UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II SCUOLA POLITECNICA E DELLE SCIENZE DI BASE



COLLEGIO DEGLI STUDI DI INGEGNERIA

Department of Civil, Building and Environmental Engineering http://www.dicea.unina.it

## LM-TEAM Transportation Engineering And Mobility

Italy: studying and working in transportation



# The transport sector (some figures for Europe and Italy)

TRANSPORT SECTOR IN EUROPE				
Companies	1 496 mln			
Employees	11.4 mln			
Value added to GDP	15 %			
Turnover	3 000 billion			
Road transport incidence (inland)	80% for passengers			
Koad transport incidence (infand)	50% for goods			
Private passenger transport	>70%			

ITALIAN TRANSPORTATION INFRASTRUCTURES				
Road	91%			
Railways/tramways/subways/funiculars	6.6%			
Roads extent	260,000 km			
Railways extent	54,000 km			
Ports	285			
Airports	44			

# Transport services and mobility (some figures for Italy)

• Transport services

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- Every year, 24
   million Italians travel around the world, moving around the boot.
- Each year, 27 million (6 tonnes) male
   African elephants
   are transported
   from Bolzano to
   Reggio Calabria.

PASSENGER TRANSPORT SERVICES (National Mobility)							
Internal passenger traffic (2019)	pax*km (*109)	Equivalent number of tours around the world					
Roads	874,5	21.821.585,00					
Railways	63,5	1.584.529,00					
Air navigation	21,8	543.980,00					
Waterways	4,2	104.803,00					
TOT Passengers	964	24.054.897,00					

GOODS TRANSPORT (Italian Mobility)								
Internal freight traffic								
(2018)	ton*km (x10 <sup>9</sup> )	Modal Share						
Roads	104	53%						
Waterways	59	30%						
Railways/Pipelines	31	16%						
Air navigation	2	1%						
TOT Freight	196	100%						



## Current Plannig for Infrastructures and Services in Transportation - Italy



## Ten years to transform Italy

For the well-being of people and businesses, respecting the environment

Infrastructures, mobility, logistics, quality housing for a more prosperous, fair, sustainable and resilient Country

Contratto di Programma ANAS

Contratto di Programma RFI





## More than 20 billions/year of investments



## Current Plannig for

## Infrastructures and Services in Transportation - Italy



### More than 20 billions/year of investments



# Extra investments in Transportation in Italy (from Next Generation EU)

62 billions (in 3 years) extra fund in transportation, including logistics, and mobility



CHI SIAMO NEWS DOCUMENTI EVENTI RICERCHE CONTATTI https://www.clustertrasporti.it/en/



Piano Nazionale di Ripresa e Resilienza: 62 miliardi di euro per mobilità, infrastrutture e logistica sostenibili



#### Pubblicato il 7 Maggio 2021

Investimenti senza precedenti per la costruzione e la riqualificazione di infrastrutture, per la mobilità sostenibile, per rafforzare le imprese e migliorare la qualità del lavoro e della vita delle persone, tutelando gli ecosistemi terrestri e marini. Il Ministro del **MIMS Enrico Giovannini**individua alcuni degli ambiziosi obiettivi del **Piano Nazionale di Ripresa e Resilienza** (Pnrr) che, grazie allo stanziamento di 62 miliardi permetterà di attuare progetti determinanti per il rilancio del Paese, basati sulla sostenibilità economica, sociale e ambientale.

#### Il programma del MIMS

l progetti del Ministero si finanziano per 41 miliardi con le risorse europee del programma **Next Generation Eu** (40.7 miliardi) e con guelle del React Eu (313



# National and Regional planning





# Feasibilty studies and impacts assessment for strategic infrastructures





# Networks design and optimisation





# **Optimisation of services**



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# A changing world



## CCAM Cooperative Connected and Automated Mobility





# C-ITS







C-ITS C

Vehicle to Vehicle, Vehicle and Roads Communicate and Share the information in real time. Cooperative Intelligent Transport Systems





C-ITS in urban areas





Tab I – Infrastructures and Mobility	Semester
Demand analysis and forecasting	2
Transport Planning and appraisal	1
Traffic Control	1
Railway and Transit services	2
Freight and logistic	2
Testing and Validation of automated road vehicles	1
Sustainable Road Materials	2

Tab. II - Measures, analyses, decision support	Semester
Measurement sensors and transducers	1
Statistical Lab for Industrial data analysis	1
Transportation Geothecnics	2
Structural Health Monitoring for Infrastructures	1
Digital maps and geological 3D models	1

Tab. III - Enabling ICT and industrial technologies	Semester
Energy Management for transportation	1
Electric Systems in Transportation	1
Image processing for computer vision	2
Systems and Control Fundamentals	1
Real-time systems	2

Autonomous choices	Semester
Smart Roads and cooperative driving	2
Laboratory for Road Safety	2
Operational Research	1
Resilience of Transportation Systems	2
Any other course at the Univ. of Naples,	
including tables from I to III	

## Framework of the Study Program

Positioning and location-based services (9 ETCS)

Machine Learning and Big Data (9 ETCS)

Road safety (9 ETCS)

Intelligent Transportation Systems (9 ETCS)

2x Table I (18 ETCS)

1x Table II (9 ETCS)

2x Table III (18 ETCS)

Autonomous choice (15 ETCS)

() Internship (9 ETCS)

MSc Thesis (12 ETCS)



## Predetermined Study Programs Resilient networks and infrastructures

Year	Semester	Course				
		Language Skills	3			
		Positioning and location-based	9	20		
	I	Structural health monitoring for infrastructures	9	50		
		Electric systems for transportation	9			
		Machine Learning and big data	9			
	II	Intelligent transportation Systems	9	26		
		Road Safety	9	50		
		Transportation geotechnique	9			
	 	Transport planning and appraisal	9	10		
II		Energy management for transportation	9	10		
		Sustainable Road Materials	9			
		Resilience of Transportation Systems	6	26		
		Lab/Internship	9	50		
		MSc thesis	12			



## Predetermined Study Programs Smart Planning

Year	Semester	Course				
		Language Skills	3			
		Positioning and location-based	9	20		
	I	Digital maps and geological 3D Models	9	50		
		Systems and Control fundamentals	9			
I		Machine Learning and big data	9			
	II	Intelligent transportation Systems	9	26		
		Road Safety	9	50		
		Railway and transit services	9			
		Traffic control	9	10		
		Energy management for transportation	9	10		
п		Freight and logistics	9			
11		Smart Roads and cooperative Systems	6	26		
		Lab/Internship	9	50		
		MSc thesis	12			



## Predetermined Study Programs Smart Mobility

Year	Semester	Course				
		Language Skills	3			
		Positioning and location-based	9	20		
	I	Measurement sensors and transducers	9	50		
		Systems and Control fundamentals	9			
I		Machine Learning and big data	9			
	II	Intelligent transportation Systems	9	26		
		Road Safety	9	50		
		Real-time systems	9			
	I		Testing and validation of automated road vehicles	9	10	
		Energy management for transportation	9	10		
п		Railway and transit services	9			
11		Smart Roads and cooperative Systems	6	26		
		Lab/Internship	9	50		
		MSc thesis	12			



# Supplemental programs

- Minor Transition Engineers (Predetermined Programs) + 10 ETCs w.r.t. MSc-TEAM
  - Interdisciplinary training (technical-scientific area)
  - Training on digital skills
  - Training on soft skills
- Excellence training program
  - Smart Roads and Cooperative Driving + Smart Urban Design
  - Resilience of Transportation Systems + Resilience of Geotechnical Systems



## Learning approach





## Lab-centered learning





anylogic

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## Lab-centered learning

RESOURCES

NDUSTRIES FEATURES



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## AnyLogic Simulation Software Make intelligent decisions

COMPANY

AnyLogic is the leading simulation modeling software for business applications, utilized worldwide by over 40% of Fortune 100 companies. AnyLogic simulation models enable analysts, engineers, and managers to gain deeper insights and optimize complex systems and processes across a wide range of industries.

LEARN MORE



## Lab-centered learning

<b>∢</b> MathWorks∘	Products	Solutions	Academia	Support	Community	Events		Get MATLAB
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### Simulation and Model-Based Design

Design and simulate your system in Simulink before moving to hardware. Explore and implement designs that you wouldn't otherwise consider – without having to write C, C++, or HDL code.

Download a free trial



What Is Simulink?



## Lab-centered learning



A / Products & Services / Simulation Software



## Lab-centered learning

#### **OpenTrack Railway Technology**

#### **OPEN**TRACK

we care for public transport systems



HOME

#### COMPANY

RAILWAY SIMULATION

OVERVIEW

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RAILWAY SIMULATION COPY

REFERENCES

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#### **Railway Simulation**



## Lab-centered learning

#### VERA Virtual Environment for Road sAfety







#### Instrumented vehicle (naturalistic observation of driving behaviour)



#### Sensors and sources of data:

Front and rear Radar; GPS; IMU; Front, Rear, Side and Pilot Cameras; Wheel Encoders; OBD-II; Clutch, gas-pedal and brake sensors; Steering wheel sensor



## Lab-centered learning

#### Pre-testing of Advance solutions

- Vissim+IPG TruckMaker+ XPack4 Roadbox + Speedgoat Real-time
- Real-time machine communicating on CAN network
- Speedgoat Real-time used as ECU rapid prototyping platform
- Other hardwares integrable: C-ITS hardware, CAN-USB Interface, real hardware
- Realistic traffic environment modelled by UniNa





# How to join

- Teaching and learning in English (foreign students are welcomed)
- Required background fits almost any technical bachelor under mild conditions:
  - At least 36 recorded ETCs in mathematics, physics, chemistry, probability theory, statistics
  - At least 39 recorded ETCs in technical and engineering fields, of which at least 18 in <u>civil</u> engineering
- Level B2 CEFR (Common European framework Reference)
- For foreign students https://www.dicea.unina.it/? page\_id=1329



## Partnerships and committments



Ministero delle infrastrutture e della mobilità sostenibili





## Contact



UNIVERSITA' DEGLI STUDI DI NAPOLI FEDERICO II DOCENTI

### https://www.docenti.unina.it/gennaronicola.bifulco



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https://www.transportengineering.it/