COURSE DATA

Data Subject	
Code	33108
Name	Indicators and environmental monitoring
Cycle	Grade
ECTS Credits	4.5
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1104 - Degree in Environmental Sciences	Faculty of Biological Sciences	4	First term

Subject-matter

Degree	Subject-matter	Character
1104 - Degree in Environmental Sciences	176 - Environmental indicators and monitoring	Optional

Coordination

Name	Department
BATLLE SALES, JORGE	25 - Plant Biology
GARCIA ROGER, EDUARDO MOISES	275 - Microbiology and Ecology

SUMMARY

This course will provide theoretical and practical introduction to the use of indicators of environmental and ecological status, as well as planning and conducting follow-up (monitoring) environment. Indicators are measures of a component or material environmental phenomenon, used to estimate or evaluate conditions or environmental changes or to establish environmental goals. Therefore, knowledge of the indicators is essential in ecological research and environmental management, for its versatility and synthetic capacity in the evaluation of the state of the habitat and ecosystem. Here we will therefore both descriptive indicators (ecological) and standards (indicators for environmental management), either abiotic or biological indicators. Be detailed use, selection and applications, and interpretation. Environmental monitoring involves obtaining environmental data over time to observe or detect changes in key variables. This monitoring is usually focused on environmental management objectives, or to evaluate possible harmful effects of human impacts on biodiversity or investigate ecological processes over time. This course aims to clarify the needs and planning strategies for environmental monitoring, and practical aspects to carry out quality monitoring. regular monitoring networks will be introduced, but also what methods and techniques can be implemented in the field for data and indexes in a standardized

and quality for proper environmental monitoring and further analysis to draw conclusions with statistical soundness.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Consolidated knowledge of Ecology and Soil Science.
Working knowledge of spreadsheet programs and internet search tools.

OUTCOMES

1104 - Degree in Environmental Sciences

- Capacidad para seleccionar y aplicar sistemas de indicadores ambientales en el medio natural.
- Capacidad para diseñar sistemas de monitorización ambiental y realizar planes de vigilancia en distintos sistemas naturales.

LEARNING OUTCOMES

Practical work involving problem solving, data analysis and critical interpretation.
Using bibliographic databases in electronic form, access to magazines and other printed and electronic format, and use of at least one presentation software.
Solving problems involving making qualitative and quantitative data in the laboratory or field, the analysis of these data and their interpretation in a theoretical context.
Knowledge and application of environmental indicator systems in the natural environment.
Knowledge of the main types of indicators and their particular use.
Practice and use of ecological indicators in the field and interpreting their meaning in the assessment of ecological status.
Development of environmental monitoring systems and implementation of environmental monitoring plans.
Implementation issues and case owners of different sampling techniques in environmental and ecological data.
Planning and analysis of data resulting from the environmental monitoring.

DESCRIPTION OF CONTENTS

1. Basic characteristics of the environmental indicators

1.1 Introduction to environmental indicators.
1.2 What are indicators and to use them?.
1.3 Characteristics to meet the indicators.
1.4 Main types of indicators (levels).
1.5 Indicators and temporal and spatial variability of the natural environment.

2. Design and selection of indicators

2.1 Selection of a minimum set of indicators

3. Abiotic indicators of the environmental and land use

Indicators for assessing the soil environment
Indicators for assessing the aquatic environment
Indicators of land use

4.

5. Biological indicators of ecological status and biodiversity

Indices based on indicator species. Niche models. Indicadoraqs estenoicas species. Endemic and protected. Exotic and invasive species. Indices based on ecological strategies, diversity, biomass and abundance. Indicators in paleoecology, and ecological restoration ambintal reconstruction.

6.

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10. Computing Practices

11. Laboratory Practice

12. Field Practice

Obtaining biological indices and sampling for calculation of environmental indicators. Sampling techniques used for monitoring organisms and habitat. The field trip will take place with other subjects in a place with little impacted areas and more disturbed by man.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	27,00	100
Laboratory practices	12,00	100
Computer classroom practice	4,00	100
Tutorials	2,00	100
Attendance at events and external activities	4,00	0
Development of group work	10,00	0
Development of individual work	10,00	0
Readings supplementary material	3,50	0
Preparation of evaluation activities	15,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	10,00	0
TOTAL	**112,50**	

TEACHING METHODOLOGY

The hours of classroom theory will be taught primarily through lecture methodology, with the support of board and presentations, which will first be made available to the students in the virtual classroom. Also, you can also use participatory methods of problem solving or case studies, and discussion of scientific texts, guided by the teacher.
The hours of computing be taught in groups of approximately 32 students working in pairs. In these sessions students, supervised by a teacher, do exercises using data processing software such as spreadsheets or statistical.
Hands-on activities will include field sessions (7h) and laboratory (5h). In field and laboratory sessions are groups of approximately 16 students and work in pairs or in groups of 4. Under the supervision of a teacher, do practical work related to the themes developed in the theory sessions. In the field work to

obtain biological indices and sampling for calculation of environmental indicators and sampling techniques used for monitoring organisms and habitat. The field trip will take place with other subjects in a place with little impacted areas and more disturbed by man.
The tutorials are performed in subgroups of 16 students or so. In them, the teacher monitors the work and progress of students and addresses the concerns raised.

EVALUATION

The evaluation of knowledge is done through a written test (examination) consists of multiple choice and open questions. The issues may include any aspect that has been presented, discussed and worked in lectures, tutorials, seminars and practices that have been independently in computer classroom, lab or field. In order to get approved will be necessary to overcome a 5 on the exam. This examination will consist of two parts according to the syllabus. The review counted 80% of the final grade.

In the part of the subject taught by the Educational Unit of Ecology, students attend one or more workshops with oral presentations in the classroom for guest researchers, compulsory attendance. The attendance at the seminar counted 10% of the final grade.

In the part of the course taught by the Educational Unit of Soil Science, Reports and / or practical activities counted 10%.

To pass the course will have to overcome each of the parties with at least 5 points 10 on each.

REFERENCES

Basic

- Heink, U. & I. Kowarik, 2010. What are indicators? On the definition of indicators in ecology and environmental planning. Ecological Indicators 10(3): 447-459
- McComb, B., et al., 2010. Monitoring animal populations and their habitats: a practitioners guide. CRC Press.
- Cassatella, C., Peano, A., 2011. Landscape Indicators. Assessing and Monitoring Landscape Quality
- Jorgensen et al. (Eds) 2005. Ecological Indicators for Assessment of Ecosystem Health. CRC press.
- Spellerberg, I. 2005. Monitoring ecological change. Cambridge Univ. Press.
- Berger, A.R. & W.J.Iams 1996. Geoindicators: Assessing Rapid Environmental Changes in Earth Systems. Rotterdam: A.A.Balkema.
- Aguirre Royuela, M.A., 2002. Los sistemas de indicadores ambientales y su papel en la información e integración del medio ambiente. I Congreso de Ingeniería Civil, Territorio y Medio Ambiente, febrero 2002, Madrid. Vol. II, pp. 12311256.
- Banco Público de Indicadores Ambientales (BPIA) - Calidad y evaluación ambiental - magrama.es [WWW Document], n.d. URL http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/informacion-ambiental-indicadores-ambientales/banco-publico-de-indicadores-ambientales-bpia-/# (accessed 5.14.15).

- Artiola, J., I. L. Pepper, M. L. Brusseau 2004. Environmental Monitoring and Characterization. Elsevier Science & Technology Books.
- Berger, A.R. & W.J. Iams 1996. Geoindicators: Assessing Rapid Environmental Changes in Earth Systems. Rotterdam: A.A.Balkema.
- Environmental indicator report 2013 European Environment Agency (EEA) [WWW Document], n.d. URL http://www.eea.europa.eu/publications/environmental-indicator-report-2013 (accessed 5.14.15).
- Fidalgo, M.L., Ferreira, C., Sampaio, A., 2013. Assessment of the preferences of red swamp crayfish (Procambarus clarkii) fed with Riparian tree leaves: A microcosm study. International Review of Hydrobiology 98, 183190. doi:10.1002/iroh.201301536
- Liu, Y., Zheng, B.H., Fu, Q., Wang, L.J., Wang, M., 2012. The Selection of Monitoring Indicators for River Water Quality Assessment. Procedia Environmental Sciences 13, 129139. doi:10.1016/j.proenv.2012.01.013
- Lobato, T.C., Hauser-Davis, R.A., Oliveira, T.F., Silveira, A.M., Silva, H.A.N., Tavares, M.R.M., Saraiva, A.C.F., 2015. Construction of a novel water quality index and quality indicator for reservoir water quality evaluation: A case study in the Amazon region. Journal of Hydrology 522, 674683. doi:10.1016/j.jhydrol.2015.01.021
- Mason B.J., 1992. EPA. Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies. ENVIRONMENTAL MONITORING SYSTEMS LABORATORY OFFICE OF RESEARCH AND DEVELOPMENT U.S. ENVIRONMENTAL PROTECTION AGENCY LAS VEGAS, NEVADA 89193.
- Schuschny, A. & Soto H., 2009. Guía metodológica Diseño de indicadores compuestos de desarrollo sostenible, Colección Documentos de proyectos. Comisión Económica para América Latina y el Caribe (CEPAL) Naciones Unidas.
- Sotelo, J.A. et al., 2011. Indicadores por y para el desarrollo sostenible, un estudio de caso. Estudios Geográficos Vol. LXXII, 611654. doi:10.3989/estgeogr.201124
- Tugel, A.J. et al., 2008. Soil Change Guide: Procedures for Soil Survey and Resource Inventory, Version 1.1. USDA, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE.
- USDA-NCRS, 2008. Installing Monitoring Wells in Soils. USDA Natural Resources Conservation Service National Soil Survey Center Lincoln, Nebraska.
- USDA-NCRS, n.d. Soil Quality as an Indicator of Sustainability [WWW Document]. URL http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053174.pdf (accessed 5.14.15).
- USDA-NRCS, n.d. Soil Quality Indicator Sheets [WWW Document]. URL http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/health/assessment/?cid=stelprdb1237387 (accessed 5.14.15).

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available

1. Contenidos

Se mantienen los contenidos inicialmente recogidos en la Guía Docente.

2. Volumen de trabajo y planificación temporal de la docencia

El volumen de trabajo no cambia. Las actividades a realizar son las especificadas en la Guía de la asignatura. Se mantiene la programación temporal de materiales docentes puestos a disposición del alumnado, de acuerdo con el calendario académico, pero se les da libertad de estudiarlos según su propio criterio y posibilidades. Algunas tareas podrán tener plazo de presentación, para facilitar su evaluación.

3. Metodología docente

Adaptables según el grado de presencialidad:

(a) Clases de teoría:

- En el caso previsto de semipresencialidad, en función de la disponibilidad de aforo del aula, consistirán en sesiones presenciales combinadas con material on-line puesto a disposición del alumnado a través de Aula Virtual.

- En caso de no presencialidad, todas las sesiones se sustituirán per archivos de vídeo y/o lecciones locutadas puestas a disposición del alumnado a través de Aula Virtual para sustituir la lección magistral.

(b) Tutorías individuales: En cualquier caso, por correo electrónico, ampliando la disponibilidad horaria del profesor. Excepcionalmente, por videoconferencia a través de conexión on-line en Blackboard Collaborate.

(c) Tutorías grupales:

- En el caso previsto de semipresencialidad, al tratarse de subgrupos de tamaño reducido en la misma aula en la que tienen lugar las sesiones teóricas, no se anticipan problemas de aforo. La metodología docente no cambia.

- En caso de no presencialidad se realizarán ejercicios y cuestionarios on-line, asistidos con la aplicación chat de Aula Virtual.

(d) Prácticas de campo:

- En el caso previsto de semipresencialidad, al tratarse de subgrupos de tamaño, no se anticipan problemas de aforo. No cambia la metodología docente.

- En caso de no presencialidad, se sustituyen por estudios de casos prácticos facilitados y guiados por el profesor.

(e) Prácticas de laboratorio:

- En el caso previsto de semipresencialidad, al tratarse de subgrupos de tamaño, no se anticipan problemas de aforo. No cambia la metodología docente.

- En caso de no presencialidad, se sustituyen por sesiones a distancia en las que se analizaran datos similares a los que se habrían obtenido en el laboratorio. Se facilitarán guiones adaptados de las prácticas.

(f) Prácticas de informàtica:

- En el caso previsto de semipresencialidad, al tratarse de subgrupos de tamaño, no se anticipan problemas de aforo. No cambia la metodología docente.

- En caso de no presencialidad, se sustituyen por sesiones on-line con guiones adaptados para que los estudiantes puedan realizar las prácticas de manera autónoma.

4. Evaluación

Se mantiene el peso de las distintas actividades evaluables, correspondiendo al examen final un valor del 70% sobre la calificación total. El examen presencial es la forma de evaluación que ofrece las suficientes garantías, por lo que es el sistema de preferencia. En caso de no poder realizarse en esta modalidad, se realizará en línea, con tiempo limitado, bien a través del módulo cuestionarios del Aula Virtual o como tareas, en función de las posibilidades técnicas. Si por causas técnicas, debidamente justificadas, algún estudiante no puede realizar algún examen, se estudiará la posibilidad de realizar una prueba alternativa que, en todo caso, será de tipo interactivo (combinando parte oral y escrita).

5. Bibliografía

Se mantiene la bibliografía recogida inicialmente en la Guía Docente.