Motorsport Engineering

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MSi RACE TECH INSTITUTE

Welcome to the most modern and advanced academic centre in Spain. MSi Race Tech Institute will skill-up future motorsport engineers who will join the teams in the top international categories.

We have the best teaching material, including the Teo Martín Motorsport team's competition vehicles and the best specialist teaching staff in the sector, all of whom have extensive experience in the world of motorsport.

We also provide students with state-of-the-art technology so that our passion, racing, can be transmitted to all of them with the greatest guarantee of success.

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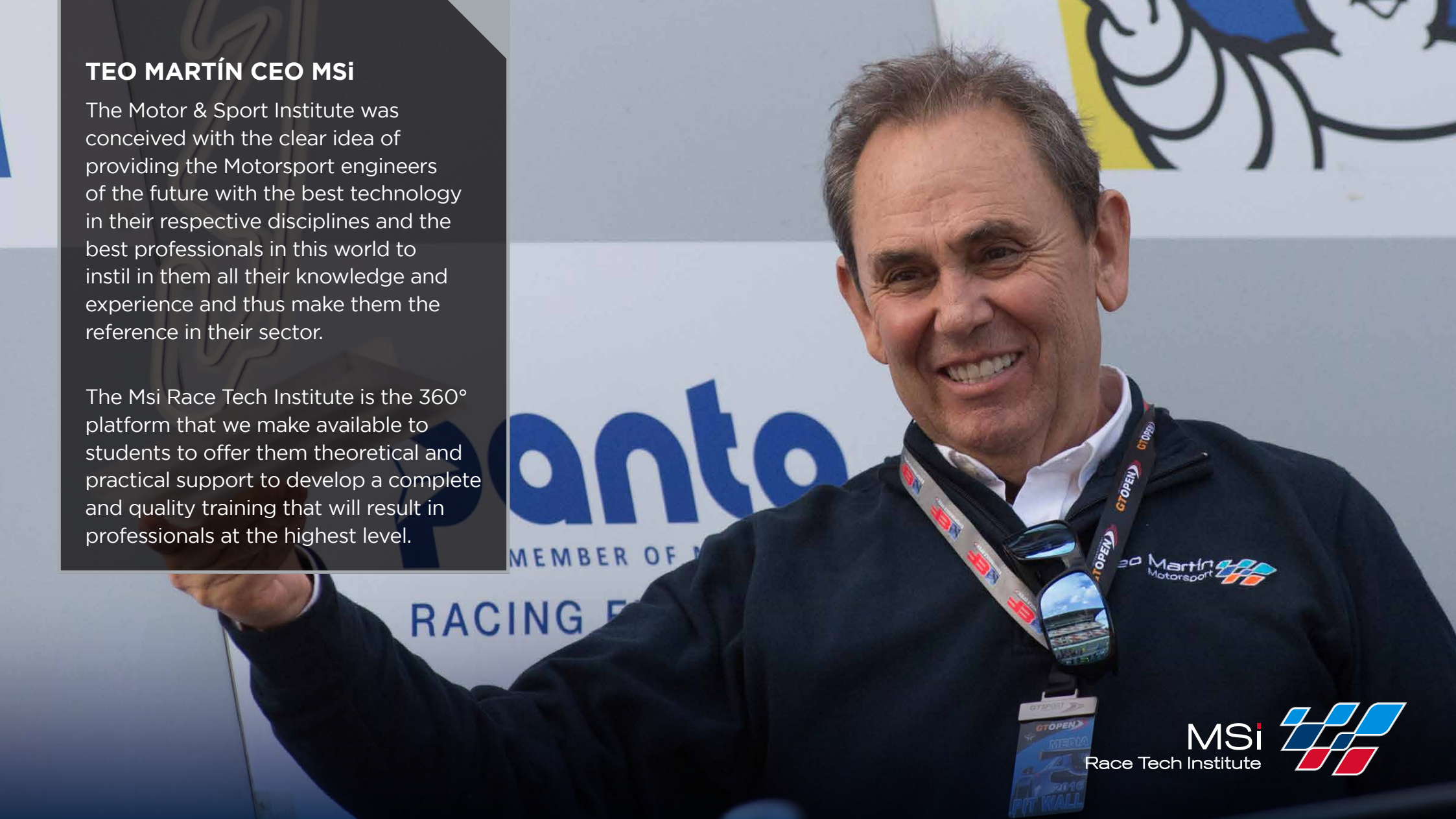
TEO MARTÍN CEO MSi

The Motor & Sport Institute was conceived with the clear idea of providing the Motorsport engineers of the future with the best technology in their respective disciplines and the best professionals in this world to instil in them all their knowledge and experience and thus make them the reference in their sector.

The Msi Race Tech Institute is the 360° platform that we make available to students to offer them theoretical and practical support to develop a complete and quality training that will result in professionals at the highest level.



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Academic overview

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MSI TECHNOLOGY PARK

Our technical centre develops engineering projects in the motorsport field and has the best facilities for training: We have a dyno and Seven Post Rig, the only vehicle dynamic test bench in Spain, for the training of engineers. The wind tunnel, CNC machining, metrology laboratories, additive manufacturing (3D printing) and professional driving simulators complement our training facilities.

ISO CERTIFICATION

The Quality Management System adopted by MSi Race Tech Institute complies with the requirements of the UNE-EN ISO 9001:2015 Standard in the field of design and delivery of training actions in automotive mechanics.

HIGH LEVEL OF INTERNSHIPS

Internships are the basis for the creation of experienced and quality motorsport engineers. Complementary activities, cross-disciplinary projects, practical training on the racetrack and in the laboratories of the MSi Technology Park add value to the training and build on the knowledge acquired in the classroom.

AGREEMENTS WITH MOST RELEVANT COMPANIES

All our agreements with companies such as AVL Racetech, Dassault-Simulia, Hypermill, OpenMind, Philips, UFV, RFEdA, Beta, PPG, Innovalia or Hoffmann Group, among others, will make our teaching quality grow exponentially, encouraging the best talents of each of the promotions, with masteclass and through support to the MSi Technology Park, as well as promoting their employability through the approach with different companies.

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REGULAR TOP LEVEL MASTERCLASSES

All students who specialise in the Race Tech Institute will receive lectures from prestigious companies in the world of motorsport, who will offer their knowledge and experience with the sole aim of providing the student with the best possible training.

HIGHLY QUALIFIED TEACHING STAFF

All our teachers have extensive experience in the world of racing, design and engineering. Our teaching staff are leaders in the sector.

OWN WORKSTATION

At the beginning of the course, the student will receive a laptop computer at no additional cost which can be used during the course.

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REFERENCE SOFTWARE OF THE PRESENT AND FUTURE OF THE INDUSTRY

Official partnership agreement between Dassault Simulia (Catia, Abaqus, XFlow) and AVL Racing (AVL VSM™ RACE and AVL DRIVE™ RACE). The first Motorsport master's degree to offer Dassault-Simulia XFlow with Lattice-Boltzmann technology for CFD study.

Software such as Matlab and Simulink from Mathworks, Star CCM+ from Siemens, Motec, AIM, Windarab from Bosch will form the list of software to be studied during the training.

360 TRAINING

The students of the MSI Race Tech Institute will complete each one of the syllabuses in parallel with the work of the Teo Martín Motorsport teams, present in the most prestigious international championships as well as with their collaborating teams, which are present both in rallies and on circuits.

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WE MOTIVATE THE TALENT OF OUR STUDENTS

Skill competitions, continuous technical evaluation of students, promotion of the best talents and driving training through our professional simulators.

TEAM MANAGEMENT, SPONSORSHIP AND MARKETING

At MSi we aim to provide students with the knowledge and experience to be fully operative inside any racing team, understanding all the areas of the business.

100% FACE-TO-FACE COURSES

Attendance will be controlled and compulsory with at least 80% attendance for evaluation.

MAIN LANGUAGE OF THE TRAINING

The formation will be given mainly in Spanish with partial content in English in order to make the experience as close as possible to the reality inside a motorsport team, and also allowing international students to join our multicultural group of students.

EXCLUSIVE TRAINING

With small groups.

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VISITS TO OUR FACILITIES

Open days will be arranged for allowing to see all the characteristics of our facilities and the general and specific characteristics of each level of training. The dates will be communicated through mailing and social networks. For security reasons due to the COVID restrictions, these open days will be held periodically after completing the preregistration process.

TITLE OF MOTORSPORT ENGINEERING

The student will receive a diploma issued by MSi - Race Tech Institute as Motorsport Engineering.

AGREEMENTS WITH RESIDENCES

In case of need, we provide accommodation information near our facilities.

CREDIT TERMS:

Fractionated monthly fees with no extra costs.

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Master’s Degree in Motorsport Engineering

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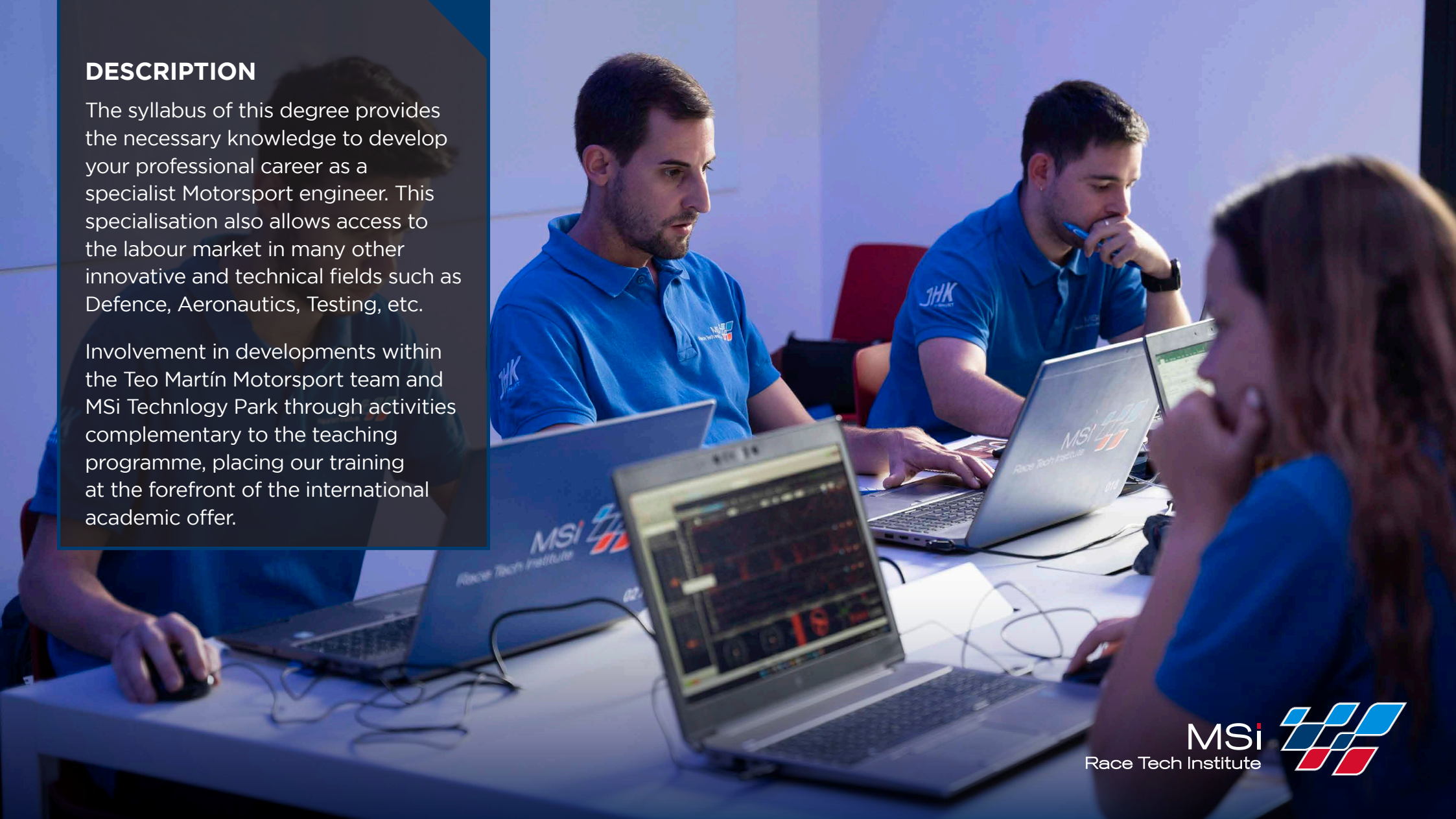
DESCRIPTION

The syllabus of this degree provides the necessary knowledge to develop your professional career as a specialist Motorsport engineer. This specialisation also allows access to the labour market in many other innovative and technical fields such as Defence, Aeronautics, Testing, etc.

Involvement in developments within the Teo Martín Motorsport team and MSi Technlogy Park through activities complementary to the teaching programme, placing our training at the forefront of the international academic offer.



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ADMISSION TO THE MASTER'S DEGREE

Candidates must have a B2 level of English, pass the personal interview and also meet at least one of the following requirements:

- Hold an Engineer's Diploma
- To be currently working on the final project of an Engineering's degree If the student does not have any knowledge of CAD design and vehicle components, it will be necessary to conduct the MSI Race Tech course in advanced computer aided design and automotive components in Motorsport.

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CURRICULUM (TWO SEMESTERS)

- 1st four-month period (October-January): **380h**
- 2nd four-month period (February-April): **460h**
- Total number of teaching hours: **850h**
- Work placement or TFM: **150h**
- Complementary activities in associated projects: **120h**

TIMETABLE AND DURATION

- **6 hours/day**:
  From 15h to 21h
- **Starting date:**
  October 2, 2024*
- **Delivery of the final master's thesis:**
  June 2025*
- **Submission of the final master's thesis**:
  July 2025*

*** The teaching plan, as well as the subjects are subject to possible changes both before and during the development of the teaching plan due to the needs of the co-ordination, the students and the academic year.*

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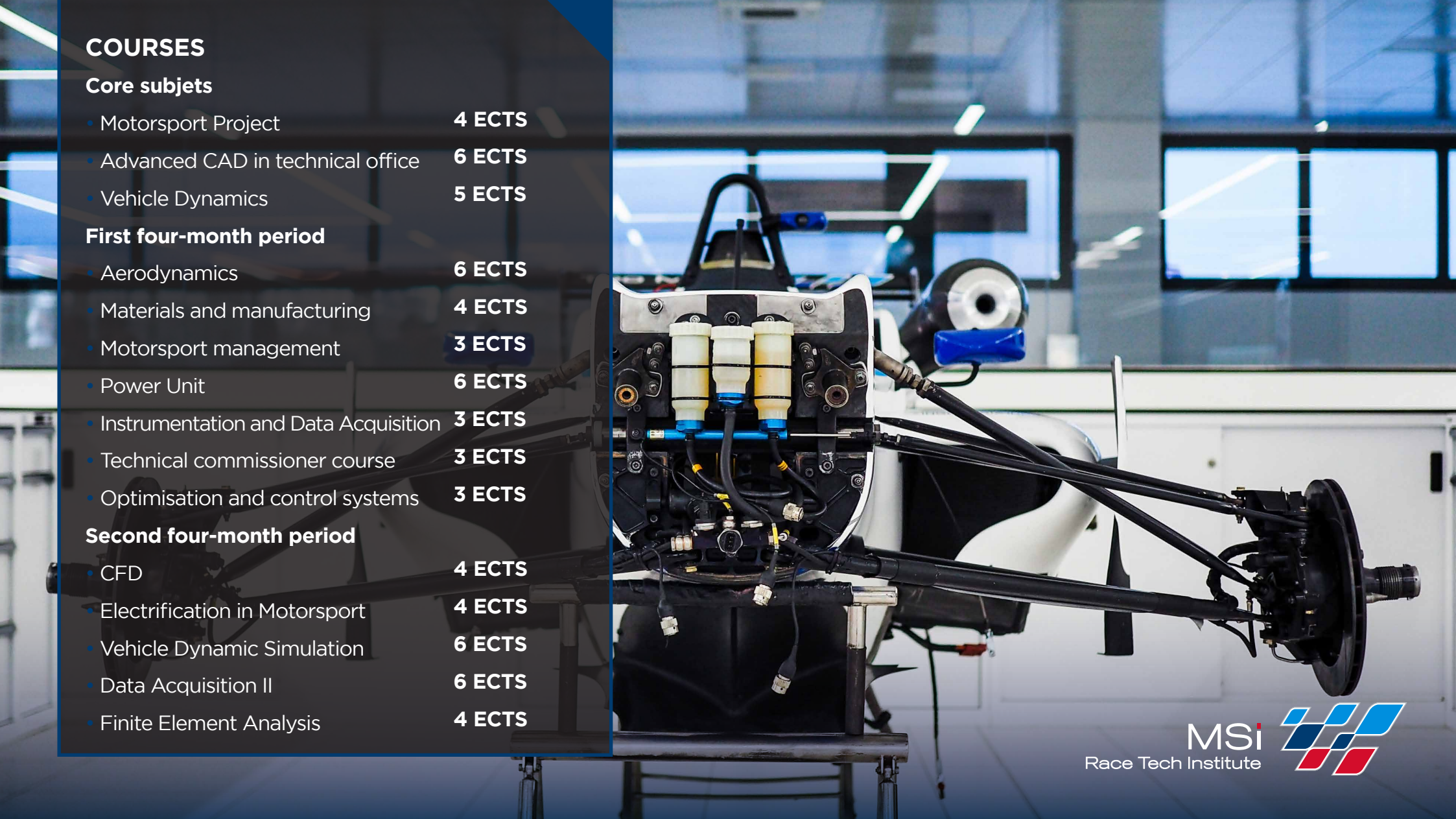

COURSES

Core subjets

- Motorsport Project **4 ECTS**
- Advanced CAD in technical office **6 ECTS**
- Vehicle Dynamics **5 ECTS**

First four-month period

- Aerodynamics **6 ECTS**
- Materials and manufacturing **4 ECTS**
- Motorsport management **3 ECTS**
- Power Unit **6 ECTS**
- Instrumentation and Data Acquisition **3 ECTS**
- Technical commissioner course **3 ECTS**
- Optimisation and control systems **3 ECTS**

Second four-month period

- CFD **4 ECTS**
- Electrification in Motorsport **4 ECTS**
- Vehicle Dynamic Simulation **6 ECTS**
- Data Acquisition II **6 ECTS**
- Finite Element Analysis **4 ECTS**

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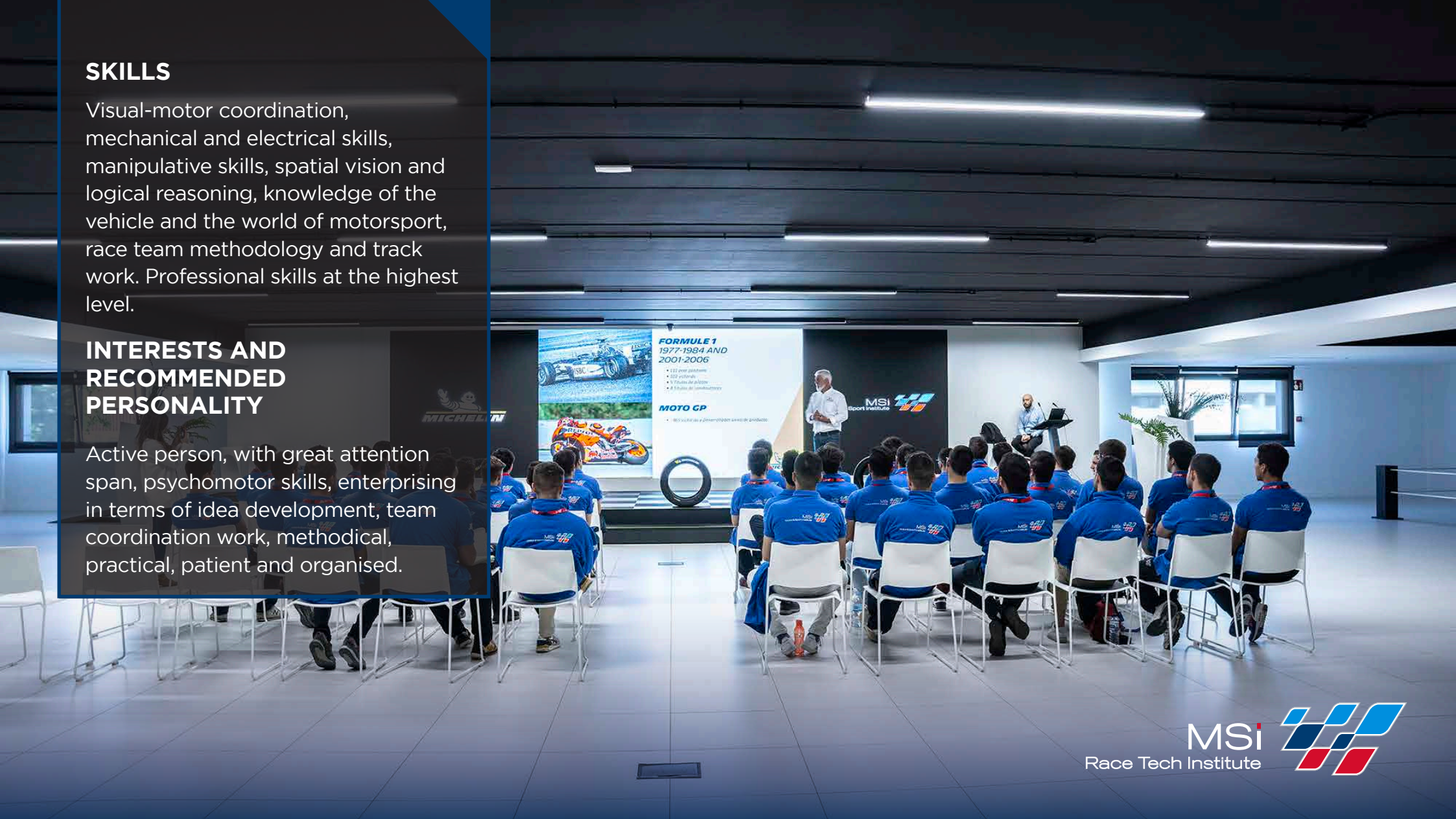
SKILLS

Visual-motor coordination, mechanical and electrical skills, manipulative skills, spatial vision and logical reasoning, knowledge of the vehicle and the world of motorsport, race team methodology and track work. Professional skills at the highest level.

INTERESTS AND RECOMMENDED PERSONALITY

Active person, with great attention span, psychomotor skills, enterprising in terms of idea development, team coordination work, methodical, practical, patient and organised.



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POSSIBLE CAREER OPPORTUNITIES

- Motorsport Track Engineer
- Performance Engineer
- Vehicle development engineer
- Technical Office Engineer
- Design Engineer
- Motorsport Coordination and Organisation Engineer
- Data and Analysis Engineer
- Manufacturing engineer

CAREER PROSPECTS

Motorsport professionals are in high demand. Our advanced degree at MSi Race Tech Institute will provide students with the necessary tools to develop their professional work in the field of top-level competition engineering. From the total number of teaching hours, 70% will correspond to classroom attendance and the remaining 30% to practice and final project.

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Teaching Plan - First four-month period

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AERODYNAMICS

- Applied fluid-dynamics
- Impact of Aerodynamics on Vehicle Performance: g-g Diagram
- Experimental Methods for Aerodynamic Evaluation: Wind Tunnel and Track Tests
- Ground Effect
- Spoilers, Endplates and Flap Gurney
- Wheel Aerodynamics
- Underbody and Diffuser
- Aeromap

Reference Software

- XFlow

Practical Resources

- Wind Tunnel
- CFD (XFlow)
- 3D Printing
- Finishing and Metrology
- Composites

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INSTRUMENTATION AND DATA ACQUISITION I

- Introduction to instrumentation and its application in motorsport
- Basic concepts: signal, frequency, analogue-digital conversion, calibration and configuration
- Design of an optimal data acquisition system, depending on the budget
- Measurement and data logging
- Introduction to the main software for data acquisition in racing
- Introduction to data analysis

Reference software

- Excel. Matlab, AIM, Motec, Ctools, Wintax

Practical resources

- Session data
- Simulator

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VEHICLE DYNAMICS

- Introduction
- Fundamentals of Dynamics
- Suspension and steering
- Racing tyres and their modelling
- Longitudinal, vertical and lateral dynamics
- Powertrain
- Brakes
- Introduction to dynamic simulation and its correlation with track data acquisition

Reference software

- Excel, AVL VSM™ RACE

Practical resources

- On-track workshops

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ADVANCED DESIGN AND CAD

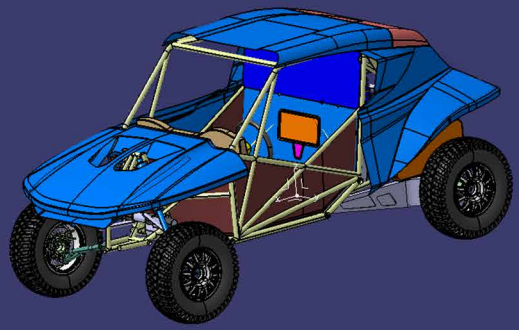
- Introduction to mechanical design and design software
- Handling of solids and their tools
- Advanced tools for solid generation
- Mechanical assemblies and assemblies. Constraints and interferences
- Surfaces. Interference creation and analysis
- Reverse engineering. 3D scanning
- File handling and compatibility with other engineering software

Reference software

- Catia

Practical resources

- Metrology
- Scanner



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MOTORSPORT MANAGEMENT

- Introduction to motorsport management
- The different stakeholders: Brand, team, organiser
- Motorsport strategy
- Feasibility and economic management of a racing team. Financial statements. Main risks
- Operations in a racing team. Optimising efficiency
- Annual planning and monitoring
- Marketing and communication
- Race strategy

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POWERUNIT

- From the “Engine” to the “Power Unit”
- Introduction to Internal Combustion Engines (ICM)
- Charge and Combustion Renewal Performance
- ICM dynamics. Lubrication and cooling
- Electronic injection and its types
- Calibration and management software
- The electric motor in competition, and its auxiliary elements
- Management of power flows in power units
- Introduction to engine simulation

Reference software

- Excel, AVL Boost

Practical resources

- Bench testing of an engine

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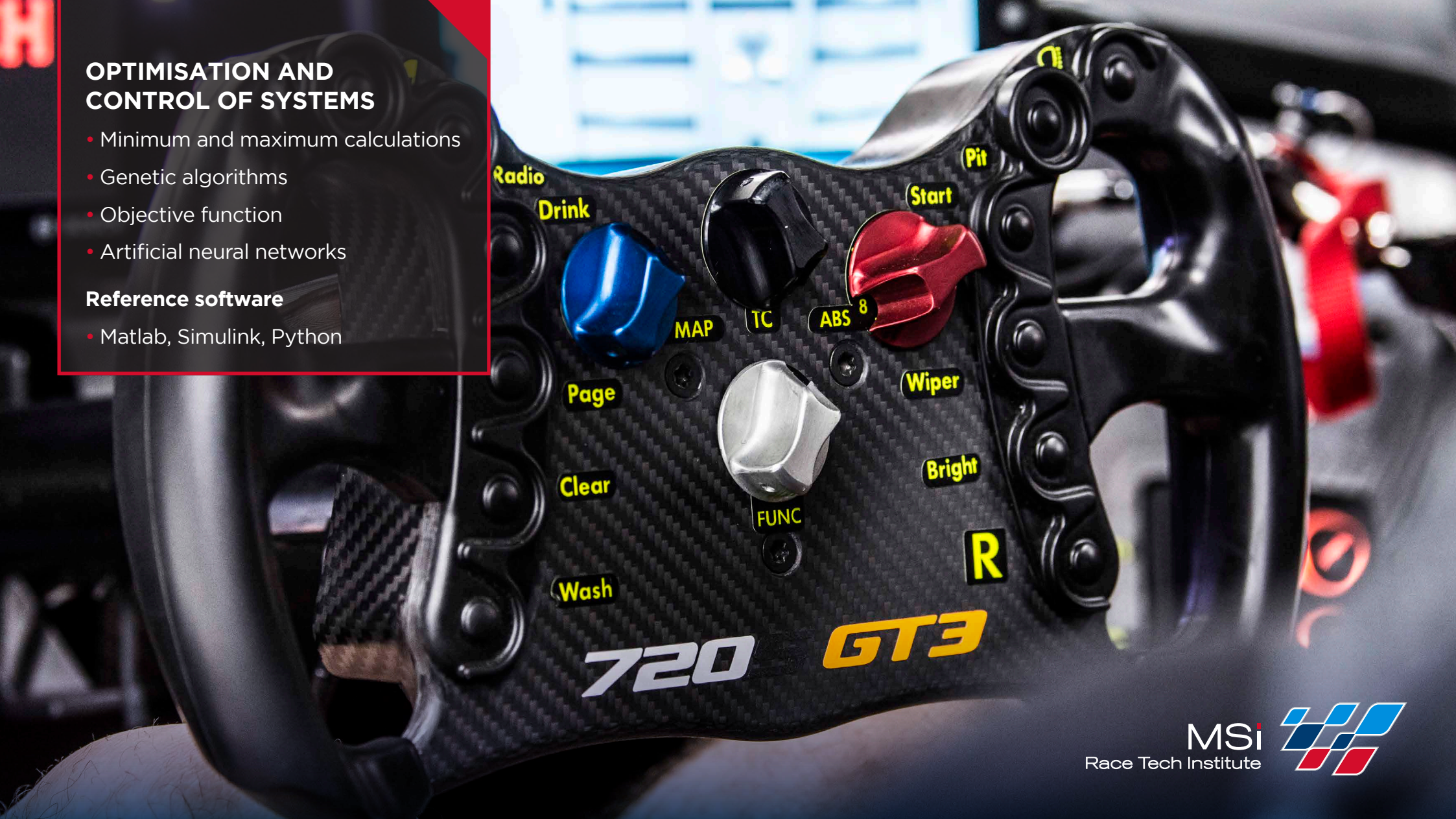
OPTIMISATION AND CONTROL OF SYSTEMS

- Minimum and maximum calculations
- Genetic algorithms
- Objective function
- Artificial neural networks

Reference software

- Matlab, Simulink, Python



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Second term - Second semester
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CFD

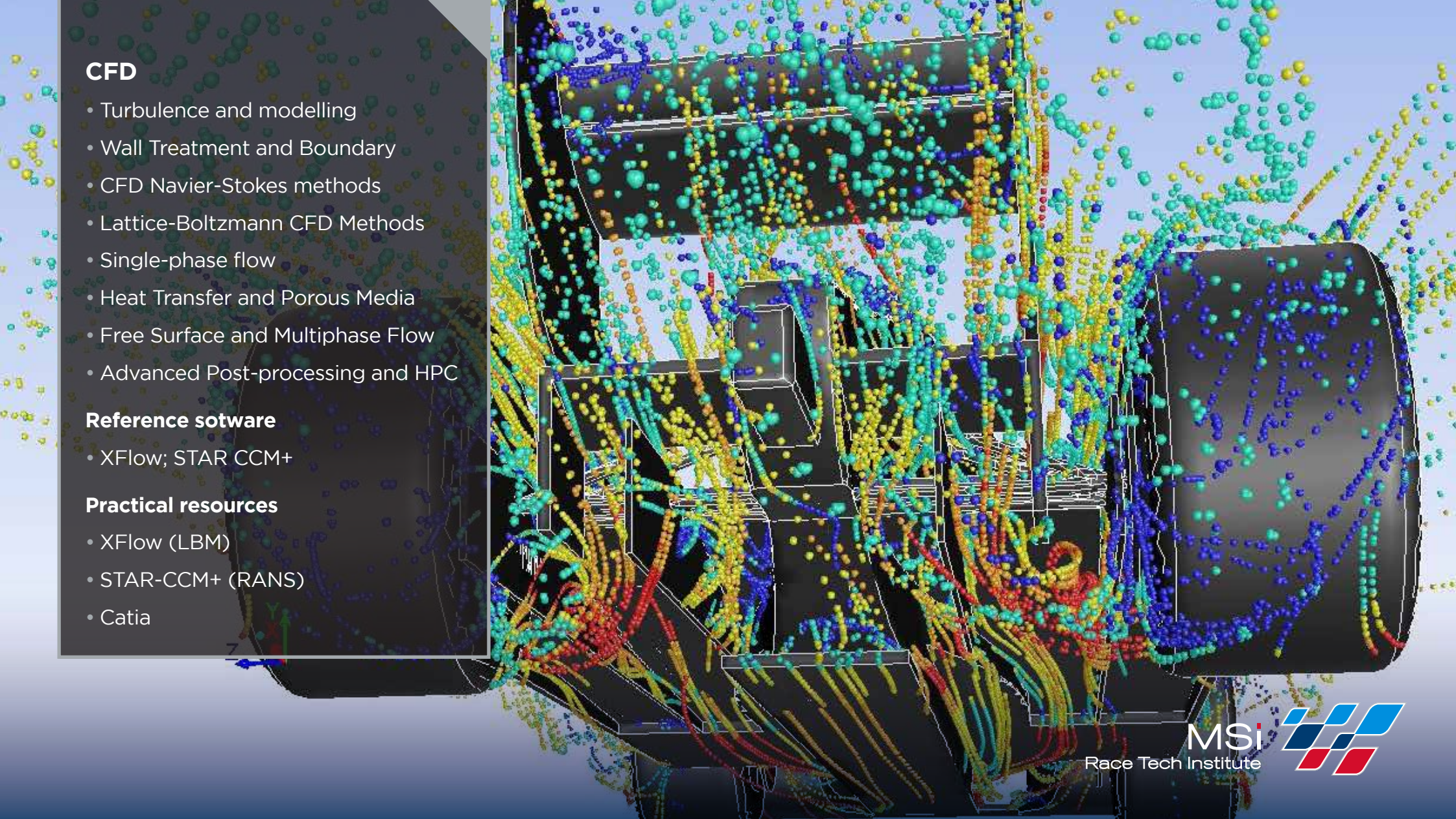
- Turbulence and modelling
- Wall Treatment and Boundary
- CFD Navier-Stokes methods
- Lattice-Boltzmann CFD Methods
- Single-phase flow
- Heat Transfer and Porous Media
- Free Surface and Multiphase Flow
- Advanced Post-processing and HPC

Reference sotware

- XFlow; STAR CCM+

Practical resources

- XFlow (LBM)
- STAR-CCM+ (RANS)
- Catia



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ELECTRIFICATION IN MOTORSPORT

- Electrification in motorsport
- The electric propulsion system
- The electric motor
- The inverter
- The battery
- The BMS
- Sizing of the electric propulsion system
- Race charge/discharge management
- Associated track engineering
- Practical exercises: Li-ion traction battery, electric motor, power electronics and battery in dyno, element D&M

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DATA ACQUISITION II

- Advanced uses of data acquisition in competition
- What, how, under what conditions and at what cost to measure?
- Vehicle performance and its assessment
- Driver performance and its assessment
- Reporting and evaluation. What is important and what is ancillary
- Data acquisition and telemetry as fundamental tools of the Technical Department
- On-track vs. on-site testing. Correlation

Reference software

- VSM, AIM, Bosch, Wintax, CTools, Motec

Practical resources

- In-room instrumentation
- Instrumented vehicle
- Acquired data
- Simulation

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STRUCTURAL DESIGN OF THE CHASSIS

- Introduction
- Methodology and organisation of the design project
- Requirements of a racing chassis chassis requirements
- Chassis types and applications

chassis types and applications

- Finite element structural analysis
- Modal analysis
- Correlation of results
- Re-engineering

Reference software

- Abaqus

Practical resources

- Computer room
- Metrology and testing

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MATERIALS AND MANUFACTURING

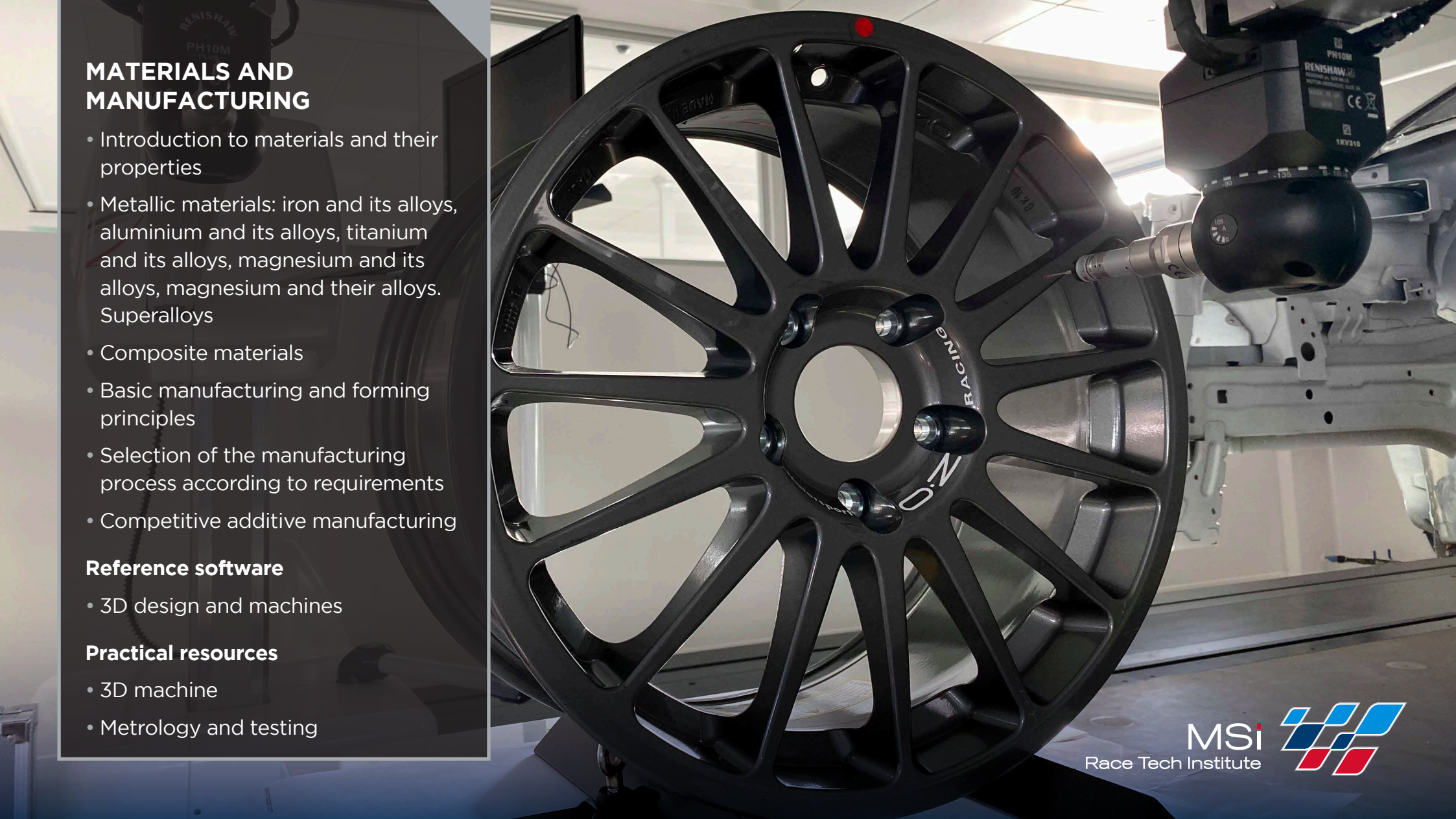
- Introduction to materials and their properties
- Metallic materials: iron and its alloys, aluminium and its alloys, titanium and its alloys, magnesium and its alloys, magnesium and their alloys. Superalloys
- Composite materials
- Basic manufacturing and forming principles
- Selection of the manufacturing process according to requirements
- Competitive additive manufacturing

Reference software

- 3D design and machines

Practical resources

- 3D machine
- Metrology and testing



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DYNAMIC SIMULATION

- Introduction to physical simulation models
- Characteristics and configurations of the main components influencing the dynamic characterisation of racing vehicles. Method of moments
- Influence of the main components and their characteristics on racing vehicle dynamics
- The driver and his model
- Simulation as a fundamental tool for the motorsport engineer

Reference software

- VSM

Practical resources

- Computer classroom
- Data from the different races of the racing team (various categories)

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MOTORSPORT PROJECT

Project to be developed and reported, in one or more of the following areas:

- Management or operation of the TMM team
- Design and/or testing of components on TMM racing cars
- Dynamic simulation
- 7 post-rig suspension test bench
- Testing, calibration and process optimisation
- Wind tunnel and CFD
- Development and testing of new composite manufacturing technologies
- Innovation projects and development of new technologies at MSi Innovation Hub
- Alternative power units
- AVL Racing Project
- Simulia Project - Dassault

Reference software

- Variables depending on the project

Practical resources

- Variables depending on the project

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TFM MOTORSPORT ENGINEERING

The students of the Master Motorsport Engineering carry out real end of master projects applied to the world of competition.

A recent example consisted of the creation of a T3, carrying out the complete project from scratch, starting from the concept, through design, manufacture and validation to the realisation of the assistance in its first race in Zuera in the Spanish Championship.

Areas worked on:

- **Concept**: Project Management, Regulatory and Policy Analysis, Reverse Engineering
- **Design**: CAD, CFD y CAE, Kinematic Studies
- **Manufacturing**: Composites, Metal structures (chassis), suspensions, wiring and electronics
- **Validation**: Dyno, Homologation, Private testing, Race assistance, Race support

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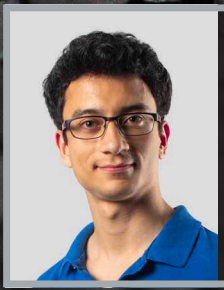
RECENT SUCCCES STORIES

Jose Manuel Galán

High Performance Powertrains Engineer at Mercedes AMG Petronas Formula One Team.

Santiago Vallecilla

Powetrains Design Engineer at Nissan Technical Center Europe.



Diego Gudiel

Rallyes engineer at Hyundai Motorsport.

Ignacio Arespacochaga

CAD design engineer at Managing Composites.

Andrés Segura

Track engineer at PHM Racing.

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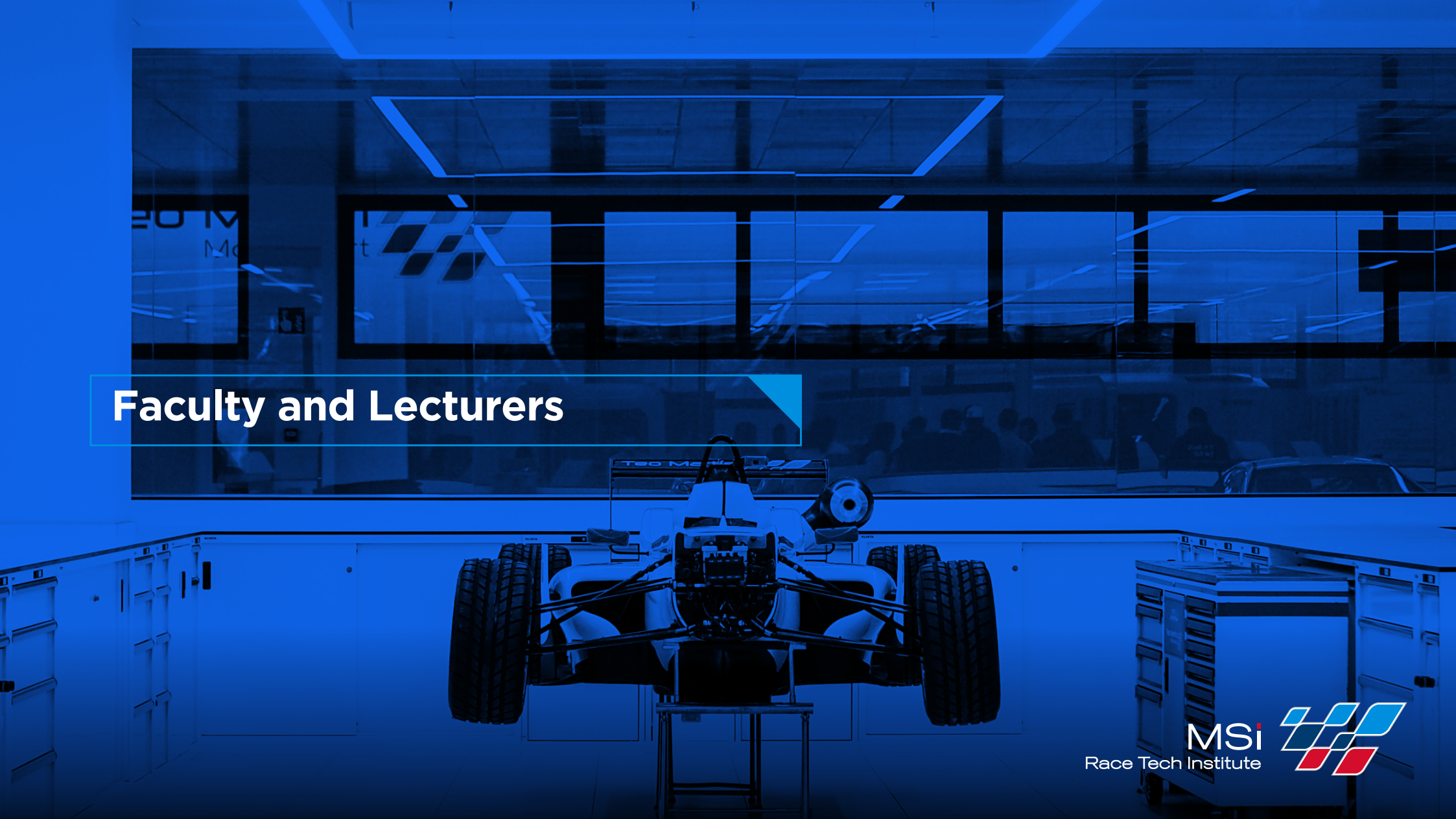
Faculty and Lecturers



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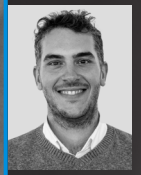
FACULTY

Álex Batán



Senior project engineer at Mclaren Automotive Ltd. Aeronautical engineer.

Justo Álvarez

Degree in Industrial Engineering, Universidad Pontificia de Comillas (ICAI). Master's Degree in Automotive Engineering, Universidad Politécnica de Madrid (INSIA).

Héctor Atienza

Technical responsible for various areas and technical and administrative management of motor racing at national and international level working under direct supervision. Technical Manager of the RFEdeA.

José Soler

Industrial Engineer from the University of Seville and Chartered Engineer from the Institution of Engineering and Technology (IET) in the United Kingdom. Founding partner of Talos Technology.

Fernando Álvarez

Polytechnic University of Madrid. Master in Electromechanical Engineering, Mechatronics. Technical Director at the RFdeA. Member of the FIA Regulations and Homologations Commission.

Francisco Gutiérrez

Graduate in Industrial Engineering and member of the Official College of Industrial Engineers of Madrid (2006). Master's Degree in Technical Specialisation in Motor Racing from Epsilon Euskadi in 2007. With experience in Formula 1.

Lluc Martí

Engineer by profession, entrepreneur by vocation. CEO and founder of Managing Composites. Composites manager in projects for Tesla and Koenigsegg.

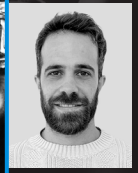
Santiago García O'Regan

Aeronautical Engineer, Universidad Politécnica de Madrid. MSc Motorsport Engineering at Oxford Brookes University (UK). Specialist R&D Applications Engineer. With experience in Formula 1.

María José Blanco

Industrial Engineer from the University of Seville. With experience in Formula 1.

José Viyeira

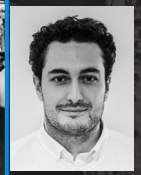


Aeronautical Technical Engineer. Master's degree in competition vehicle engineering. Project leader engineer at Automotiva.

Lluis Isasi

PhD in Engineering.

Eduardo Nicolás



Managing Composites.

Aitana López

Design Engineer. Managing Composites.

Adrián Villar

Aerodynamics Teacher

Laurent Barrera

Industrial Technical Engineer. Data, Performance & Systems Engineer for Aston Martin in GT3, Race Engineer for Mercedes AMG and Porsche in GT4.

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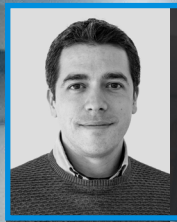
SPEAKERS



Jesús Muñiz

Technical Director of MSI Technical Center. Former head of hybridisation reliability at Renault Sport F1.

Álvaro Martínez de Tejada

Aeronautical engineer, focus on management, senior consultant. Master's degree in engineering and materials science, Masdar institute of science and technology, Abu Dhabi.

Hermenegildo Baylos

Technical Manager at Renault Competición. Operations Manager Movistar Racing Formula Team. Technical Director of RFEDA..

Teo Martín

CEO MSi.

Nacho Pérez

CEO Racing Import.

Julián Piedrafita

CEO Piedrafita Sport.

ZF Group

Hoffmann Group

Hypermill

AVL & AVL Racetech

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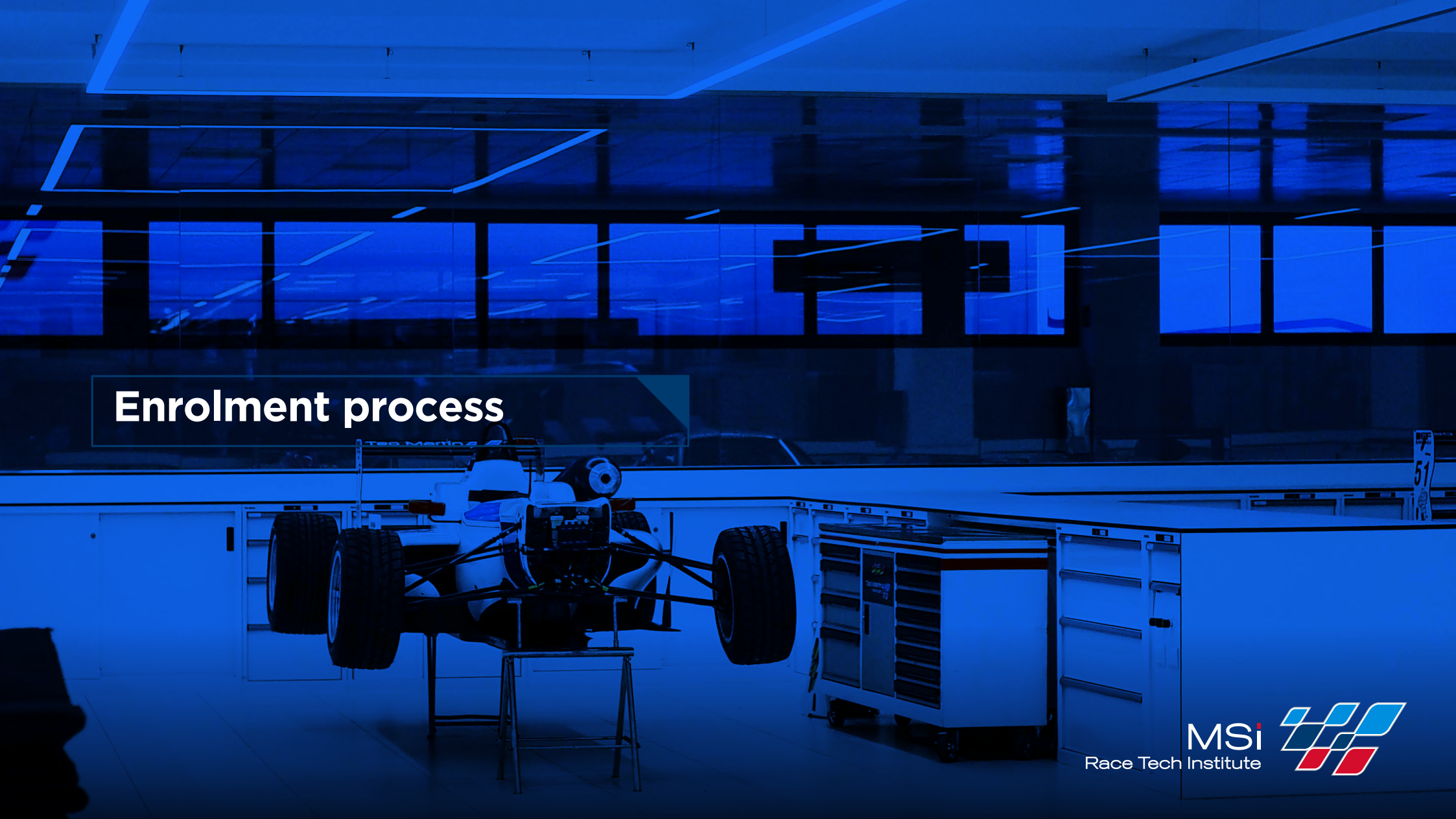
Enrolment process



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ENROLMENT PROCESS (1)

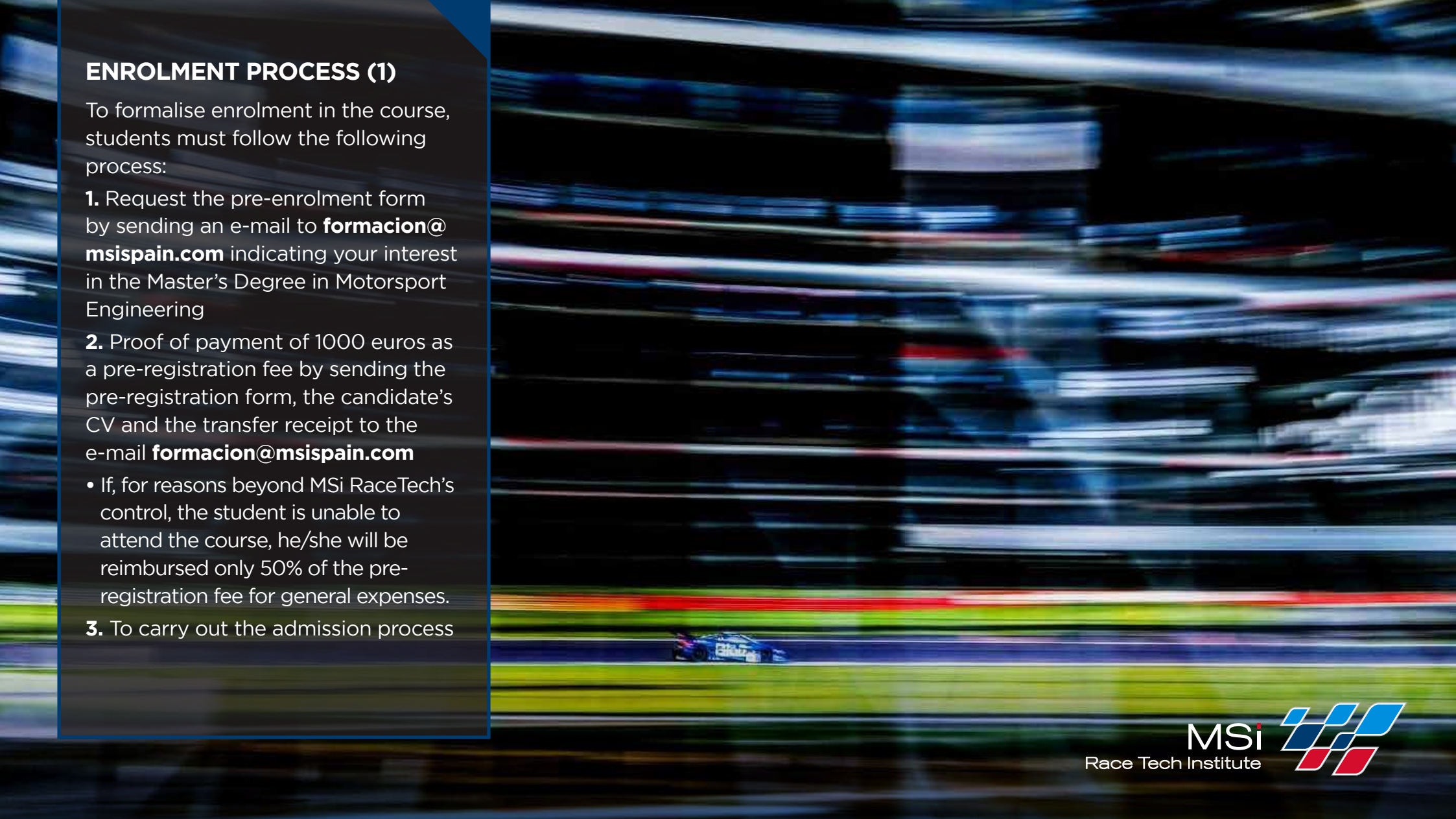
To formalise enrolment in the course, students must follow the following process:

1. Request the pre-enrolment form by sending an e-mail to **formacion@msispain.com** indicating your interest in the Master's Degree in Motorsport Engineering

2. Proof of payment of 1000 euros as a pre-registration fee by sending the pre-registration form, the candidate's CV and the transfer receipt to the e-mail **formacion@msispain.com**

- If, for reasons beyond MSi RaceTech's control, the student is unable to attend the course, he/she will be reimbursed only 50% of the pre-registration fee for general expenses.

3. To carry out the admission process



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ENROLMENT PROCESS FOR INTERNATIONAL STUDENTS (2)

4. Complete the enrolment process*

- **Motorsport Engineering Enrolment Fee**: 5,800 euros

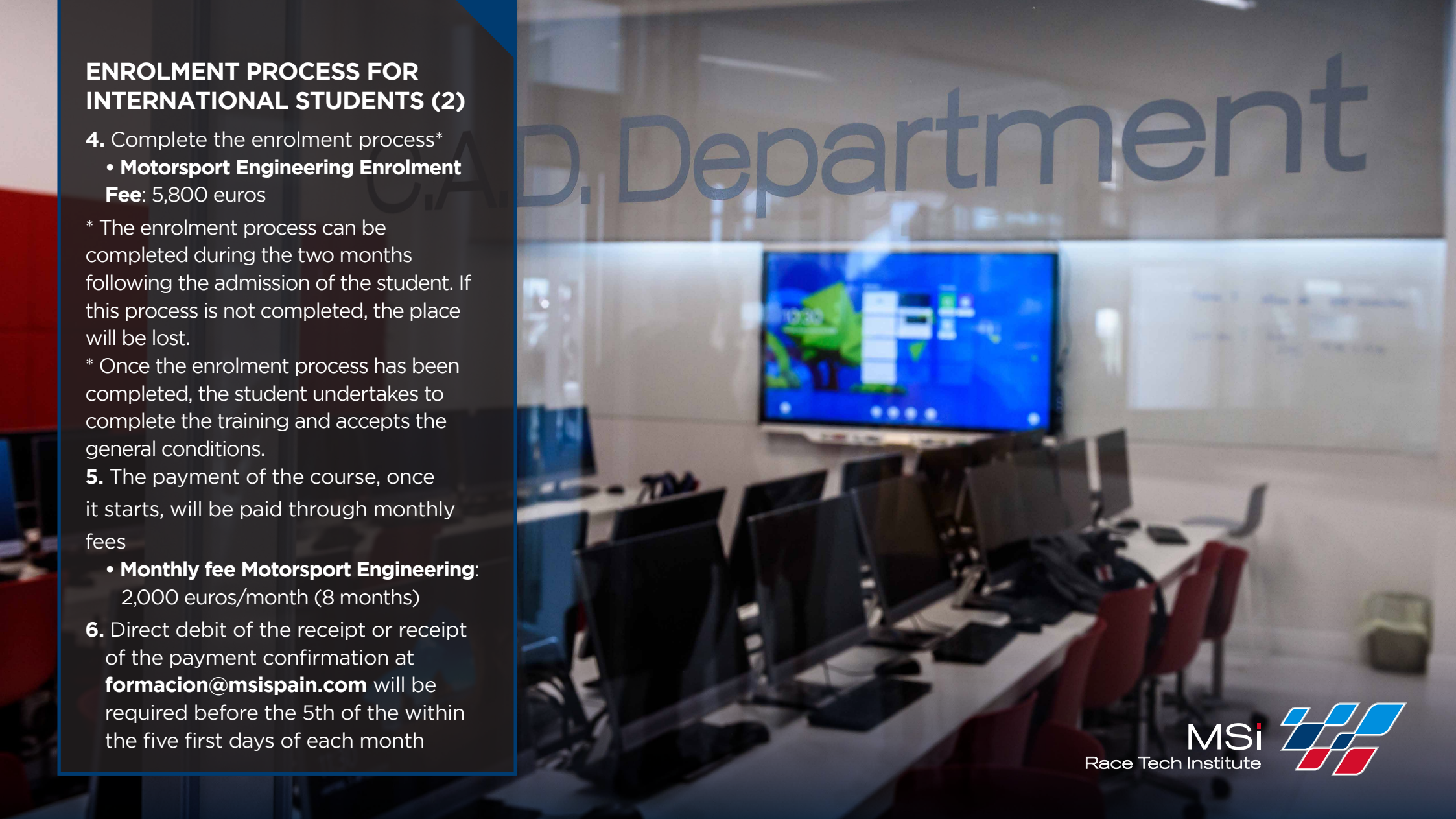
* The enrolment process can be completed during the two months following the admission of the student. If this process is not completed, the place will be lost.

* Once the enrolment process has been completed, the student undertakes to complete the training and accepts the general conditions.

5. The payment of the course, once it starts, will be paid through monthly fees

- **Monthly fee Motorsport Engineering**: 2,000 euros/month (8 months)

6. Direct debit of the receipt or receipt of the payment confirmation at **formacion@msispain.com** will be required before the 5th of the within the five first days of each month



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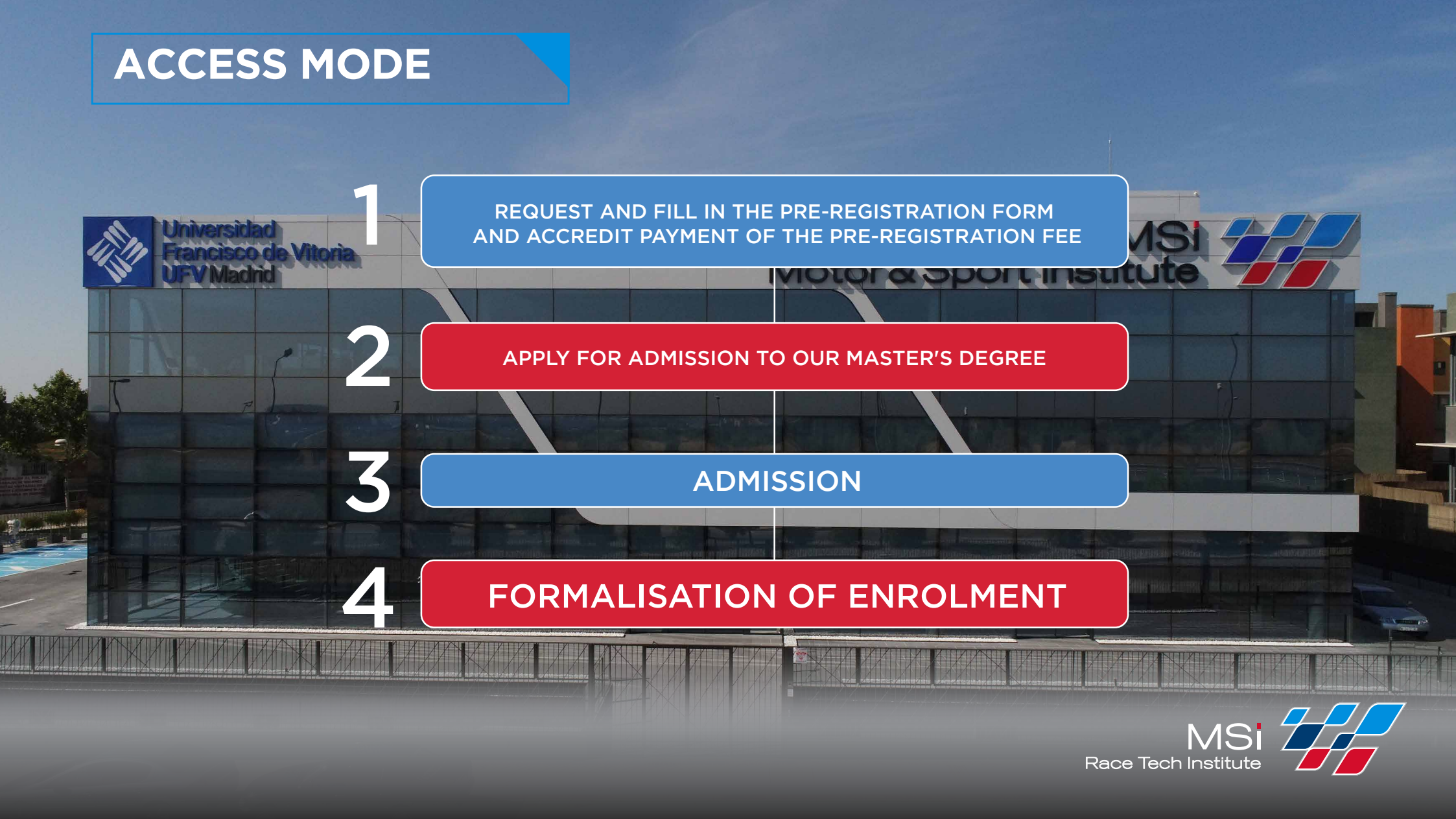
ACCESS MODE



1. REQUEST AND FILL IN THE PRE-REGISTRATION FORM AND ACCREDIT PAYMENT OF THE PRE-REGISTRATION FEE
2. APPLY FOR ADMISSION TO OUR MASTER'S DEGREE
3. ADMISSION
4. FORMALISATION OF ENROLMENT

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MOTORSPORT ENGINEERING

In collaboration with:

Universidad Francisco de Vitoria
UFV Madrid

MSi Motor Sport Institute

Main partners

Real Federación Española de Automovilismo

PHILIPS

JHK T-SHIRT

AVL RACETECH

DASSAULT SYSTEMES

PPG

EQA Organización Certificada ISO 9001

Technical partners

Beta

Hoffmann Group

innovalia METROLOGY

EQA Organización Certificada ISO 9001

MSi Race Tech Institute

CONTACT

Tel. 610 159 667
formacion@msispain.com
www.msispain.com

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In collaboration with:

Universidad
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This version of the dossier supersedes all previous versions.

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v4 Version - February 2024