



# COURSE DESCRIPTION RAILWAY AND TRANSIT SERVICES

# SSD: TRASPORTI (ICAR/05)

DEGREE PROGRAMME: TRANSPORTATION ENGINEERING AND MOBILITY (P55) ACADEMIC YEAR 2022/2023

# **COURSE DESCRIPTION**

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# **GENERAL INFORMATION ABOUT THE COURSE**

INTEGRATED COURSE: NOT APPLICABLE MODULE: NOT APPLICABLE CHANNEL: FG A-Z YEAR OF THE DEGREE PROGRAMME: II PERIOD IN WHICH THE COURSE IS DELIVERED: SEMESTER I CFU: 9

# **REQUIRED PRELIMINARY COURSES**

None

PREREQUISITES

None

# **LEARNING GOALS**

The aim of the course is to provide students with general concepts relating to the simulation, design and management of railway and transit systems. The different simulation techniques, design methodologies, regulatory aspects and contractual management tools for railway and transit systems will be presented.

# **EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)**

## Knowledge and understanding

The course aims to provide students with the knowledge and basic methodological tools necessary to analyse, design and manage railway and transit services. These tools will allow

students to understand the connections between regulatory and organizational aspects, the main relationships that exist among the different technological systems hypothesized or analysed (vehicles and types of services) and the related supply models for their representation, and to grasp the implications in the case of a multimodal and integrated design.

#### Applying knowledge and understanding

The course is aimed at transmitting the methodological and operational skills and tools necessary to concretely apply the knowledge acquired in the field of planning and management of railway and transit services. In particular, the student will be able to simulate and design railway and transit services (also with a multimodal approach) and calculate the performance indicators of transport networks and services before and after each project intervention. Furthermore, the methodological tools acquired will allow the student to prepare the technical annexes to a service contract, a specification for the assignment of railway and transit services and to calculate the economic implications (costs) deriving from the increase in the reliability of the services.

## **COURSE CONTENT/SYLLABUS**

Introduction: Concept of modelling, Concept of transportation system design. The simulation of railway and transit services: Introduction to simulation; Types of vehicles and systems for railway and transit services; Signalling systems for railway transportation systems; Supply models, flow propagation models, congestion models and cost functions; User behaviours for railway and transit systems; Simulation techniques and methodologies: assignment, frequency and schedulebased approaches. Pedestrian movements: Introduction (autonomous mode, aid to public transport services, aid to private car system); Pedestrian speed, pedestrian distance, areas of influence and concept of potential user; Fundamental relationship of pedestrian flow, unit of measurement and concept of pedestrian space; Dimensioning of a walkway, dimensioning of the elements of a railway station (platform); Behaviour of users at railway platforms. The design of railway and transit services: "what if" approach and "what to" approach; Variables (decisional and descriptive ones), constraints (technical, external and assignment ones) and objectives (efficiency, effectiveness, quality and objective functions); The design with an optimisation approach: the service frequency definition; The design with a simulation approach. definition of the initial configuration (current scenario, project scenario, target scenario); Load diagrams of railway and transit lines; User typologies of the railway and transit services: captive and non-captive users. Regulatory and organisational aspects for local public transport: Concept of local public transport; The European Union, the Italian and the Campania Region legislation; Bid procedures and service contracts (gross cost and net cost); Reliability, safety and security of railway and transit services; Quality: quality typologies (expected, planned, provided and perceived qualities), quality management phases. Quality in the local public transport services. Decision Support Systems: G.I.S. software: main features; Transportation system simulation software: main features; Notes on hybrid software, examples of commercial software; The use of railway simulation software for determining rail timetable, rail line capacity and train running times; The use of transportation simulation software for determining passenger flows on railway and transit lines (frequency and schedule-based approaches).

### **READINGS/BIBLIOGRAPHY**

Slides, lecture notes, and technical papers are downloadable from the teacher's website.

## Textbooks:

Hansen I. A. and Pachl J. (2008) Railway timetable &traffic: Analysis, modelling, simulation. Euralil Press, Hamburg, Germany.

Cascetta E. (2009) Transportation systems analysis: Models and applications. Springer, New York (NY), USA.

## TEACHING METHODS OF THE COURSE (OR MODULE)

The teacher will use: a) frontal lessons for about 40% of the total hours, b) design and exercise activities for about 60% of the total hours.

## **EXAMINATION/EVALUATION CRITERIA**

a) Exam type	
	Written
$\mathbf{\nabla}$	Oral
$\mathbf{\nabla}$	Project discussion
	Other

## In case of a written exam, questions refer to

Multiple choice answers

- Open answers
  - Numerical exercises

## b) Evaluation pattern

N.A.