Last update: 04-12-2018

250137 - TRANSP - Transportation

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering

Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering

Academic year: 2018

Degree: BACHELOR'S DEGREE IN CIVIL ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN CIVIL ENGINEERING (Syllabus 2017). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Spanish, English

Teaching staff

Coordinator: MIGUEL ANGEL ESTRADA ROMEU, FRANCESC SORIGUERA MARTÍ

Others: JOSÉ MAGÍN CAMPOS CACHEDA, MIGUEL ANGEL ESTRADA ROMEU, FRANCESC ROBUSTÉ ANTÓN, FRANCESC SORIGUERA MARTÍ

Opening hours

Timetable: It is mandatory that students ask for a support session by e-mail:

Miquel Estrada: Thursday from 4:15 PM to 7:15 PM
Francesc Soriguera: Wednesday from 4:15 PM to 7:15 PM
Francesc Robusté: Tuesday, from 4:15 PM to 7:15 PM

Degree competences to which the subject contributes

Specific:

3065. Knowledge of the design and functioning of intermodal exchange infrastructures such as ports, airports, railway stations and transport logistics centres.

Generical:

3104. Students will learn to identify, formulate and solve a range of engineering problems. They will be expected to show initiative in interpreting and solving specific civil engineering problems and to demonstrate creativity and decision-making skills. Finally, students will develop creative and systematic strategies for analysing and solving problems.

3106. Students will learn to assess the complexity of the problems examined in the different subject areas, identify the key elements of the problem statement, and select the appropriate strategy for solving it. Once they have chosen a strategy, they will apply it and, if the desired solution is not reached, determine whether modifications are required. Students will use a range of methods and tools to determine whether their solution is correct or, at the very least, appropriate to the problem in question. More generally, students will be encouraged to consider the importance of creativity in science and technology.

3107. Students will learn to identify, model and analyse problems from open situations, consider alternative strategies for solving them, select the most appropriate solution on the basis of reasoned criteria, and consider a range of methods for validating their results. More generally, students will learn to work confidently with complex systems and to identify the interactions between their components.

3110. Students will learn to plan, design, manage and maintain systems suitable for use in civil engineering. They will develop a systematic approach to the complete life-cycle of a civil engineering infrastructure, system or service, which includes drafting and finalising project plans, identifying the basic materials and technologies required, making decisions, managing the different project activities, performing measurements, calculations and assessments, ensuring compliance with specifications, regulations and compulsory standards, evaluating the social and environmental impact of the processes and techniques used, and conducting economic analyses of human and material resources.

3112. Students will develop an understanding of the different functions of engineering, the processes involved in the life-cycle of a construction project, process or service, and the importance of systematising the design process. They will learn to identify and interpret the stages in preparing a product design specification (PDS), draft and optimise specifications and planning documents, and apply a systematic design process to the implementation and operation phases. Students will learn to write progress reports for a design process, use a range of project management tools and prepare final reports, and will be expected to show an awareness of the basic economic concepts associated with the product, process or service in question.
3113. Students will learn to identify user requirements, to draft definitions and specifications of the product, process or service in question, including a product design specification (PDS) document, and to follow industry-standard design management models. Students will be expected to show advanced knowledge of the steps involved in the design, execution and operation phases and to use the knowledge and tools covered in each subject area to the design and execution of their own projects. Finally, students will assess the impact of national, European and international legislation applicable to engineering projects.

Transversal:

585. ENTREPRENEURSHIP AND INNOVATION - Level 1. Showing enterprise, acquiring basic knowledge about organizations and becoming familiar with the tools and techniques for generating ideas and managing organizations that make it possible to solve known problems and create opportunities.
586. ENTREPRENEURSHIP AND INNOVATION - Level 2. Taking initiatives that give rise to opportunities and to new products and solutions, doing so with a vision of process implementation and market understanding, and involving others in projects that have to be carried out.
589. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.
594. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
584. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Teaching methodology

The course consists of 4.0 hours per week of classroom activity (large size group).

The 3.0 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 1 hour 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.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

The course will be taught in English in one group. The rest of the groups (G10 and G20) will be taught in Spanish.

Learning objectives of the subject

Students will acquire an understanding of the design and operation of intermodal facilities, including ports, airports, railway stations and transport logistics centres.

Upon completion of the course, students will have acquired the ability to: 1. Carry out a transport planning study in an urban area. 2. Carry out a study of air and sea transport needs, as well as a cost-benefit analysis to demonstrate cost-effectiveness. 3. Apply appropriate mathematical techniques to transport logistics problems.

Transport-system analysis and evaluation tools, such as operations research, traffic theory, operations analysis, demand estimation and forecasting techniques, transport economics, evaluation of alternatives, transport system modelling and route assignment; Causal and quantitative operation of transport systems and behaviour of the various agents that comprise them (users, operators and administration/society); Design, functioning and operation of transport terminals and infrastructure; Management of the resources necessary to operate transport terminals and infrastructure; Mobility patterns of people and merchandise, and their relationship to ICTs; Intermodal passenger terminals in urban public transport systems, airport terminals (land-side management, air-side management and baggage handling systems), port terminals (operation of container terminals, dry and liquid bulk terminals, automobile terminals, ro-ro terminals, etc.), railway terminals and dry ports, highway terminals, logistics centres and freight consolidation terminals

Infrastructure design and operation of transport terminals, such as ports, airports, railway stations and logistics platforms.
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1. Develop a study of transport planning in urban areas.
2. Develop a study of maritime or air transport needs and a cost-benefit analysis
3. Apply mathematical tools to problems of transport logistics.

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Knowledge of tools for analysis and evaluation of transportation systems such as operations research, traffic theory, analysis of operations, demand modeling and demand forecasting, transport economics, appraisal, transport modeling and flow assignment. Knowledge of causal and quantitative performance of transport systems as well as the stakeholder behavior (users, transport agencies and society). Knowledge of design, performance and management of terminals and transport infrastructures. Management of the required resources for their operations and mobility patterns of people and goods and their relationship with Information and Communication Technologies -modal interchange terminals for passengers in public transport systems, airport terminals (land- side /air-side management, baggage management system), port terminals (operating container terminals, liquid / solid bulk, ro-ro, etc.), railway terminals and in-land ports, road terminals, freight villages, logistics centers and hubs.

Study load

Total learning time: 150h			
	Theory classes:	36h	24.00%
	Practical classes:	15h	10.00%
	Laboratory classes:	9h	6.00%
	Guided activities:	6h	4.00%
	Self study:	84h	56.00%

Content

Analytic tools in transport engineering	Learning time: 33h 36m Theory classes: 10h Practical classes: 2h Laboratory classes: 2h Self study : 19h 36m

Description:
Operations and transport modeling. Transport chain. Urban mobility.

One vehicle, many vehicles
(x,t) Diagrams. Problems
Deterministic theory. Queue Discipline. Optimization. Diagrams (s-t) and (N-t). Applications: traffic accident, train station. Stochastic models.
Queue Theory. Applications

Specific objectives:
Knowledge of the operations and performance of transport infrastructure
Knowledge of tools to describe how vehicles run along a linear infrastructure
Knowledge of tools to quantify the time spent by vehicles at transport systems
Proper application of mathematical techniques in transport systems with capacity problems

Operations in transport systems	Learning time: 48h Theory classes: 9h 30m Practical classes: 4h 30m Laboratory classes: 6h Self study : 28h

Description:
Theory of stationary traffic flow models. Fundamental Equation and Conservation Equation. Fundamental variables. Analysis of the fundamental variables in the microscopic and macroscopic level. Car following models. Variational theory. Macroscopic Fundamental Diagram in cities. Control. Detectors. Traffic lights. Networks. Paradoxes.
Traffic theory. Applications
Traffic flow. Laboratory
Modal characterization. Design of corridors. Network design in urban areas. Fleet size determination. Operations. Level of service.
Public mass transport in urban areas

Specific objectives:
Knowledge of the traffic theory for the correct evaluation of the vehicle operation in the road network
Proper application of traffic models to evaluate the performance of road networks. Case studies
Knowledge of design, performance and operation of public transport systems
Proper application of models to efficiently design and operate public transport networks

Transport economics and users' behaviour	Learning time: 38h 24m Theory classes: 8h Practical classes: 8h Self study : 22h 24m

Description:

Traffic data and Information. Errors. Sampling. Surveys. Information needs. Elasticities. Simulation of the demand. UTP Models. Trip generation / attraction. Trip Distribution. Estimated trip matrices from traffic flow data. Partial Matrices. Discrete Choice Models. Logit model. Independence of irrelevant alternatives. Hierarchical logit model. Probit model. Calibration by maximum likelihood. Stated preference and revealed
Wardrop principles. Traffic assignment models.
Problems

Specific objectives:

Knowledge of demand forecasting models and flow assignment
Introduction to case studies of transport system modeling

Transport systems	Learning time: 24h Theory classes: 6h Practical classes: 2h Laboratory classes: 2h Self study : 14h

Description:

Capacity, performance and level of service. Road transport: costs, road terminals, service stations, toll booths. Subsystems, components and tasks, optimization of operations, job scheduling, simulation. Applications: Port terminals, airport and rail.
Maritime transport networks. Costs. Design and management of port terminals.
Air transport networks. Costs.Design and managment of airports.

Specific objectives:

Knowledge of causal and qualitative performance of the transport system
Knowledge of design, performance and management of transport terminals
Knowledge of causal and qualitative performance of maritime and intermodal transport systems
Knowledge of causal and qualitative performance of air transport system

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Qualification system

The final mark of this subject will be obtained from continuous assessment. Continuous assessment consists of doing individual activities or practices in a group, which are additive and training-oriented. It consists of 2 individual exams in the classroom (E1, E2), 1 project assignment (P) in groups of 4 people (homework) and multiple activities in the classroom (A)

The final mark (FM) for the course by continuous assessment will be determined by the following formula: FM = {0,25E1 + 0,25E2 + 0,25P+0.25A}.

Criteria for re-evaluation qualification and eligibility: Students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

Regulations for carrying out activities

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

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Bibliography

Basic:

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Complementary:

Vuchic, V. R. Urban Transit : Systems and Technology. New Jersey: John Wiley, 2007. ISBN 9780471758235.

Hoel, L.A, N. J.; Garber, N.J.; Sadek, W. Transportation infrastructure engineering: a multi-modal integration. Stamford: Cengage Learning, 2011. ISBN 9780495667896.

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Larson, R.C.; Odoni, A. R. Urban operations research. Belmont, Mass: Dynamic Ideas, 2007. ISBN 9780975914632.

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Simchi-Levi, D., Chen, X.; Bramel, J. The Logic of logistics : theory, algorithms, and applications for logistics and supply chain management. 3a ed. New York: Springer, 2014. ISBN 9781461491484.

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Meyer, M.D. ; Miller, E. Urban transportation planning : a decision-oriented approach. 2nd ed. New York: Mc Graw Hill, 2001. ISBN 0072423323.

Hall, R.W. Handbook of transportation science [on line]. 2nd ed. Boston: Kluwer Academic, 2003 [Consultation: 10/12/2018]. Available on: <https://link.springer.com/book/10.1007%2Fb101877>. ISBN 1402072465.