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### ART. 1 - TYPOLOGY OF MASTER'S PROGRAMME

The University of Pavia has activated a first-level Master's course in "Race Engineering" at the Department of Industrial Engineering and Information for the 2021/2022 academic year. The course takes advantage of the educational, logistic and organizational collaboration of ASC S.r.l. (Quattroruote Automotive Safety Centre and Vairano circuit), Skydrive and ADM Motorsport.

**Edition:** III

**Disciplinary Area:** Industrial Engineering

### ART. 2 - EDUCATIONAL AIMS, PROFESSIONAL OPPORTUNITIES AND COURSE APPEAL

The aim of the Master's programme is to produce highly qualified professionals with a solid preparation in managing competition race cars. Specific competence will be gained by the students in the techniques for car set up in a virtual manner through CAE as well as through the possibility of experimenting on the track, during the entire duration of the programme, with a Formula 4 and auto GT car driven by a professional pilot. The learning environment is highly innovative and includes classroom lessons along with test sessions on the ASC's circuit of Quattroruote, during which students will have hands-on learning of the techniques and methodologies of Race Engineering activities (from race car management to radio communications to the psychological aspects in relations between the pilot and the team). All participants will follow an introductory course in advanced driving techniques specifically designed for the programme, a fundamental feature of which is the interaction with professional Race Engineers for the entire length of the programme.

The training programme for the Master's ends with targeted training on a VI-Grade CarRealTime compact static simulator and with a specific training module on the SkyDrive dynamic simulator at the Monza Speedway.

Career opportunities for graduates involve all the racing units and race teams in motor sports competitions in Europe and the world. More specifically, the competencies acquired from the Master's programme represent a key factor in permitting students to quickly and successfully become part of a racing team. At present this type of engineering professional, strongly requested by the market, is not associated with any specific academic programme.

The Level I Master's in "Race Engineering" is offered to international students who are young engineers with a passion for motor racing.

Affiliated with the programme are firms such as ASC, VI-grade, McLaren, Pirelli, CD Adapco/Siemens, Seat, Thyssen Presta, AudiSport, ZF-TRW, Ycom, Brembo, Lamborghini, Continental, Prema, ADM Motorsport, Team Lazarus, JAS Motorsport, Tatuus, Autotecnica Motori, Maserati, Alfa Romeo, Magneti Marelli, FCA, Abarth, Ferrari, Michigan Scientific, Michelin, Oreste Berta, PCB, Kistler, Danisi Engineering, Skydrive.

The current context of crisis in the automotive sector, also due to the pandemic in progress, can find a way to relaunch also thanks to the acquisition of highly trained human resources not only from a theoretical and methodological point of view but also on the most innovative design techniques and experimentation currently available and which constitute the main area of specialization of the Master's courses.

### **ART. 3 - MASTER'S DEGREE PROGRAMME**

The Master's course lasts one year (**1,500 total hours - 60 CFU**) and can be broken down into: lectures held at the University of Pavia (Faculty of Engineering and at Palazzo Vistarino), and the ASC – Quattroruote - Safe Driving Centre (Vairano di Vidigulfo, PV), practical training at ASC – Safe Driving Centre (Vairano di Vidigulfo, PV), technical visits to structures related to the course, final internship with partner companies, seminars, study activities, preparation and individual training.

**Lessons for the Master's course are expected to begin in October 2021.**

The institutional location of the Master is at the Faculty of Engineering where the lectures and computer exercises will be held. Seminars, meetings with companies and training activities with the use of a compact driving simulator will be held at Palazzo Vistarino, headquarter of the Alma Mater Ticinensis Foundation, which also hosts the Master in Design and Development of Vehicle Dynamics.

Lectures and seminars will be held by researchers from the University of Pavia, by researchers from other universities including University of Naples Federico II, University of Pisa, Politecnico di Milano, Sheffield Hallam University and by experts from companies such as VI-Grade, Pirelli, MegaRide, Danisi Engineering, McLaren, CD Adapco/Siemens, MSC Adams, Ycom, Brembo, Porsche, AudiSport, Jas Motorspor, Tatuus, Autotecnica Motori, SkyDrive, Regolo Studio. There will be technical visits to the Driving Simulator Center of Danisi Engineering, the Pirelli laboratories and the Pirelli circuit in Vizzola Ticino.

In the new edition of the Master's course, some unique and very innovative seminars and workshop will be offered:

- 1) Experimental seminar on vehicle dynamics designed in collaboration with FCA;
- 2) Seminar on experimental aerodynamics;
- 3) Seminar on vehicle instrumentation.

Student attendance at the various training activities is mandatory for at least 75% of the total number of hours.

The training period cannot be suspended.

Transfers to similar Master's courses at other universities are not permitted.

The Master's course, which mainly addresses an international market, may be conducted in English depending on the number and nationality of enrolled students. Some lessons may be online.

The teaching Modules are organized as follows

Module	SSD	Contents	Number of lecture - hours	Hours of training/laboratory	Hours individual study	Total number of hours	CFU
<b>I) Integrated teaching: Vehicle Dynamics Design</b>							
1) Vehicle Dynamics Fundamental	ING-IND/13, ING-IND/14, ING-IND/15, ING-IND/06	Fundamentals of vehicle dynamics. Aerodynamics. Tires.	60	0	90	150	6
2) Virtual Dynamics Design and Simulation	ING-IND/13	Multibody analyses introduction. Adams Car. Real-time analyses. From real-time virtual Dynamics to Dynamic driving simulator.	8	32	60	100	4
3) Driving Simulator training	ING-IND/13	Experimental training with static driving simulator.	8	32	60	100	4
<b>II) Integrated teaching: Propulsion and Control</b>							
4) Propulsion: ICE, Hybrid, Electric	ING-IND/08, ING-IND/32	Internal combustion engines. Principal characteristics and features. Architecture. Consumption. Electric Motors. Generators. Accumulation Systems. Power supply. Recharging. Connection Systems. Wiring. Protocols. Diagnostics.	30	0	45	75	3
5) Vehicle Dynamics Control	ING-INF/04	Introduction to the main regulators. Braking control systems, stability, traction, and vector control. Classical problems, Vehicle dynamic control, Measurements, sensors and observers.	10	0	15	25	1
<b>III) Integrated teaching: Vehicle experimentation and pilot / vehicle interaction</b>							

6) Advanced Driving Course	ING-IND/13, ING-IND/34, ING-INF/05, ING-INF/06, BIO/09	Driving experience and training.	2	8	15	25	1
7) Skydrive Dynamic Simulator	ING-IND/13	Simulation of race track activities propaedeutic to the final examination.	10	0	15	25	1
8) Race Track Management and Vehicle Set Up for Performance	ING-IND/13, ING-IND/14, ING-IND/04	Basic knowledge and tools evaluation. Manuals and regulations. Methodology for an effective race car setting. Analyses of Track tests.	18	72	135	225	9
9) Race Engineering Science	ING-IND/13, ING-INF/05, ING-INF/06, BIO/09	Every day task and performance evaluation. Development of a methodology to 'read driver's mind'. Team building.	10	0	15	25	1
10) Data acquisition	ING-IND/12, ING-IND/13	Data acquisition systems. Data analysis. Transducers and sensors. Experimental training.	8	32	60	100	4
11) Biomechanics: Driver/Vehicle interaction	ING-IND/13, ING-IND/34, ING-INF/05, ING-INF/06, BIO/09	Methodology and tools for the evaluation of driver/vehicle interaction. Comfort and features. Integrated system of measurement and monitoring. Driver physiology. Psychophysical stress and physiological adaptation. Environmental factors.	20	0	30	50	2
Partial total of hours/CFU			184	176	540	900	36
Internship-training-seminars						550	22
Final exam						50	2
<b>Total n° of hours/CFU</b>						<b>1500</b>	<b>60</b>

#### ART. 4 - IN-COURSE ASSESSMENTS

Learning is assessed during the course by the teachers giving the lessons and practicals, leading the seminars and the practical tests, and supervising the students' work. There is no specific mark for course examinations and the final exam.

#### ART. 5 - FINAL EXAMINATION AND ACHIEVEMENT OF THE QUALIFICATION

The final exam will entails the presentation and defence of a written thesis regarding the traineeship activity undertaken by the candidate.

At the end of the Master's course, participants who have completed all of the activities and fulfilled their obligations and passed the final exam, will be awarded a Level I Master's degree in "**Race Engineering**".

#### ART. 6 - FACULTY

Teaching will be carried out by faculty from the University of Pavia and from other universities as well as by highly-qualified outside experts.

#### ART. 7 - ADMISSION REQUIREMENTS

The Master's programme is aimed at students who possess:

1. **a degree in accordance with DD.MM. (Ministerial Decrees) 509/99 and 270/2004, pertaining to the class of degrees in:**

Industrial engineering – 10; L-9  
with particular reference to Degree programmes in mechanical, aerospace, electrical, energy, mechatronics, industrial, materials, and automotive Engineering.

2. **a second-cycle degree in accordance with DD.MM. 509/99 and 270/04 pertaining to the class of degrees in:**

Mechanical engineering – 36/S; LM-33	Energy and nuclear engineering – 33/S; LM-30
Aerospace and astronautics engineering – 25/S; LM-20	Science and the Engineering of Materials – 61/S; LM-53
Electrical engineering – 31/S; LM-28	Automation engineering – 29/S; LM-25

3. **a degree in accordance with the previous regulations in:**

Mechanical engineering	Electrical engineering
Industrial engineering	Nuclear engineer
Aerospace engineering	Materials engineering

In the event of admissions applications from foreign students, the Academic Board will evaluate the equivalence of the foreign degree and the Italian degree required for admission to the Master's programme.

The maximum number of enrolments is **14**.

The minimum number necessary for activation of the course is n° **7** enrolments.

The Academic Board may also assess whether the conditions exist for extending the aforementioned number of places.

If the number of applicants exceeds the maximum number called for, a Committee made up of the Coordinator and two members of the Master's Academic Board will determine a ranking based on merit (expressed in hundredths), which takes into account the following evaluation criteria:

1. Up to a maximum of **30 points** for the **graduation mark** as follows:
  - 10 points for a graduation mark < than 100/110;
  - 11-21 points for graduation marks from 100/110 to 110/110 (for a mark of 100 points, 11 points are awarded, and the score is increased by one point for every additional mark achieved);
  - 30 points for marks of 110/110 'cum laude'.
2. Up to a maximum of **70 points** for **an interview** in Italian or English, whose aim is to evaluate the competencies, capacities and motivations of the candidate regarding the content and specific objectives of the Master's programme. Special recognition will be given for any work experience in the automotive sector – such as scientific publications related to the topic area of the Master's – and for knowledge of specific development software such as Matlab, Simulink, Adams, etc.  
**Students pass the interview with a score of at least 42/70.**

In case of a tie in the rankings, the younger candidate will be given preference.

Should one or more candidates who are admitted to the course renounce their place, such places shall be made available to those candidates whose names appear in the final classification, until all places are assigned.

#### **ART. 8 - DEADLINE FOR ADMISSION APPLICATION**

Candidates must send off their application for admission, according to the procedures established by the Call for Applications, **from 7 June 2021 until the deadline of 25 September 2021.**

#### **ART. 9 - ATTACHMENTS TO THE APPLICATION**

Candidates must attach the scan of the following documents during the online registration procedure for the Master's course:

- 1) **application form** (the form to be used is on page 8);
- 2) front-rear of the **personal identification document** uploaded during registration;
- 3) **self-declaration** of the exams taken during the academic career (only for those who have obtained the academic qualification in Italy);
- 4) in case of a qualification obtained abroad:
  - a. **Academic qualification** required for admission in Italian or English;
  - b. **"Declaration of value"** issued by the Italian diplomatic representative situated in the country to which the institution that issued the qualification belongs;
  - c. **Degree certificate** in Italian or English with the exams taken and the relative marks (transcript of records);
  - d. As an **alternative** to the "Declaration of value", the University recognizes the following documents as valid:
    - o **Diploma supplement** (if the foreign qualification is issued by an European University);
    - o **Certificate of comparability** issued by [Naric](#) / [Cimea](#);

- 5) **letter of reference;**
- 6) **motivational letter;**
- 7) **curriculum vitae** highlighting any professional experience in work areas pertaining to the Master's course.

Please note that as indicated in Article 3 of the General Call for admissions, **candidates holding a qualification obtained abroad** must, **before the enrolment deadline or at least by 11 January 2022**, deliver **the original** of the following documentation, **together with a declaration of legal validity from the Italian diplomatic representative situated in the state where the qualification was issued and handed in**, to Servizio Post Laurea - Ufficio Master (via Ferrata, 5 - 27100 Pavia).

**The above requisites must already be in the candidate's possession by the deadline for the submission of the application for admission.**

#### **ART. 10 - UNIVERSITY TUITION AND FEES**

##### **Enrolment:**

Those enrolled in the Master's course must pay the sum of **€ 15,000.00** inclusive of: € 16.00 (stamp duty tax) and € 142.00 (administrative fees) for the 2021/2022 academic year.

This amount must be paid in **two installments**:

- 1° installment of € 10,000.00 to be paid upon enrolment;
- 2° installment of € 5,000.00 to be paid by **11 January 2022**.

##### **Final exam:**

To be admitted to the final exam, candidates must submit a specific application form along with the payment of **€ 116.00<sup>1</sup>** as a fee for the issuance of the Master's diploma (including n° 2 stamp duty tax paid virtually: one for the parchment and one for the application).

#### **ART. 11 - WEB SITE AND ORGANIZATIONAL SECRETARY**

Any communication to candidates will be announced by means of publication on the following **website**: <http://raceengineering.unipv.eu/>

**For information on the organization of the course contact:**

##### **Organizational Secretary**

*Department of Industrial Engineering and Information*

Prof. Carlo E. Rottenbacher, Ms. Laura Pecoraro

Tel. 0382/6992200

Fax 0382/6992228

E-mail: [info.raceeng@unipv.it](mailto:info.raceeng@unipv.it)

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<sup>1</sup> Please note that the amount may be updated by resolution of the Board of Directors after the publication of this Notice.

**APPLICATION FORM  
TO I LEVEL MASTER: "RACE ENGINEERING"**

**(the form, duly filled in, must be uploaded in the on-line procedure of admission to the Master course as per issue n°9 of the annex to the relevant call for admissions)**

The undersigned (FORENAME, SURNAME) \_\_\_\_\_

Date of birth \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

State of residence \_\_\_\_\_ Permanent address \_\_\_\_\_

\_\_\_\_\_ E-mail \_\_\_\_\_

**APPLIES  
for admission to the aforementioned Master course**

**and ATTACHES**

to the formal admission form the following papers **to be submitted mandatorily for the application evaluation:**

1. front-back of the personal ID document/passport uploaded during the on-line registration procedure;
2. self-declaration of the passed exams during the academic career reading relevant marks (only for whom have an Italian academic title);
3. In addition, whoever achieved a foreign academic title must attach:
  - ✓ Academic qualification required for admission in Italian or English;
  - ✓ "Declaration of value" issued by the Italian Embassy/Consulate in the State where the academic title had been released (only if already available);
  - ✓ Degree certificate in Italian or English with the taken exams and the relative marks (transcript of records);
  - ✓ As an alternative to the "Declaration of value on site", the University recognizes the following documents as valid:
    - Diploma supplement (if the admission qualification to the Master is issued by a European University);
    - Certificate of comparability issued by Naric / Cimea;
4. reference letter;
5. motivational letter;
6. CV listing also professional experiences in working environments pertaining the above Master, if any.

Date, \_\_\_\_\_

Signature \_\_\_\_\_