

## **ICAM - MASTERE SPECIALISE en GENIE FERROVIAIRE**

### **MODULE 1 - *Railway environment***

- History of the railway
- Poles and their specificities in the world
- European problems of transport
- Railway solutions :
  - passenger transport : main lines transport
  - passenger transport : urban and interurban transport
  - freight
- European policies : orientation, evolution and turn of Europe of the networks
- Interworking
- Homologation and standardization
- Service to the customers

### **MODULE 2 - *Operation: Infrastructure and networks***

- Operating schedule of conditions vision owner / prescriber (urban transport)
- Operating schedule of conditions vision network exploitation (urban transport)
- Design and typology of the infrastructures :
  - functional program
  - design of the infrastructure layout
  - principal types of works of civil engineering : ground works, structures, hydraulic and drainage works
  - environmental integration of the infrastructure
  - railway equipments (tracks, trackside equipment, indications, overhead lines)
- Costs of construction
- Exploitation of the networks and materials
- Marketing and tariffing
- Allocation of routes
- Organisation of the network maintenance
- Safety and risk management for the network
- Control and optimisation of the network and materials exploitation
- Supply of the electric power

### **MODULE 3 - *Production and maintenance of rolling stock***

- Schedule of conditions : preliminary draft
- Schedule of conditions : methods of project development (clients, suppliers and owners)
- Production :
  - techniques of manufacture–organisation
  - subcontracting organisation
- Maintenance :
  - corrective, preventive and predictive
  - maintenance organisation, exploitation cost
  - integration of maintainability in the design
- Life cycle according to the type of propulsion (electric or diesel)
- Organisation of the maintenance actions subcontracting

### **MODULE 4 – *On board computers and information management***

- Mecatronics
- Real time data processing
- Electromagnetic compatibility
- Structure of the embarked electronic systems, control
- Transmission of information :
  - intern with the train
  - train-ground
  - radio-telecommunication
- Indication treatment

- ERTMS

### **MODULE 5 - *Traction and braking***

- Railway dynamics :
  - friction
  - adherence
  - modelling of a traction system
- Traction chain :
  - traction history
  - electric traction
  - turbine-thermal traction
  - diesel-thermal traction
- Collecting and energy management :
  - electric protection
  - electric power components
  - DC current feeder systems
  - AC current feeder systems
  - circuit supplied with battery
  - battery charger
  - revolving electric machines
- Method of starting of the traction chains for electric systems, diesel systems and gas turbines
- Electric protection :
  - disconnecting switches, fuses
  - system of current return
- Braking :
  - technologies
  - deceleration
  - types of braking
  - parameters which intervene in the deceleration schedule of conditions

### **MODULE 6 - *Bodies and bogies***

- Industrial design, finite elements
- Uniform of the body during service
- Structure tests, instrumentation
- Technical constraints related to the carriage of goods
- Tilt trains
- Stability, derailment
- Obsolescence

### **MODULE 7 - *Incorporation of equipment***

- Structures of the train, optimisation parameters
- Coordination of architecture with specialists
- Subsets and components
- Specific standards
- Aero-acoustic
- Fluid mechanics

### **MODULE 8 - *Project management***

- Management methods
- Information : strategic vector of management
- Fundamental points of management by projects : characteristics of the railway infrastructure projects
- Typology of contracts
- Typology of schedules of conditions
- Risk management