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Art. 1 - Tipology of Master's programme

The University of Pavia has activated a first-level Master's course in "Race Engineering" at the DEPARTMENT OF ELECTRICAL, COMPUTER AND BIOMEDICAL ENGINEERING for the 2022/2023 academic year. The course takes advantage of the educational, logistic and organizational collaboration of ASC S.r.l. (Quattroruote Automotive Safety Centre).

Edition: 4

Disciplinary area: SCIENTIFIC-TECNOLOGICAL AREA

Art. 2 - Educational aims, professional opportunities and course appeal

The Master aims to train 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 VI-Grade CarRealTime, MSC Adams and CFD software and with a specific training module on the SkyDrive dynamic simulator at the Monza Speedway.**

Career opportunitites 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.

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, Corbetta Racing, PetriCorse, Imperiale Racing.

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'd degree programme

The Master's course lasts **ONE YEAR** (a total of 1500 hours and 60 CFU) and is divided into: lectures at the University of Pavia (Faculty of Engineering and in the Vistarino building) and ASC - Safe Driving Center (Vairano di Vidigulfo, PV) practical exercises at ASC - Centro di Guida Sicura (Vairano di Vidigulfo, PV) and Monza circuit, technical visits to course facilities, final internship at partner companies, seminars, study activities, preparation and individual training.

The start of the Master's lessons is expected in November 2022.

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

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, University of Padova, Stanford 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 Motorpsort, Tatuus, Autotecnica Motori, SkyDrive, Regolo Studio, Haas F1 team.

There will be technical visits to the *Driving Simulator Center* of Danisi Engineering, the CSI center, the Pirelli laboratories and the Pirelli circuit in Vizzola Ticino.

Students will be offered some very innovative seminars and workshops, such as:

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

Each individual teaching credit corresponds to 25 hours that will be assigned to the activities of lectures, practical exercises, group work, seminars, study and research activities for the writing of the thesis and individual preparation. The hours will be distributed according to the following predefinite distributions:

Lectures Hours	10
Study Hours	15

or

Lectures Hours	2
Study Hours	15
Exercises, practical activities Hours	8

The Master's course, mainly addressing an international target, based on the number and nationality of students enrolled, can be delivered in English. Some lessons can be delivered online.

The Teaching Modules are organized as follows:

Module	Year	SSD	Language	L(h)	STD(h)	DAD(h)	EX(h)	Tot(h)	CFU
Design of the Vehicle Dynamics	I								
1) Vehicle Dynamics Fundamental		ING-IND/13 MECCANICA APPLICATA ALLE MACCHINE	English	60	90	0	0	150	6
		Contents: <ul style="list-style-type: none"> • Fundamentals of vehicle dynamics • Aerodynamics • Tires. 							
2) Virtual Dynamics Design and Simulation		ING-IND/13 MECCANICA APPLICATA ALLE MACCHINE	English	8	60	0	32	100	4
		Contents: <ul style="list-style-type: none"> • Multibody analyses introduction • Adams Car • Real-time analyses • From real-time virtual Dynamics to Dynamic driving simulator. 							
3) Driving Simulator training		ING-IND/13 MECCANICA APPLICATA ALLE MACCHINE	English	8	60	0	32	100	4
		Contents: <ul style="list-style-type: none"> • Experimental training with static driving simulator. 							
Propulsion and Control	I								
4a) Propulsion: ICE		ING-IND/08 MACCHINE A FLUIDO	English	10	15	0	0	25	I
		Contents: <ul style="list-style-type: none"> • Internal combustion engines • Principal characteristics and features • Architecture • Consumption. 							
4b) Propulsion: Hybrid, Electric		ING-IND/32 CONVERTITORI, MACCHINE E AZIONAMENTI ELETTRICI	English	10	15	0	0	25	I
		Contents: <ul style="list-style-type: none"> • Electric Motors • Generators • Accumulation Systems • Power supply • Recharging • Connection Systems • Wiring • Protocols • Diagnostics. 							
4c) Propulsion: Materials and Structural Resistance		ICAR/08 SCIENZA DELLE COSTRUZIONI	English	10	15	0	0	25	I
		Contents: <ul style="list-style-type: none"> • Ottimizzazione topologica • Analisi agli elementi finiti. 							

5) Vehicle Dynamics Control		ING-INF/04 AUTOMATICA	English	10	15	0	0	25	1	
		Contents: <ul style="list-style-type: none"> • Introduction to the main regulators • Braking control systems, stability, traction, and vector control • Classical problems, Vehicle dynamic control, Measurements, sensors and observers. 								
Vehicle Testing and Pilot/Vehicle Interaction	I									
6) Advanced Driving Course		ING-IND/13 MECCANICA APPLICATA ALLE MACCHINE	English	2	15	0	8	25	1	
		Contents: <ul style="list-style-type: none"> • Driving experience and training. 								
7) Skydrive Dynamic Simulator		ING-IND/13 MECCANICA APPLICATA ALLE MACCHINE	English	10	15	0	0	25	1	
		Contents: <ul style="list-style-type: none"> • Simulation of race track activities propaedeutic to the final examination. 								
8) Race Track Management and Vehicle Set Up for Performance		ING-IND/13 MECCANICA APPLICATA ALLE MACCHINE	English	18	135	0	72	225	9	
		Contents: <ul style="list-style-type: none"> • Basic knowledge and tools evaluation • Manuals and regulations • Methodology for an effective racing car setting • Analyses of Track tests. 								
9) Race Engineering Science		ING-IND/13 MECCANICA APPLICATA ALLE MACCHINE	English	10	15	0	0	25	1	
		Contents: <ul style="list-style-type: none"> • Every day task and performance evaluation. • Development of a methodology to 'read driver's mind' • Team building. 								
10) Data acquisition		ING-IND/12 MISURE MECCANICHE E TERMICHE	English	8	60	0	32	100	4	
		Contents: <ul style="list-style-type: none"> • Data acquisition systems • Data analysis • Transducers and sensors • Experimental training. 								
11) Biomechanics: Driver/Vehicle interaction		ING-IND/34 BIOINGEGNERIA INDUSTRIALE	English	20	30	0	0	50	2	
		Contents: <ul style="list-style-type: none"> • 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. 								
								PARTIAL	900	36
Internship/Stage		English						550	22	
Final Exam								50	2	
								TOTAL	1500	60
L Lectures; STD Study; DAD Online lessons; EX Exercises, practical activities.										

Students attendance of the various training activities is compulsory for at least 75% of the total number of hours. The training period may not be suspended.

Transfers to similar Master's degrees at other universities are not allowed.

Art. 4 - In-course assessments

Learning is assessed during the course, by the teachers who hold the lessons and exercises, carry out the seminars and practical tests and follow the work of the students. 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 consist in the presentation and discussion of a written thesis on the internship carried out by the students.

At the end of the Master, participants who have carried out all the activities and fulfilled the obligations, upon passing the finale exam will be awarded the Diploma of University Master of FIRST level 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 a degree in accordance with DD.MM. (Ministerial decrees) 509/99 and 270/04:

- (2009) L-9 | Class of degrees in Industrial engineering

Degree in accordance with the previous regulations

- LT | 10 | Class of degrees in Industrial engineering

Withing the above degree classes, the following qualifications will be preferential:

- Mechanical engineering;
- Electrical engineering;
- Industrial engineering;
- Nuclear engineering;
- Aerospace engineering;
- Materials engineering.

Moreover the following academic titles belonging to classes of degrees in accordance with DD.MM. 509/99 and 270/04, will be evaluated:

- Aerospace and Aeronautical engineering - 25/S, LM-20;
- Automation engineering - 29/S, LM-25;
- Electrical engineering - 31/S, LM-28;

- Energy and nuclear engineering - 33/S, LM-30;
- Mechanical engineering - 36/S, LM-33;
- Material sciences and engineering - 61/S, LM-53.

In case of application for admission by students with an academic degree obtained abroad, the Academic Board will evaluate the equivalence of the qualification with an Italian qualification suitable for admission to the Master's degree.

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

The **minimum number** of participants to activate the course is **7**.

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. The interview is considered passed 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. In the event of the resignation of one or more candidates, the available places will be made available again according to the ranking of merit, fino to exhaustion of the places themselves.

Art. 8 - Deadline for admission application

Applicants must submit their application for admission in accordance with the procedures, set out in the Call for Admission, **from 24 June 2022 and by the deadline of 21 September 2022**.

Art. 9 - Attachments to the online application

Candidates must attach, during the online application procedure to the Master, the scan of the following documentation:

- 1) **application form** (the form to be used is on page 8);
- 2) front-rear of the **personal identification document** inserted during registration;
- 3) **self-declaration** of the passed exams during the academic career reading relevant marks (only for whom have an Italian academic title);
- 4) in the case of a foreign academic title:
 - a) **Academic qualification** required for admission in Italian or English;
 - b) "**Declaration of value**" issued by the Italian Embassy/Consulate in the State where the academic title had been released (only if already available);

- c) **Degree certificate** in Italian or English with the taken exams and the relative marks (transcript of records);
- d) 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](#);
- 5) **reference letter**;
- 6) **motivational letter**;
- 7) **curriculum vitae** listing also professional experiences in working environments pertaining the above Master, if any.

Please note that as indicated in Article 3 of the Call for Admission, applicants holding a qualification obtained abroad **must deliver, before the enrolment deadline or at least by 11 January 2023**, the original versions of the required and uploaded documentation together with a declaration of legal validity by the Italian Embassy/Consulate in the State where the academic title had been released, to Ufficio Master - Servizio Post Laurea - via Ferrata 5, 27100 Pavia.

The admission requirements must be met 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 2023**.

Final exam:

To be admitted to the final exam, candidates must submit a **specific application form** along with the payment of **€ 116.00¹** 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

The **Organizational Secretary** will be located at:

Dipartimento di Ingegneria Industriale dell'Informazione

Via A. Ferrata, 5 - 27100 Pavia (PV)

T: 0382/69.92.201

E: info.raceeng@unipv.it

The reference contacts are: Prof. Carlo E. Rottenbacher - Sig.ra Laura Pecoraro

The website of the secretary is:

<http://raceengineering.unipv.it>

¹ 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:
 - a) Academic qualification required for admission in Italian or English;
 - b) "Declaration of value" issued by the Italian Embassy/Consulate in the State where the academic title had been released (only if already available);
 - c) Degree certificate in Italian or English with the taken exams and the relative marks (transcript of records);
 - d) 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