VNIVERSITAT DE VALÈNCIA

Course Guide
45006 Gestión de la calidad de las aguas superficiales en base a modelos

COURSE DATA

Data Subject	
Code	45006
Name	Gestión de la calidad de las aguas superficiales en base a modelos
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
2250 - M.D. in Environmental Engineering	School of Engineering	2	First term

Subject-matter

Degree	Subject-matter	Character
2250 - M.D. in Environmental Engineering	29 - Gestión de la calidad de las aguas superficiales en base a modelos	Optional

Coordination

Name	Department
SECO TORRECILLAS, AURORA	245 - Chemical Engineering

SUMMARY

UPV Professor: Enrique Javier Asensi Dasí

The subject "Surface water quality management based on models" is an elective subject of three credits belonging to the specialty in "Environmental management in civil engineering". This course provides students with the basic knowledge and skills necessary for the analysis and modeling of surface water pollution problems in the natural environment.

The subject, with a fundamentally practical orientation, delves into the application of surface water quality models for the management of environmental problems associated with the discharge of wastewater into rivers, estuaries, lakes and reservoirs. The Water Quality Analysis Simulation Program (WASP) of the EPA is used to solve the practical cases raised in the subject.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

The subject is considered as a continuation of the module "Transport of pollutants in surface waters" of the subject "Transport of pollutants in the natural environment", where a first approximation to the models of surface water quality is carried out. In this subject, the basic concepts necessary to develop simplified water quality models are introduced and a first approximation to the use of the WASP program is made.

The Environmental Quality Assessment subject provides the basic knowledge related to the characterization of water quality, while the Contaminated Soil and Sediment Management subject provides the knowledge related to the characterization of sediments and the modeling of interactions between water and the sediment.

35176 - Evaluation of environmental quality
35177 - Transport of pollutants in the natural environment
35182 - Management of contaminated soils and sediments (UPV-UV)

OUTCOMES

2250 - M.D. in Environmental Engineering

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Identify, formulate and solve complex environmental engineering problems by applying engineering, scientific and mathematical principles.
- Recognise the ethical and professional responsibilities of environmental engineering and make informed judgements considering the impact of engineering solutions in global, economic, environmental and social contexts.

- Learn and apply new knowledge, using appropriate learning strategies.
- Carry out a comprehensive assessment of environmental water quality.
- Characterise emissions to water.
- Implement measures for preventing pollution and recovering, protecting and improving environmental quality.
- Develop and apply mathematical models for the simulation, optimisation or control of processes in the field of environmental engineering.
- Design, calculate and select engineering solutions to environmental problems, comparing alternatives that include emerging technologies under criteria of technical, social, economic and environmental viability.
- Apply tools for environmental assessment and management including environmental impact assessment and environmental risk assessment.
- Develop environmental solutions under the principles of circular economy and the sustainable development goals.

LEARNING OUTCOMES

1. Identify and model the transport and transformation processes associated with the environmental problems studied: anoxia, eutrophication, toxicity and thermal stratification.
2. Acquire the basic knowledge to address the analysis and resolution of problems associated with the discharge of wastewater and its effect on the natural environment.
3. Implement surface water quality models using the Water Quality Analysis Simulation Program (WASP)
4. Apply models to manage the quality of surface waters and propose solutions to environmental problems in rivers, estuaries, lakes and reservoirs.

DESCRIPTION OF CONTENTS

1. Surface water quality modeling

1. Dissolved oxygen, organic matter and nitrification. anoxia
2. Phytoplankton and nutrients. Eutrophication
3. Toxic organic compounds, heavy metals and radioactive substances
4. Interactions between the water column and the sediment

2. Water temperature modeling

1. Heat as a pollutant. energy balances
2. Heat exchanges with the atmosphere
3. Thermal layering

3. Application of models for surface water quality management

1. Advanced modeling with WASP
2. Implementation of transport and quality models. Calibration and validation
3. Wastewater discharge management. Study cases

WORKLOAD

ACTIVITY	Hours	% To be attended
Computer classroom practice	20,00	100
Theory classes	6,00	100
Theoretical and practical classes	2,00	100
Classroom practices	2,00	100
Development of group work	10,00	0
Study and independent work	35,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

Theoretical activities. Expository development of the subject with the participation of the student in the resolution of specific questions. Realization of individual evaluation questionnaires.

Practical activities. Learning through problem solving, exercises and case studies through which skills are acquired on the different aspects of the subject

Work in the laboratory and/or computer room. Learning by carrying out activities developed individually or in small groups and carried out in laboratories and/or computer rooms.

EVALUATION

The evaluation of the subject consists of a written test and an academic work. In the written test, the student must show that they are capable of implementing and using a water quality model with the WASP program. The academic work consists of the resolution of a practical case of surface water contamination where management measures must be applied using the WASP program.

The exam has a weight of 30% and the academic work of 70% of the final grade. Students who do not pass the exam or the academic work will be able to recover them at the end of the semester. To pass the subject it is necessary to obtain an average grade of 5 with a minimum grade of 4 points in each of the parts of the subject.

Academic works (1): 70% of the Grade
Written test (1): 30% of the Grade

REFERENCES

Basic

- Surface water-quality modeling. Chapra, Steven C.
- Environmental modeling : fate and transport of pollutants in water, air and soil. Schnoor, Jerald L.
- Hydrodynamics and Water Quality: Modeling Rivers, Lakes, and Estuaries. Ji, Zhen-Gang
- Processes, Coefficients, and Models for Simulating Toxic Organics and Heavy Metals in Surface Waters. United States Environmental Protection Agency
-Rates, constants and kinetics formulations in surface water quality modeling. United States Environmental Protection Agency