

Course guides

250409 - PLAGESTRTE - Planning and Management of Transportation

Last modified: 06/10/2020

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). (Compulsory subject).
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Compulsory subject).
MASTER'S DEGREE IN SUPPLY CHAIN, TRANSPORT AND MOBILITY MANAGEMENT (Syllabus 2014). (Optional subject).

Academic year: 2020 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: FRANCESC ROBUSTÉ ANTÓN

Others: MIGUEL ANGEL ESTRADA ROMEU, MANUEL GRIFOLL COLLS, PERE MACIAS ARAU, ADRIANA HAYDEE MARTINEZ REGUERO, JOSEP MERCADÉ ALOY, FRANCESC ROBUSTÉ ANTÓN, ELISABETH ROCA BOSCH, FRANCESC SORIGUERA MARTÍ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

8169. The ability to plan, manage and operate civil engineering infrastructure.
8208. The ability to analyse and interpret the regulation and impact of infrastructure and their repercussions for sustainable development, taking into account economic, environmental, social and cultural factors.
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.
8562. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

8563. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

The course consists of 1,4 hours per week of classroom activity (large size group) and 0,7 hours weekly with half the students (medium size group).

The 1,4 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 0,7 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Material: Powerpoints, course notes and readings

LEARNING OBJECTIVES OF THE SUBJECT

Students will acquire an understanding of the design and operation of modal interchange transport infrastructure, including ports, airports, rail terminals and logistics centres.

Upon completion of the course, students will be able to:

Conduct studies of transport engineering and planning, transport types and functions, urban transport, management of public services, demand, costs, logistics, and financing of transport infrastructure and services;

Analyse and interpret the regulation and impact of infrastructure and their repercussions for sustainable development, taking into account economic, environmental, social and cultural factors;

Plan, manage and operate civil engineering infrastructure.

Transport planning: Multi-modal transport and mobility; Transport systems and territorial impact; Hierarchy of transport systems; Physical limitations of transport systems: Capacity and performance; Impacts of transports systems: Environmental, physical, social, cultural, economic; Transport systems in urban areas; Localisation of economic activities; Infrastructure networks; Branch and mesh networks; Decision-making in transport and regional planning; Objectives, efficiency, sustainability, transport planning and urban planning; Journey time and short-term economic effects; Geographical information, characterisation of infrastructure and land use; Sampling and surveys; Demand modelling, econometric models; Public and private investment models, risk quantification, concessions, participating interests and management, shadow tolls; Tariff structure and profit; Management and operation of transport infrastructure and services; Private vehicles, parking, rates, service control, urban and inter-urban road infrastructure, control and ICTs; Road freight and logistics hubs; Maritime transport systems and port terminals; Air transport and airport terminals; Rail transport and rail terminals; Intermodal transport systems, international routes.

Students will acquire a good understanding of the key planning, design and management issues of any transportation/mobility system, including appraisal, economics, optimization and customer behavior issues. Transversal concepts such as capacity, performance, operations, management, planning, appraisal, service, etc. are common to all the classical transportation modes like railways, roads, ports, airports, public transportation, terminals, traffic, pedestrians, logistics and other urban mobility modes (personal mobility devices, bicycles, etc.). The territorial and urban substratum, as well as the environmental and social are very present in a transversal way.

STUDY LOAD

Type	Hours	Percentage
Practical classes	13,0	8.67
Theory classes	26,0	17.33
Self study	96,0	64.00
Laboratory classes	13,0	8.67
Guided activities	2,0	1.33

Total learning time: 150 h

CONTENTS

Theoretical classes

Description:

Introduction to the subject: contents, evaluation, readings, classes, instructors, references, etc.
Transportation system.
Location and Linear Mathematical Programming.
Operations - trajectories. (Only Spring Term).
Operations - queues. (Only Spring Term).
Geometrical probability in planning and optimization. (Only Fall Term).
Networks and accessibility.
Transportation problems and solution generation. (Only Fall Term).
Transportation microeconomics. (Only Spring Term).
Funding. Costs and financing. Demand risk and cost. Private financing of infrastructure. PPPs. Concept of project finance.
Structure of a Company vehicle project. Type of debt and equity. Risk assessment. Pricing (pricing) infrastructure and services.
Funding. Value pricing. Service pricing. Marginal cost pricing. Regulatory Law of Contract grant of Public Works. Models of funding and management of railways, ports and airports in Spain and the European Union.
Demand. Information (static and dynamic). Polls PR and PD. Review of models of 4 stages: generation / attraction, distribution, modal split, assignment routes. Balancing network: user deterministic (Wardrop) and stochastic (SUE) system. Induced demand.
Ramp factors.
Planning. Case: L9 metro line in Barcelona.
Appraisal. Cost-benefit analysis (CBA), decision analysis in the presence of uncertainty (DA). Multicriteria analysis (weighted averages, analytic hierarchy process (AHP), systemic analytical process (ANP). Agents Matrix-effects. Effects of infrastructure and transport services (direct, indirect, induced and intangibles). Reliability and evaluation risk (RPRA). decisions under uncertainty.
Arrays IA.
Logistics - Vehicle routing.
Logistics - City logistics.
Logistics - Supply Chain Management. (Only Fall Term).
Bus network layout & operation. (Only Spring Term).
Traffic theory. (Only Spring Term).
Taxicabs, ridesharing and MaaS.
Concessions (PPP). Toll motorway. Revenue/traffic forecasts. (Only Fall Term).

Full-or-part-time: 105h 36m

Theory classes: 40h

Laboratory classes: 4h

Self study : 61h 36m



Case studies

Description:

- Case 1: Railway infrastructure planning in Spain.
- Case 2: Terminal T1, BCN airport. Guest: Francisco Gutiérrez.
- Case 3: Tramway link in Barcelona. Guest: Oriol Altisench.
- Case 4: Bus network layout & operation in Barcelona and Lleida.
- Case 5: Variable speed limits in Barcelona. (Only Fall Term).
- Case 6: Road safety.
- Case 7: Electro-mobility. (Only Fall Term).
- Case 8: Air quality and mobility.
- Case 9: Mobility 4.0.
- Case 10: Apps and business models in smart mobility. (Only Fall Term).
- Case 11: Mobility in developing cities/countries.
- Case 12: Barcelona port and BEST container terminal
- Case 13: Economics of quality in road pavements.
- Case 14: Social issues and participation.

Full-or-part-time: 72h

Practical classes: 28h

Laboratory classes: 2h

Self study : 42h

GRADING SYSTEM

Structure: two parts, T (concepts) and C (cases). Part T takes 2/3 of the subject and includes the background, scientific issues and further readings. Part C includes professional cases, mainly related to Barcelona, trying to illustrate who the principles have (or have not) been in practice and the real life constraints that face implementations; in many cases, the classes will count with the participation of renowned professionals and experts.

Class structure:

- Subject (one or two classes)
- Objectives + References + Conclusions
- Background and description (PPT): main concepts, main formulas, tables, graphics, photos
- Professional case / application (simplified)
- Break
- Science and principles (blackboard or PPT)
- Homework / further readings / exercises / field work / data-info mining / self-evaluation mini-quiz / course notes

Evaluation: $\text{Grade} = (0.5A + 2.5Q + 5M + 2R)/10$

A= Attendance (attending 90% of all the classes guarantees 10 points).

Q= arithmetic average of Quizzes (theory + cases).

M= Modeling exam (exercises). M=3 to pass the subject.

R= course report (in groups of 2 students)

Continuous evaluation + re-sit. . Only the best grade is considered.

Final grades (passing =5) are magnified according to the Civil Eng. School criteria.

Teaching and learning methods, expected learning results, specific competences: See Camins OpenCourseWare.

Vertical contents: Transportation Planning and Management principles and applications. Transversal concepts: Economic and Social Territory, Sustainability, Environment, Energy, Accessibility, trade-off Supply vs Demand, trade-off Global vs Local, Functionality, TSM, etc.

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:

- Daganzo, C. Fundamentals of transportation and traffic operations. Oxford: Pergamon, 1997. ISBN 0080427855.
- Dupuy, G. El urbanismo de las redes: teorías y métodos. Barcelona: Oikos-Tau : Colegio de Ingenieros de Caminos, Canales y Puertos, 1998. ISBN 8428109370.
- Jara-Diaz, S. Transport economic theory [on line]. Oxford: Elsevier, 2007 [Consultation: 10/02/2020]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=305675>. ISBN 9780080548999.
- Meyer, M.D.; Miller, E.J. Urban transportation planning: a decision-oriented approach. 2a ed. New York: McGraw-Hill, 2001. ISBN 0072423323.
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- Sheffi, Y. Urban transportation networks: equilibrium analysis with mathematical programming methods. Englewood Cliffs, NJ: Prentice-Hall, 1985. ISBN 0139397299.

Complementary:

- de Neufville, R. Applied systems analysis: engineering planning and technology management. New York: McGraw-Hill, 1990. ISBN 0070163723.
- Gatti, S. Project finance in theory and practice: designing, structuring, and financing private and public projects [on line]. Waltham: Academic Press, 2012 [Consultation: 10/02/2020]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=1000320>. ISBN 9780124157538.
- Gramlich, E. M.. Infrastructure Investment: A review essay. Journal of Economic Literature, 1994.
- Izquierdo, R.; Vassallo, J.M. Nuevos sistemas de gestión y financiación de infraestructuras de transporte. Madrid: Colegio de Ingenieros de Caminos, Canales y Puertos, 2004. ISBN 8438002897.
- Manheim, M.L. Fundamentals of transportation systems analysis: Vol 1. basic concepts. Cambridge, MA: The MIT Press, 1979. ISBN 0262131293.
- Nicholson, W.; Snyder, C. Microeconomic theory: basic principles and extesions. 12th ed. Cengage Learning, Inc, 2016. ISBN 9781305505797.
- Wood, P.R. Project finance, securitisations, subordinated debt. 2nd ed. London: Sweet & Maxwell, 2007. ISBN 9781847032119.