Urban Mobility (250450)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) PARS: ENGINYER/A DE CAMINS, CANALS I PORTS (pla 2022)
Course	2024/25

Main teaching language at each group

- Group 10EN1 English (Q1)

Faculty

Responsible Faculty: Francesc Soriguera Martí
Faculty: Enrique Jiménez Meroño, Francesc Soriguera Martí

Objectives of Education

Specialization subject in which knowledge on specific competences is intensified.

Knowledge and skills at specialization level that permit the development and application of techniques and methodologies at advanced level.

Contents of specialization at master level related to research or innovation in the field of engineering.

The course aims to train students in the planning and management of urban mobility. To achieve this objective, the course is divided in two blocks. The 1st Block, presents the fundamental concepts of planning public transport systems, regardless of their technological support. The focus is conceptual, and larger importance is given to the concepts and ideas in detriment of facts, statistics and other descriptive aspects. This requires a significant degree of abstraction and analytical skills. This is balanced with the 2nd Block of the course with a more practical focus, consisting in the evaluation of urban mobility scenarios with simulation tools. A partially built model for a real case (a neighborhood or a medium sized city) is used as a Virtual Lab for evaluating changes in the existing transport network.

Competencies

Especific

The ability to plan, manage and operate civil engineering infrastructure.
Knowledge of transport engineering and planning, transport types and functions, urban transport, management of public transport services, demand, costs, logistics, and financing of transport infrastructure and services.

Transversal

ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.

SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	25.5 h	56.67 %
	Medium group	9.75 h	21.67 %
	Laboratory classes	9.75 h	21.67 %
	Guided Activities	0.0 h	0.00 %
Self Study		80.0 h	

Contents

1-Introduction to urban mobility

2-Analytical planning of collective transportation systems

Definitions. General ideas regarding demand & politics. Standards. Planning & design approaches.
Individual transportation. Time independent demand. Time dependent demand. - Collective transportation. Time independent demand. Time dependent demand. Transit & cars together.
Idealized analysis. Limits to door-to-door speed. What we can do about it? Realistic analysis and optimization.
Idealized analysis. New role for transfers. Systems with & without transfers. - Realistic analysis. Types of networks. People routing. Derivation of agency & user costs. Solution & comparison. -
Capacity constraint. Infrastructure costs.
Exercises corresponding to the contents of Block 1

3-Urban mobility challenges

Participation in the Symposium on Urban Mobility Challenges, which will take place at the UPC with speakers from all around Europe.

4-Evaluation of new mobility scenarios with simulation tools

Learn and practice with usual simulation tools in the transportation modeling industry. Current and future trends in the field.
Definition and analysis of relevant parameters for model calibration. Global and local parametrizations. Obtaining valid representative simple or complex indicators for the transport network
Introduce and understand the impact of the so-called 'new mobility' elements: electromobility, urban tolling, smart regulation (signaling, bus preemption in a corridor, restrictions, road closures), traffic calming, pedestrianizations, introduction of micro mobility, and connected and autonomous vehicles (CAV).
Model building, calibration, and validation, obtaining results of a simulation model.
Modal split techniques. Trip assignment techniques: static and dynamic; private and public transport. Key Performance Indicators to understand network performance (private and public transportation)
Propose, test, and evaluate new proposals by students to improve the network performance. Apply changes to the network and evaluate its impact, understanding best indicators for the comparison.
Discussion on different strategies for sustainable mobility. Understand how to model and simulate some of the external costs of transportation: e.g. emissions.

Teaching Methodology

The course consists of 3 hours per week of lectures in the classroom (large group).

2 hours are lectures, in which the teacher presents the basic concepts and materials.

1 hour is devoted to present examples and exercises with a greater interaction with students.

Support material will be provided on campus ATENEA: content, programming and evaluation, activities and relevant references.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

Grading Rules

(*) The evaluation calendar and grading rules will be approved before the start of the course.

The final mark of the course is obtained as the arithmetic mean of the marks obtained in the evaluable activities scheduled during the course.
The worst grades are not considered in the arithmetic average, so that they do not penalize those students who, for unforeseen reasons, cannot attend any of the scheduled activities.

Test Rules

If any of the evaluation activities is not handed in in the scheduled period, it will be marked with zero.

Office Hours

By appointment by e-mail.

Bibliography

Basic

- Daganzo, C.F.; Ouyang, Y. Public transportation systems: principles of system design, operations planning and real-time control. WSPC, 2019. ISBN 9789813224087.

Complementary

- Meyer, M.D.; Miller, E.J. Urban transportation planning: a decision-oriented approach. 2a ed. New York: McGraw-Hill, 2001. ISBN 0072423323.
- Kittelson and Associates; [et al.]. Transit capacity and quality of service manual. Washington D.C.: Transportation Research Board, 2003. ISBN 0309087767.
- Vuchic, V.R. Urban transit: operations, planning, and economics. New Jersey: John Wiley, 2005. ISBN 0471632651.
- Vuchic, V.R. Urban transit: systems and technology. 1. New Jersey: John Wiley, 2007. ISBN 9780471758235.
- Hall, R.W. (ed.). Handbook of transportation science. 2nd ed. Boston: Kluwer Academic, 2003. ISBN 0306480581.
- Ortúzar, J.D.; Willumsen, L.G. Modelling transport. 4th ed. Chichester: John Wiley & Sons, 2011. ISBN 9780470760390.