Course guide
250MEA006 - 250MEA006 - Management of Water and Waste Treatment Plants

Last modified: 21/06/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2024). (Optional subject).

Academic year: 2024 **ECTS Credits:** 5.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JOAN GARCIA SERRANO

Others: ROBERTO RIBES MÍNGUEZ
MARÍA DOLORES ÁLVAREZ DEL CASTILLO

TEACHING METHODOLOGY

The course consists of 2.3 hours a week in classes in the classroom and 0.7 hours a week to visit facilities.
Engage in lectures 2.3 hours when the teacher explains the concepts and basic raw materials, presents examples and exercises are performed in order to consolidate the general and specific learning objectives.
Used material support in the form of detailed syllabus through virtual campus ATENEA: content, programming and evaluation activities directed learning and literature.

LEARNING OBJECTIVES OF THE SUBJECT

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STUDY LOAD

Type	Hours	Percentage
Self study	80,0	63.95
Hours small group	9,8	7.83
Hours medium group	9,8	7.83
Hours large group	25,5	20.38

Total learning time: 125.1 h

CONTENTS

MANAGEMENT OF WATER AND SOLID WASTE PLANTS

Description:
The subject "Management of Water and Waste Treatment Plants" covers the principles and techniques necessary for the operation, maintenance, and efficient management of drinking water treatment plants, water regeneration, and wastewater treatment, as well as the management of urban solid waste. It focuses on the selection and use of equipment, automation and process control, energy efficiency, and economic and safety aspects.

Specific objectives:
1. Introduction to Treatment Plant Management
1.1. Importance of treatment plant management.
1.2. Types of water and waste treatment plants.
2. Drinking Water Treatment Plants
2.1. Regulatory framework. Drinking water quality.
2.2. Potabilization processes and treatment technologies.
2.3. Equipment selection: criteria. Control, monitoring, and supervision systems.
2.4. Operation, maintenance, and conservation: planning and tools.
2.5. Organization, profiles, staff, and roles.
2.6. Structure of operation and maintenance costs. Strategies for improving efficiency and energy consumption.
2.7. Safety and health.
3. Regeneration and Treatment of Wastewater
3.1. Regulatory framework. Quality of treated waters.
3.2. Wastewater treatment processes and technologies. Water regeneration processes. Treatment, valorization, and disposal of sludge.
3.3. Equipment selection: criteria. Control, monitoring, and supervision systems: microbiological control of processes.
3.4. Operation, maintenance, and conservation: planning, tools, problem identification: sanitation, water and sludge line.
3.5. Organization, profiles, staff, and roles.
3.6. Structure of operation and maintenance costs. Strategies for improving efficiency and energy consumption.
3.7. Safety and health.
4. Waste Treatment Plants
4.1. Industrial waste. Generation, characterization, and typology. Regulatory framework related to waste management.
4.2. Management of municipal waste. Generation, composition, collection operations. Mechanical biological treatment plants (MBT). Inputs, operations, equipment, and outputs.
4.3. Thermal treatment systems for waste. Energy efficiency, incineration residues, gaseous emissions, and gas treatment.
4.4. Waste disposal. Types of controlled landfills. Admission criteria. Leachate treatment.
5. Automation and Control
5.1. Automation systems in treatment plants.
5.2. Process control and monitoring.
5.3. Technological innovations: Big Data, AI, and Machine Learning.
6. Contracts and Administrative Management
6.1. Forms of management and operation: direct, indirect, concert, etc.
6.2. Legal and administrative aspects: companies and employees.

Full-or-part-time: 19h 12m
Theory classes: 8h
Self study : 11h 12m

MANAGEMENT OF DRINKING WATER TREATMENT PLANTS. THEORY AND PROBLEMS

Description:
2. Drinking Water Treatment Plants
2.1. Regulatory framework. Drinking water quality.
2.2. Potabilization processes and treatment technologies.
2.3. Equipment selection: criteria. Control, monitoring, and supervision systems.
2.4. Operation, maintenance, and conservation: planning and tools.
2.5. Organization, profiles, staff, and roles.
2.6. Structure of operation and maintenance costs. Strategies for improving efficiency and energy consumption.
2.7. Safety and health.

Specific objectives:
Apply knowledge of the Unit 2

Full-or-part-time: 9h 36m
Practical classes: 4h
Self study : 5h 36m

MANAGEMENT OF WASTEWATER TREATMENT PLANTS. THEORY AND PROBLEMS

Description:
Regeneration and Treatment of Wastewater
3.1. Regulatory framework. Quality of treated waters.
3.2. Wastewater treatment processes and technologies. Water regeneration processes. Treatment, valorization, and disposal of sludge.
3.3. Equipment selection: criteria. Control, monitoring, and supervision systems: microbiological control of processes.
3.4. Operation, maintenance, and conservation: planning, tools, problem identification: sanitation, water and sludge line.
3.5. Organization, profiles, staff, and roles.
3.6. Structure of operation and maintenance costs. Strategies for improving efficiency and energy consumption.
3.7. Safety and health.

Specific objectives:
Regeneration and Treatment of Wastewater
3.1. Regulatory framework. Quality of treated waters.
3.2. Wastewater treatment processes and technologies. Water regeneration processes. Treatment, valorization, and disposal of sludge.
3.3. Equipment selection: criteria. Control, monitoring, and supervision systems: microbiological control of processes.
3.4. Operation, maintenance, and conservation: planning, tools, problem identification: sanitation, water and sludge line.
3.5. Organization, profiles, staff, and roles.
3.6. Structure of operation and maintenance costs. Strategies for improving efficiency and energy consumption.
3.7. Safety and health.

Related activities:
Apply knowledge of the Unit 3

Full-or-part-time: 16h 48m
Theory classes: 7h
Self study : 9h 48m

MANAGEMENT OF SOLID WASTE TREATMENT PLANTS. THEORY AND PROBLEMS

Description:
4. Waste Treatment Plants
4.1. Industrial waste. Generation, characterization, and typology. Regulatory framework related to waste management.
4.2. Management of municipal waste. Generation, composition, collection operations. Mechanical biological treatment plants (MBT). Inputs, operations, equipment, and outputs.
4.3. Thermal treatment systems for waste. Energy efficiency, incineration residues, gaseous emissions, and gas treatment.
4.4. Waste disposal. Types of controlled landfills. Admission criteria. Leachate treatment.

Specific objectives:
Apply the concepts of Unit 4

Full-or-part-time: 14h 23m
Practical classes: 6h
Self study : 8h 23m

Evaluation

Full-or-part-time: 24h
Laboratory classes: 10h
Self study : 14h

GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

EXAMINATION RULES.

Failure to perform a continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

BIBLIOGRAPHY

Basic:
- Metcalf & Eddy, AECOM. Wastewater engineering: treatment and resource recovery [on line]. 5th ed. New York, N.Y.: McGraw-Hill Education, 2014 [Consultation: 25/06/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5662641. ISBN 9780077441210.
- Droste, R.L. Theory and practice of water and wastewater treatment [on line]. 2nd ed. Hoboken, NJ: John Wiley & Sons, 2019 [Consultation: 25/06/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5554617. ISBN 9781119312376.
- Díaz Fernández, J.M. Ecuaciones y cálculos para el tratamiento de aguas. Madrid: Paraninfo, 2018. ISBN 9788428341523.
- Spellman, F.R. Handbook of water and wastewater treatment plant operations. Fourth edition. Boca Raton: CRC Press, 2020. ISBN 9780367485559.
- Crittenden, J.C.; Rhodes, R.; Hand, D.W.; Howe, K.J.; Tchobanoglous, G. Stantec's water treatment: principles and design [on line]. 3rd ed. Hoboken, NJ: John Wiley & Sons, Inc., 2022 [Consultation: 18/07/2024]. Available on: https://onlinelibrary-wiley-com.recursos.biblioteca.upc.edu/doi/book/10.1002/9781119820086. ISBN 9781119820086.