POLITECNICO DI TORINO

MASTER OF SCIENCE IN MECHANICAL ENGINEERING
INDUSTRIAL SECTOR

Career
TRANSPORTS AND *TRANSPORT SYSTEMS*

Career courses

- **Models and technologies for traffic and transports**
- **Rolling stock mechanical design**
- **Engineering and operation of transport systems**
- **Automation in transport systems**
- **Transport techniques and economics**
- **Electric traction**

*In transports, as well as in other engineering areas, education and research identify new requirements that, in the mobility of people and the transport of people and goods, are often connected in recent times to the pursuit of independence from black oil, higher safety and quality of services: these objectives are clearly achievable through **fixed-plant transport systems** – as **railways**, **tramways**, **metros**, **cable installations** and **people movers** - with their rolling stock and traction systems, with automation and network management using ITS (Intelligent Transport Systems), without losing sight of the economy of the transport system.*

PROFESSIONALS

The "Transport Systems" career, inserted within the educational path of the Master of Science – of Industrial connotation – in Mechanical Engineering, is mainly set on engineering, design, automation, management and operation of transport systems and related installations, including energy issues.

The figures that emerge can be summarised as follows.

A. Engineer able to **design and maintain transport systems, installations and terminals**: engineers, designs, sizes, schedules and controls the maintenance of fixed plant transport systems - rail, cableway, metropolitan, unconventional, even unmanned - and related terminal infrastructures for modal exchange.
His/her main responsibilities include:
   - definition of the level of service required for a transport system;
   - performance and economic evaluation of a transport system;
   - designing and dimensioning of transport systems on the basis of the identified specifications;
   - definition and dimensioning of terminal infrastructure for modal exchange;
   - collaboration for the integration of electronic, computer and telecommunications technologies within transport systems;
   - maintenance plans for transport installations and terminals.

B. Engineer able to design, inspect and maintain **rolling stock**: designs, sizes, schedules and controls the construction and maintenance of railways, trams and metro's rolling stock;
his/her main responsibilities include:
   - rolling stock design with integration of structural, mechanical and electrical components;
   - rolling stock construction planning and supervision;
   - organisation of rolling stock and its components maintenance plans.

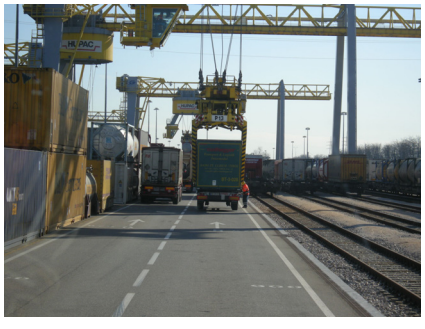
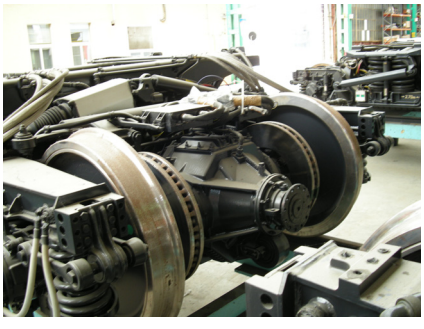
C. Engineer in charge of the maintenance and operation of transport systems, plants and infrastructures for freight and passengers: organises and manages **networks and transport systems**, and the related terminal infrastructures for modal exchange, including **handling installations**, pursuing safety, quality and efficiency targets, optimising the use of resources and respecting the environment.
His/her main skills include:

- identification of the requirements for the transport of people and goods as well as for **outdoors logistics**;
- identifying the **supply** which better matches the system requirements, user needs and the **demand** as well as the main multimodal transport elements in order to organise a shipment using motor vehicles, trains or ships;
- choice of the most adequate **transport modes** and **external handling equipment** according to the needs of an intermodal network or infrastructure, on the basis of models or simulations;
- transport **optimisation** consistent with technical constraints.







This is supported by the need of knowledge about:

- automation and telematics systems for transportation, in order to control and regulate road traffic or vehicles operating on fixed installations when pursuing "ITS";
- rolling stock project constraints for railways (limit of weights, track and loading gauges, vehicles and their connections within the rail or metro system);
- principles of functional and structural design in railway construction, of different kinds of traction (electric, Diesel) and their transmissions;
- problems of wheel/rail interaction, dynamic vehicle behaviour and quality of travel;
- problems of traction and braking, electrical and mechanical, in different applications of rail, tram and metro's rolling stock;
- main automation devices and systems currently used in modern transport systems and their installations;
- control systems used in automated transport systems;
- transport economics, for people mobility, goods transport and outer logistics.

WHY AND WHAT FOR: OUR AND YOUR MOTIVATIONS

Transport systems include both a component linked to the **demand** and one connected to the **supply**. The latter includes all the systems, installations and technologies which enable a quality, safe and efficient mobility of people and transport of goods, as it is nowadays required by the demand, with defined carrying capacity and mechanical performances.

The analysis, design and choice of transport systems, from an academic and research point of view, has a history that – in the first half of the last century – was closely related to *railways and fixed installations*. In the second half, with the development of the road network, it became mainly an infrastructural problem: designers and builders of various infrastructures felt the need of making roads, in particular, appropriate for the demand and this has led, during the 60's and the 70's, to analyse mainly *problems of traffic and land use planning*.

Today, on the other hand, the demand often saturates the supply, both in space and time; the supply can no longer easily adapt to the growth in demand both for territorial capacity constraints and environmental impact issues during operation or, vice versa, the conditions to increase infrastructure offer in Europe do not often exist since the supply sometimes generates itself demand.

In the analysis of supply saturation and the ways to deal with it, traffic and emissions aspects, however, do not seem to be the basic nodes of the problem, since today both congestion and environmental impacts result from inefficient use of vehicles. In this sense the problem is upstream, i.e. the **use of energy**, which determines emissions: nowadays this can be improved also through telematics or ICT (Information and Communication Technology) for transport (ITS-**Intelligent Transport Systems**), optimisation in the use of vehicles, through their shared use, **multimodal** and **intermodal transport**; so the core of the problem is in these last points. Monitoring emissions, evaluate the impacts of traffic and infrastructure to meet the mobility is certainly correct, but it is a consequence of not always a rational use of soil and vehicles, which can be improved also with "ITS" and the development of **shared-use vehicles** that can be **remotely monitored** in their different parts: **railway systems**, driverless or unmanned systems deriving from **metros** or **ropeways** for urban public transport, demand responsive transport services; in addition, it is possible to intervene on the demand of mobility. The adoption of advanced technologies is also linked to vehicle and traffic's safety, the development of advanced signalling systems, of control and monitoring units, etc., in accordance with what has been highlighted in the latest European Commission documents.

Research and teaching pursue these needs and goals in the area of expertise, remembering that University teaches - before providing a specific knowledge in a sector – how to learn and solve problems, from theory to practical applications, in particular in Mechanical - Industrial and Civil engineering, by applying Information engineering, depending on chosen the study addresses.

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