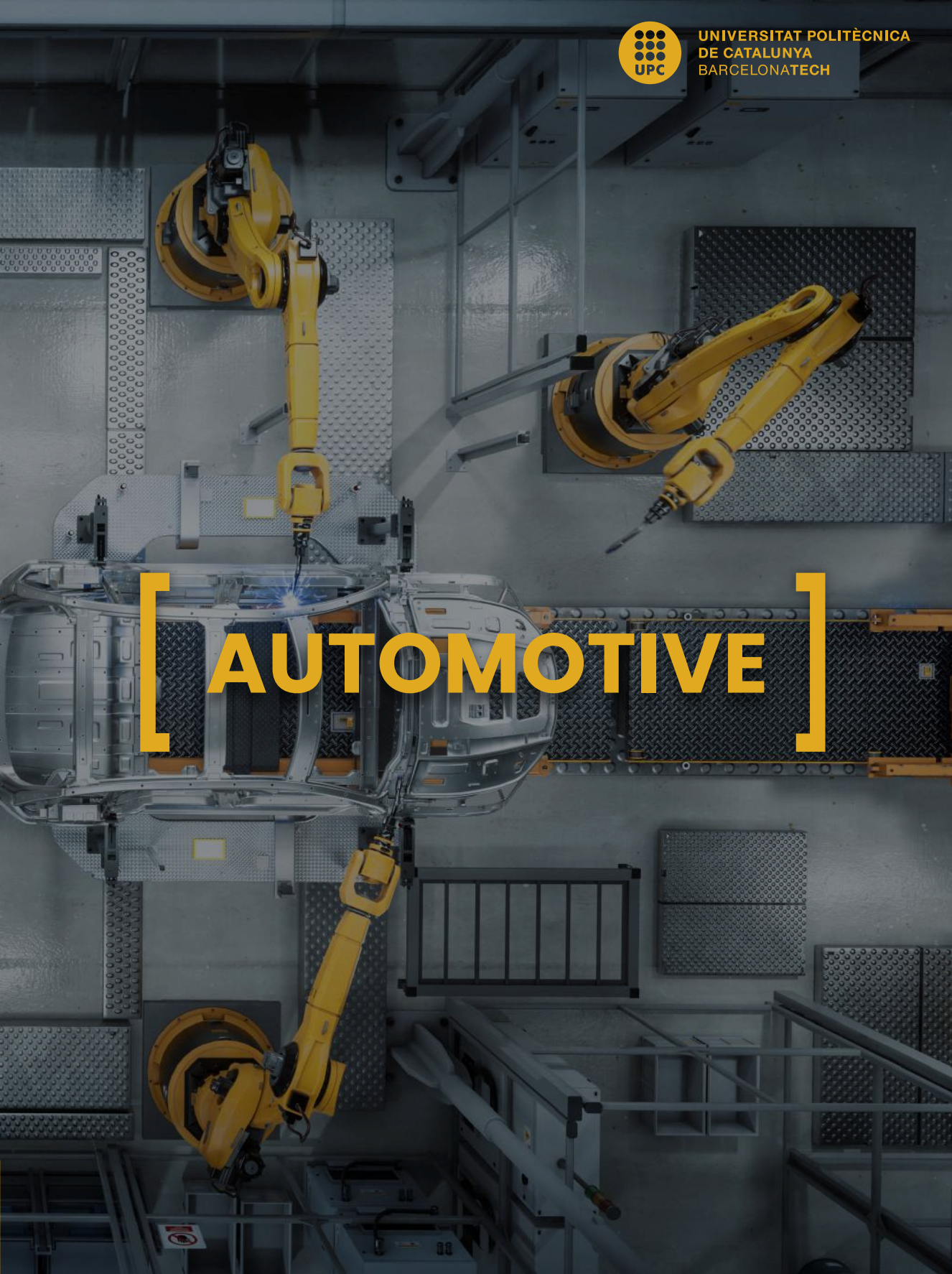
UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH



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RESEARCH, DEVELOPMENT & INNOVATION AT THE UNIVERSITAT POLITÈCNICA DE CATALUNYA (UPC)

The Universitat Politècnica de Catalunya (UPC) specializes in the areas of architecture, science and engineering, including Automotive technologies. In this field, the main focus areas are:

PROPULSION SYSTEMS
ADVANCED MATERIALS
SIMULATION
ADVANCED MANUFACTURING
SECURITY AND COMFORT
ELECTRICITY, ELECTRONICS
SMART MOBILITY
ELECTRIC VEHICLE

As a result of the UPC's recognized research track record in its areas of specialization, we can offer a wide range of services:

- **R&D technology transfer projects**
- **Consortium for national and Horizon Europe projects**
- **Patents**
- **Technology assessment**
- **Specialized facilities**

The UPC is the leading university in Spain in volume of research and technology transfer to companies, and has become one of the major hubs of knowledge in Southern Europe.

PROPULSION SYSTEMS

- Advanced electric propulsion systems (electromobility) and hybrids
- Electricity storage
- Fast charge (wired and wireless)
- Alternative fuels (hydrogen, synthetic). Use of hydrogen for heavy transport.
- High efficiency thermoelectric systems
- Optimisation of ion engines in combustion
- Acoustics and analysis of the vibration signal
- Advanced cooling systems
- Catalysts for the elimination of methane emissions in vehicles propelled by natural gas
- Catalysts for the elimination of soot and carbon monoxide in vehicles propelled by petrol and diesel
- Synthetic fuels for the automobile industry

ADVANCED MATERIALS

- Advanced replacement materials: recycled and recyclable materials
- Multifunctional nanomaterials
- Multi-material design
- Light and resistant materials
- Surface coatings
- Tribology
- Material forming technologies
- Resistance of materials and deformable solid mechanics
- Highly resistant metal alloys due to microstructural design
- Functionalisation of materials for mechanical resistance, electrical conductivity, biocompatibility and weldability
- Replacement of scarce materials. Recovery of rare earths.

SIMULATION

- Computational fluid dynamics (aerodynamics, aeroacoustics, heat transfer, etc.)
- Simulation of traffic management
- Structural computational mechanics (collision, rigidity, dynamics, durability, vibroacoustics, etc.)
- Evaluation of the thermal and fluid dynamic behaviour of components
- Fuel and energy consumption
- Characterisation of light sources and design of illumination systems
- Ergonomics
- Component design by computational fluid dynamics (CFD) and computational solid mechanics (CSM)

ADVANCED MANUFACTURING

- Flexible manufacturing
- Design for circular manufacturing
- Efficiency in manufacturing processes
- Computer-assisted technologies
- Smart logistics systems
- Quality control
- Additive manufacturing process of metal materials

SECURITY AND COMFORT

- Active and passive security
- Structural integrity and reliability
- Biomechanics
- Adaptive and integrated control interface
- Rear vision systems
- Machine-to-machine connectivity
- Smart vision systems
- Sensors
- Infotainment and telematics
- Assisted systems for autonomous driving
- Haptic interfaces
- Advanced display systems (virtual and augmented reality)
- Acoustic comfort: noise, vibrations and stridency

ELECTRICITY, ELECTRONICS

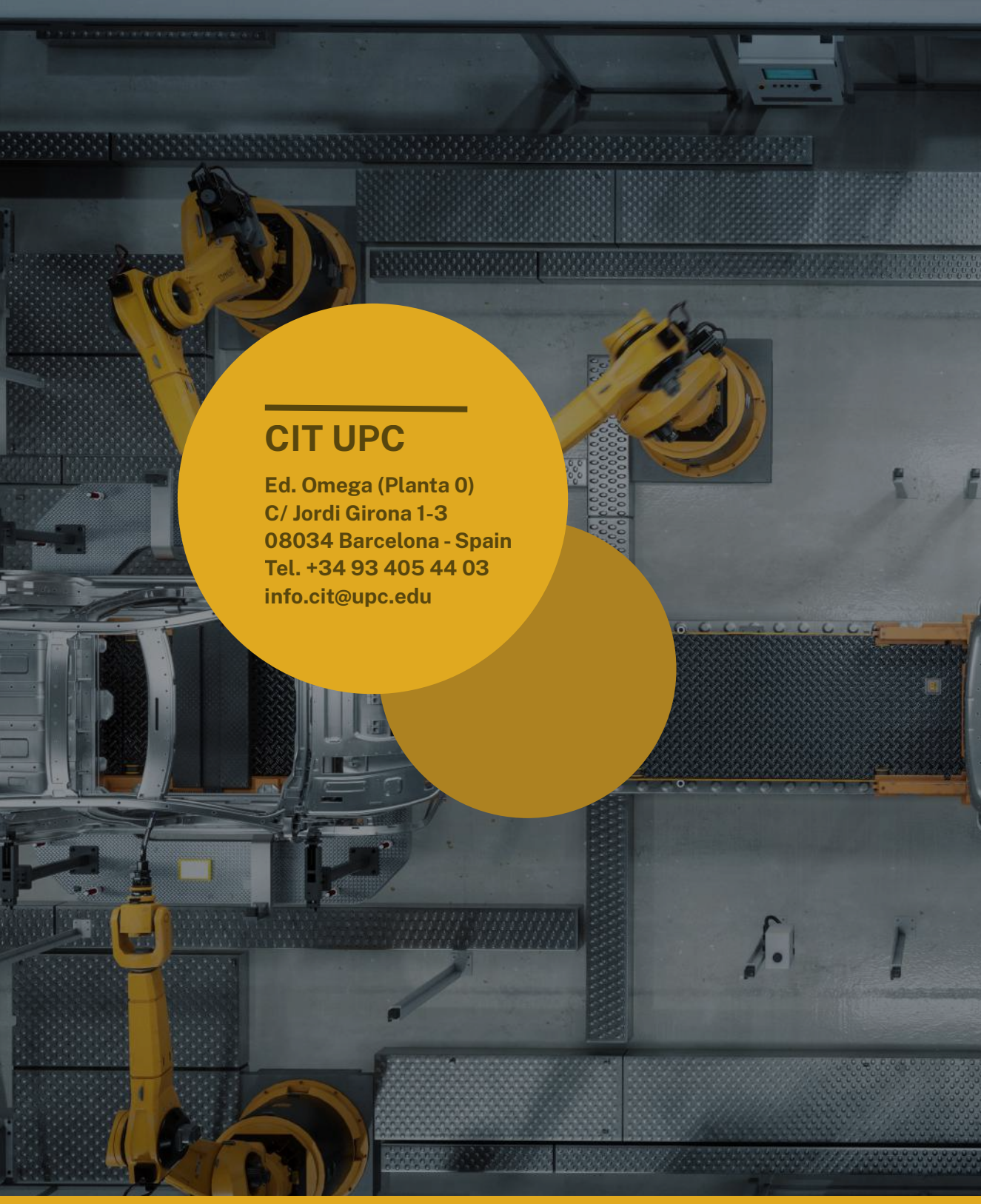
- IHuman-machine interfaces (HMI)
- Software for smart management of electric vehicle components
- Smart antenna systems for wireless systems
- High-voltage and energy distribution systems
- Energy management
- Smart batteries with innovative materials, designs and technologies
- Bidirectional charging
- Electromagnetic compatibility
- Power electronics
- Driver assistance systems (advanced driver assistance systems, ADAS)

SMART MOBILITY

- Sustainable urban mobility
- Dynamic traffic models
- Applications for active management and traffic information
- Networks of flexible routes
- Adaptive traffic signals
- Autonomous driving
- Urban logistics
- Route algorithms
- Integration for smart cities
- Development of protocols/V2I (Vehicle-to-Infrastructure) and V2V (Vehicle-to-Vehicle) communication devices
- Management of shared electric vehicles
- Machine learning to analyse data captured with IoT devices

ELECTRIC VEHICLE

- Drive systems (morphologies of reluctance electric motors and permanent magnet motors, hybrid systems, axial flow engines, etc.)
- Modelling and control of electric motors
- Design and development of chargers and V2G (vehicle-to-grid)/V2H (vehicle-to-home) systems based on proprietary and standard protocols
- Definition of specifications for charging stations
- Design of ultrafast charging stations
- Battery chargers: lithium ion, NiMH, VRLA
- Battery management systems. Smart batteries. Life cycle and second life.
- New EMC requirements of electric vehicles
- Connectivity of electric vehicles with their surrounding environment
- Aeronautics and noise generation
- Analysis of the impact of electric vehicles in electric networks
- Analysis of new business models for electric vehicles
- Smart grids
- Energy control and management for electric vehicles in hybrid fuel cells



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