

**Matter and Energy Flows**

Code: 104522  
ECTS Credits: 6

Degree	Type	Year	Semester
2503743 Management of Smart and Sustainable Cities	FB	1	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

**Contact**

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**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: Yes  
Some groups entirely in Spanish: No

**Other comments on languages**

Catalan, Spanish and English can be used by students in the classroom, as well as in exercises and exams or other tests

**Teachers**

Carlos Martínez Gasol

**Prerequisites**

Enrolled people must have sufficient knowledge to be able to do, without difficulty, the resolution of equations, among other basic knowledge of mathematics.

**Objectives and Contextualisation**

The subject will allow the enrolled people to acquire the main physical concepts necessary to understand the processes of the metabolism of intelligent cities from a material, energetic, and environmental point of view.

**Competences**

- Critically analyse work carried out and demonstrate a desire to improve.
- Identify and interpret social, economic, technological and sustainability challenges in different areas such as: town planning, infrastructures, mobility, urban economies, services and equipment, cultural diversity and social inequality, energy and natural resources, waste, etc.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.

- Work cooperatively in complex and uncertain environments and with limited resources in a multidisciplinary context, assuming and respecting the role of the different members of the group.

## Learning Outcomes

1. Critically analyse work carried out and demonstrate a desire to improve.
2. Define the basic concepts of the storage and generation of energy.
3. Describe the technologies, tools and techniques of environmental engineering.
4. Develop balances for matter and energy in static and dynamic states.
5. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
6. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
7. Work cooperatively in complex and uncertain environments and with limited resources in a multidisciplinary context, assuming and respecting the role of the different members of the group.

## Content

1. Previous concepts: change of units between the different systems of units; linear model and cyclic model; circular economy. Principle of conservation of matter and energy; environmental consequences of urban and industrial activity; balance concept
2. Macroscopic balances of matter. Stationary state and non-stationary state. Terms of the balance equation. Balance of total matter. Balance of matter applied to a component. Systems with recirculation, purge and bypass (bypass). The term generation. Urban metabolism
3. Energy balances. Stationary and non-stationary state. Thermodynamic principles. Total energy balance. Balance of mechanical energy. Calorific energy balance.
4. Environmental vectors in smart and sustainable cities: Energy, atmospheric pollution, waste water and waste. Management of solid waste.
5. Case studies of balances applied to environmental vectors. Metabolism of cities: matter, water, and waste.

## Methodology

Theoretical classes: Master classes on the concepts of the syllabus, with participation and intervention of the assistants.

Problem solving and case study classes: Problem solving related to the subject by the assistants. Discussion about the solution strategies, their analysis and their execution.

The course has a Moodle classroom, in the platform of the Virtual Campus of the UAB, where the content is weekly, as well as the presentations and exercises carried out in the classroom (a posteriori of its performance in the classroom), as well as complementary material and suggested activities.

Preparation of work and reports: Case studies that will be considered and solved by individuals enrolled in the course individually or in groups, from which they will perform a report (written and / or multimedia). Is They will work in a targeted way, in groups, and independently in groups and individually.

### Transversal competences

Work cooperatively, in complex or uncertain environments with limited resources, in a multidisciplinary context, assuming and respecting the role of the different members of the team :. The study will be considered during the first case during the group work. Special emphasis will be placed on the gender aspects, introduced in the theoretical classes, and the relation and affectation with the metabolic flows of the cities. It will be evaluated by one / a questions in the first partial.

Critically evaluate the work done and demonstrate a spirit of overcoming: It will be treated during the second case study. Emphasis will be placed on the gender aspects and the relationship and affectation with the contents of the case study. It will be evaluated specifically in the second report-work.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classes de problemes, casos estudi, i informes	24	0.96	1, 3, 4, 6, 5, 7
Classes teòriques: Classes magistrals	26	1.04	3, 4, 6, 5
Type: Supervised			
Tutories	12	0.48	1, 3, 4, 5, 7
Type: Autonomous			
Aprenentatge autònom	48	1.92	3, 4, 5
Aprenentatge col·laboratiu: elaboració de treballs i informes	30	1.2	1, 3, 4, 5, 7

## Assessment

The contents of this subject will be evaluated continuously through two partial exams and two work reports. The weight of each of the assessment activities is specified in the table. To pass the subject, you will need to obtain a 5 as a weighted global score and a 3 out of 10 assessment activity in order to be able to make an average. Not participating in any of the specific activities will be valued at zero.

There will be a final exam of recovery to evaluate evaluation activities with a score of less than 5 out of 10. To be able to participate in the recovery, a minimum previous score of 2.75 must have been obtained.

The 'non-evaluated' qualification will be awarded to those enrolled who do not pass the subject through continuous evaluation, and who do not attend the recovery exam.

Notwithstanding other disciplinary measures deemed appropriate, and in accordance with the current academic regulations, irregularities committed by a person enrolled in the course that can lead to a variation of the qualification in an assessable activity will be qualified as a zero (0). Assessment activities qualified in this way and by this procedure will not be recoverable, so that this subject will be suspended directly, with a score of less than 2.75, without opportunity to recover it in the same course. These irregularities include, among others:

- the total or partial copy of a practice, exercise, response, report, or any other evaluation activity;
- let copy;
- present a group work not done entirely by the people who make up the group (applied to the group as a whole, not just those who have not worked);
- present as own materials prepared by a third person, even if they are translations or adaptations, and generally works with non-original and exclusive elements of the person who presents it;
- Have communication devices (such as mobile phones, smart watches, camera pens, etc.) accessible during theoretical-practical assessment tests(individual exams);
- Talk to other people (except teachers) during the theoretical-practical tests (individual exams);

- Copy or attempt to copy other people during the theoretical-practical assessment tests (exams);
- Use or attempt to use written material related to the subject during the theoretical-practical evaluation tests (exams), when these have not been explicitly allowed.

In no case will the note be "saved" by the next course of any of the parts of the subject, nor will the tests be performed in a timetable other than the one set at the beginning of the course, this includes the final exam or recovery of the course, subject

In summary: copy, copy or plagiarize (or attempt) in any of the assessment activities is equivalent to a SUSPENS, non-compensatable and without validations of parts of the subject in subsequent courses. "

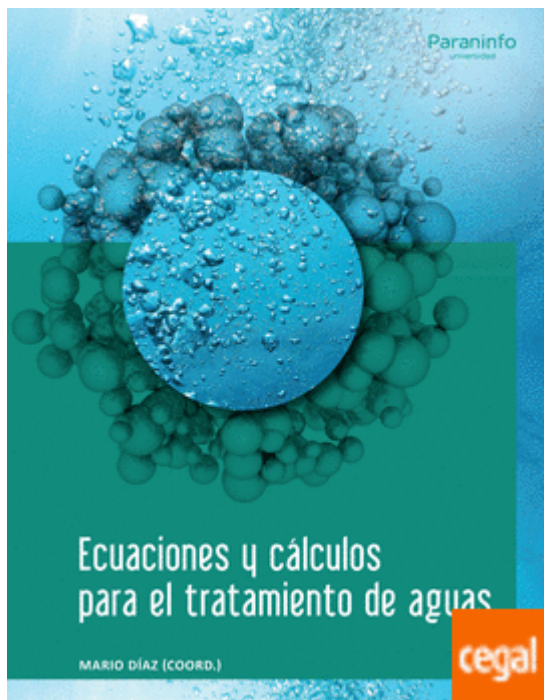
The review of the exams will be done exclusively on the date and time announced for each exam.

### Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First exam	35	3	0.12	1, 2, 3, 4, 6
First work and report	15	2	0.08	4, 5, 7
Second exam	35	3	0.12	1, 2, 3, 4, 6
Second work and report	15	2	0.08	4, 5, 7

### Bibliography

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- Editores: [Paraninfo](#)
- Año de publicación: 2018

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## Software

Excel or datasheet