Course guide
250450 - MOBURB - Urban Mobility

Last modified: 03/10/2023

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

Degree: MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: FRANCESC SORIGUERA MARTÍ

Others: ENRIQUE JIMÉNEZ MEROÑO, FRANCESC SORIGUERA MARTÍ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
8169. The ability to plan, manage and operate civil engineering infrastructure.
8234. 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:
8559. 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.
8560. 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.

8561. 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.

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.

LEARNING OBJECTIVES OF THE SUBJECT

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.

STUDY LOAD

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

Total learning time: 125.1 h

CONTENTS

1-Introduction to urban mobility

Full-or-part-time: 2h 24m
Laboratory classes: 1h
Self study : 1h 24m

2-Analytical planning of collective transportation systems

Description:
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

Full-or-part-time: 50h 24m
Theory classes: 13h
Practical classes: 5h
Laboratory classes: 3h
Self study : 29h 24m

3-Urban mobility challenges

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

Full-or-part-time: 7h 11m
Laboratory classes: 3h
Self study : 4h 11m

4-Evaluation of new mobility scenarios with simulation tools

Description:
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.

Full-or-part-time: 48h
Theory classes: 11h
Practical classes: 6h
Laboratory classes: 3h
Self study : 28h

GRADING SYSTEM

The final course grade is obtained as the arithmetic average of the grades obtained in the 1st and 2nd blocks.

The first block is assessed with an individual Partial Exam (E). The second block is evaluated according to a Mini Project.

EXAMINATION RULES.

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

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 [on line]. 2nd ed. Boston: Kluwer Academic, 2003 [Consultation: 04/03/2021]. Available on: https://link.springer.com/book/10.1007/b101877. ISBN 0306480581.
- Ortúzar, J.D.; Willumsen, L.G. Modelling transport [on line]. 4th ed. Chichester: John Wiley & Sons, 2011 [Consultation: 30/07/2021]. Available on: https://onlinelibrary.wiley.com/doi/book/10.1002/9781119993308. ISBN 9780470760390.