution of soils and sediments – Ecotoxicology- Practical work: use of air pollution bioindicator plants, calculation of the leaf injury index and extrapolation of dose-response curves – Visiting nearby public institutions and agencies in charge of environmental protection – Visiting forest sites taking part in the Con.Eco.For. initiative – Seminars and conferences on specific course topics held by national experts.

Acquisition of knowledge on:

The present course deals with the essential aspects concerning sources, chemical speciation, fate and impact of the main anthropogenic pollutants on water, air, soil and sediments, with a predominant focus on forest ecosystems. Current methodologies for pollution monitoring and biomonitoring will be presented and discussed, as they might be connected to the occurrence of forest decline, in the context of the main national, EU and international initiatives devoted to the monitoring and protection of forest ecosystems. An overview will be given about national and EU current legislation on environmental protection and environmental risk assessment, with particular

reference to forest ecosystems. Practical work will be carried out by growing and exposing bioindicator plants to open air pollution, calculating the resulting leaf injury index and building the correspondent dose-response curves, to be used for air pollution biomonitoring. Course students will be given the possibility of visiting local public institutions and agencies in charge of environmental protection. Field excursions will be organized for participating in the daily work run at the Con.Eco.For. forest sites in Calabria and Sicily. Seminars and conferences on specific course topics will be held by national experts.

Evaluation method:

The final, oral examination will be preceded by written tests on selected contents of the course program. Alternatively, each student will be assigned a specific course topic, to be studied in more depth and implemented on the basis of publicly available documentation and databases, and then presented by the student itself in the form of an open seminar to the Department.

Student's independent work:

Studying the topics listed in the course programme. Preparing the seminar assigned by the professor.

Detailed course program:

WATER POLLUTION. General features of a water body. General features of natural water bodies. Organic pollution of water bodies. Surfactants and detergents. Organic micro-pollutants.

AIR POLLUTION. Sources and processes. Characteristics of air pollutants sources. Air pollutants: classification, physical and chemical features. Main air pollutants impacting forest ecosystems. Methodological aspects while studiyng air pollutants impacts on forest trees. Symptomatology, an overview. Phytotoxic mechanisms of air pollutants. Factors influencing plants' responses to air pollutants. Resistance of forest trees to air pollutants. Identification of pollutant damages. Concentration-time-effect relationships. Socio-economic assessment of air pollutant damage. Impact of air pollutants on plant populations. Air pollutants effects on plant-host relationships. Photochemical smog and atmospheric oxidants. Enhancement of carbon dioxide levels in the atmosphere. Air pollutants removal by plants. Biogenic hydrocarbons emitted by plants.

POLLUTION OF SOILS AND SEDIMENTS. Toxic organic molecules: pesticides, herbicides, PCB, polycyclic aromatic hydrocarbons. Abiotic transformation of pesticides

in water, soils and sediments. Soil biotic transformation of pesticides. Heavy metals.

ECOTOXICOLOGY. Conventional toxicology, environmental toxicology and ecotoxicology: methods, strategies and goals. Toxicity assays in ecotoxicology. Biotic indexes. Ecological indicators. Bioindicators. Biomarkers. Predicting toxicants effects: quantitative structure-activity relationships (QSAR) in ecotoxicology. Environmental quality criteria. Bioconcentration, bioaccumulation and biomagnification. Environmental monitoring and the need for prediction. Environmental risk assessment.

PRACTICAL WORK. Practical work will be carried out by growing and exposing bioindicator plants to open air pollution, calculating the resulting leaf injury index and building dose-response curves to be used for air pollution biomonitoring.

GUIDED VISITS. Course students will be given the possibility of visiting local public institutions and agencies in charge of environmental protection. Field excursions will be organized for participating in the daily work run at the Con.Eco.For. forest sites in Calabria and Sicily.

SEMINARS. Seminars and conferences on specific course topics will be held by national experts.

Resources and main references:

TROVA, C. *L'Inquinamento delle Acque*. Edagricole, Bologna, 1997. ISBN-88-206-4044-9 - Chapters 1-3, 6, 7.

LORENZINI, G. *Le Piante e l'Inquinamento dell'Aria*. Springer-Verlag Italy, 2005. ISBN 978-88-470-0321-7 - Chapters 1, 3, 4, 13, 14, 17.

BAIRD, C., CANN, M. *Chimica Ambientale,* 2nd Italian edition, Zanichelli, Bologna, 2006 - Chapters 7, 8 and 9, Appendix 2

BRADY N.C, WEIL R.R. *The Nature and Properties of Soils*, 14th edition. Prentice Hall, Upper Saddle River, New Jersey, 2008 - Chapter 18

VIGHI M., BACCI E., Editors. *Ecotossicologia*. UTET, Turin, 1998 - Chapter 1-6, 8 (summary), 9 (summary), 11, 12 (summary), 18.

THOMPSON K.C., WADHIA K, LOIBNER A.P., Editors. Environmental Toxicity Testing. Blackwell Publishing – CRC Press, Oxford - Boca Raton, 2005. ISBN 978-1-4051-1819-4, Chapter 6

Ad hoc documentation provided by the professor of the course.