

# INFO



Universidad  
Politécnica  
de Cartagena

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Internacional

Special Newsletter  
Competition  
Teams





# Ready to compete



Their natural habitat is the asphalt of circuits. Their environment is the lab. The classroom is their first assembly plant. These are the learning settings for students of the Technical University of Cartagena who are members of any of the various racing teams.

Their philosophy, goals and know-how accurately represent the UPCT model. Innovation, applied research, acceptance of responsibilities, team work, confrontation with real problems and partnership with the business world. The UPCT motor race teams put these ideas into practice by developing many different kinds of vehicles that take part in international competitions, where our students must show their abilities as engineers, manufacturers, mechanics, designers, entrepreneurs, and even as pilots against students from other universities.

Dozens of students from the UPCT's Industrial Engineering schools, but also from Telecommunications, Naval Engineering, Business Administration and Tourism are involved in these teams, constantly giving their best. "It requires a great deal of work, but we gain a kind of experience and knowledge which textbooks cannot provide. And when you hear the engine and see your vehicle rolling for the first time, the reward is huge", sums up Daniel Albaladejo, one of the students responsible for the MotoUPCT team.

Participating in the design, manufacturing and fine-tuning of vehicles "provides us with an ideal practical training to enter the labor market. We organize ourselves as if we were a company, taking responsibilities and confronting problems. It is a simulation of real life", adds Luis Oliver, team manager of the UPCT Solar Team

## Participation in these teams gives students «an ideal training to enter the labor market»

The search for funding and partnerships to pay for materials and services offers students "the opportunity to get in touch with companies and suppliers", pinpoints Albaladejo. An excellent supporting evidence for such employability bonuses are the ten members of the UPCT Racing Team who have found a job immediately after finishing their studies, or even before doing so.

### Three teams

The UPCT Racing Team is the largest one, which has enabled them to participate in two very different competitions: Formula Student, a single-seater car competition, and the SmartMoto Cha-

llenge, which is a race for smart electric motorcycles. The team is currently in the design phase of the vehicle that will be entered for next year's international Formula Student series, a race in which the manufacturing of electric speed-cars is gaining more and more importance.

The UPCT Solar team, coordinated by professor Antonio Guerrero, is in charge of developing prototypes of solar vehicles with highest energy consumption efficiency. Last spring they raced in Rotterdam, alongside the world's best universities. With a revamped team, they are already working towards new challenges.

The MotoUPCT team, coordinated by Horacio Sánchez, is also getting ready to enter the Motostudent competition in October. As a matter of fact, the third motorcycle built by the team is being soldered at Navantia Industries.





# 6 years stepping on the gas pedal

Founded in 2008, the UPCT Racing Team has achieved success in Spain and abroad entering its prototypes in different inter-university competitions such as Formula Student. Just a look at their record of production and development and one can tell this is the largest group of Engineering students designing motor vehicles.

The team consists of some twenty students from different branches of Engineering, mainly Industrial Engineering, but also from Mechanical, Electronics, Electrical, Industrial Technology and Marine Engineering. They are monitored by professors Patricio Franco, from the Materials and Construction Department, and Miguel Lucas, from the Department of Mechanical Engineering.

In the last edition of the Formula Student races, the UPCT Racing Team was second among Spanish universities. Besides, the team took part in the SmartMoto Challenge, an electric scooter competition held in Barcelona.

The team is currently undergoing a phase of revamping, with the replacement of up to







**From the garage to success.**

1. Members of the team testing their racing vehicle at the circuit in Montmeló.
2. Garage work in progress.
3. Presentation of the economic project of the UPCT's Smart Moto.

**At the last Formula Student competition, the UPCT Racing Team was second among the university teams**

98% of its members. "For new students, these are learning opportunities that are coming up as we freshen up the team with new ideas. We have introduced a system where veteran employees share their experiences and ensure the survival of the team in later years", explains Daniel Gomariz, Chief Engineer of the team.

The UPCT Racing Team is currently working on their new racing car, which presents the novelty of being electric. A vehicle has already been conceived and designed and will now be shaped through a rigorous manufacturing process, which is fore-

seeably going to be expensive, but encouraging and exciting at the same time. "We hope to start manufacturing without neglecting lectures, studying at night. We are becoming an automobile manufacturing plant while others enjoy their weekends and their families. It is an incredibly demanding and tiring job, but our passionate efforts will be compensated by the satisfaction of achieving our goal", acknowledges Daniel Gomariz.

To achieve it, as is always the case in any kind of research activity, external financing is indispensable. "We are immersed in the search of an eminent sponsor", says the Chief Engineer of the team. Their goal is to find economic support and share the merit of their achievements. "We are just happy to dedicate our time to improve our learning", he summed up.

**SmartMoto**

One of the achievements of the UPCT Racing Team is having developed a new prototype for the SmartMoto Challenge 2013, through which the Polytechnic University of Cartagena has become one of the four universities to participate so far. For this competition, the SmartMoto division of the UPCT Racing Team developed a smart foldaway electric motorcycle loaded with applications, such as motion sensors in headlamps and indicators, the possibility to interact with mobile phones in order to turn the engine on and off, to answer calls or to look for parking space in one's own Cloud through Google Maps.





# moto UPCT

## Among the best teams



The results obtained by the MotoUPCT Team testify to the hard work that has already been carried out, but they also create new challenges for the team. In its third edition, the team starts up with new faces - UPCT teachers and students- and a new prototype that accumulates the experience of the former two teams.

"This version presents many new design features: a double-beam aluminum structure for the chassis and a double swing arm (spun, to optimize the motorcycle's weight), as well as a wide range of geometric settings aimed at adapting the motorcycle to both circuit and pilot, ensuring an unprecedented versatility in this competition", explains the spokesperson of the team, Sergio de Haro.

The very goal of the MotoUPCT Team is to position itself among the best teams of the world in the MotoStudent category, facing the innovative and complex challenges ahead. Among them, Horacio Sánchez Reinoso, professor at the Department of Materials and Manufacturing Engineering and a member of the team, points out the integration of this motorcycle with a telemetry system and a real-time vehicle-positioning system (for which there are three finished projects by professors José María Molina, Javier Garrigós and Ginés Domenech from the Telecommunications School). Two other relevant improvements are a system for capturing





**Future technology.**

- 1 Participants at the Universities Trophy in Chestre (Valencia)
- 2 New MotoUPCT prototype design.
- 3 During the Universities Trophy race.
- 3 Presentation of the parts manufactured by students of the Polytechnic Secondary School of Cartagena.



digital/analog measurements from the sensors and the conditioning of signals for their integration with the telemetry system.

“This integration of the motorcycle’s sensing, transmission and data collection systems using mobile communication technologies and telemetry software will enable us to better understand the motorbike’s status in real time and analyze the results in order to tune it up”, he explains.

against other teams in 2013 at different events, such as the 1st Trofeo Universidades held at the Ricardo Tormo circuit, and the 37th Trofeo Corpus of Cartagena, in both of which the MS2 prototype obtained the second place.

**Organization**

On the long road to further success, the team has optimized its organization and work system, under close collaboration with the Industrial Engineering and Telecommunications Schools. The structural design group, supervised by Daniel Camacho and Antonio José Andrés López, is responsible for the design and manufacture of many parts. In regards to non-structural design another group -coordinated by Sergio de Haro- is responsible for the team’s image and other elements such as fairing.

Thirdly, the “engine” work-group, under the direction of Daniel Albaladejo, studies engine performance, speed ranges and exhaust.

The project group, led by Alberto Marín, is responsible for the plan of mass production of a number of motorcycles and their amortization period. And finally, for telemetry, a group coordinated by the Telecommunications School is working on the implementation of the new system of data collection and transmission in real time.

**The team accepts the challenge to climb the podium at the next MotoStudent**

On the other hand, boosting the design of both chassis and swingarm using Solidworks, optimizing 5-axis milling and the phase sequence of machining and an improvement in the selection of tool geometry have led to the design and manufacture of a state-of-the-art chassis for the third edition of MotoStudent.

The chassis is a key element that has been possible thanks to the collaboration of the Polytechnic Secondary School of Cartagena.

The prospects for the main international university competition in October are quite good, as the team is competitive and ambitious, having already raced





# A symbol of the success of Spanish technology

The team defends its own idiosyncrasy through an acronym describing its objectives and expressing the diligence of its work methods. For its members, "SOLAR" stands for a philosophy that is Solid and Oriented to Labor, while also Autonomous and Responsible. After representing eleven other Spanish teams under this motto at the Shell Eco-marathon –an international competition for energy efficiency held last May in Rotherdam-, the UPCT Solar Team now feels ready to face the future.

Waving the Spanish flag at one of the most important competitions in Europe in the field of efficient vehicles is a real turning point for the team of professors and students from the Polytechnic University of Cartagena.

"We've learned a lot because the level in these competitions requires work quality standards in line with current needs", declares team spokesman Luis Monserrat Oliver. They had previously garnered a fifth-place at the Cheste circuit. According to pilot Patricia Pérez, "the car is running better than ever. A lot of weight has been reduced since its inception, and the



**Representing Spain.** The national flag is present in the UPCT Solar Team's work and spirit. In the picture below, two team members prepare the vehicle for the start of the race at the last Shell Eco-marathon, held in Rotherdam.







## The team plans to introduce a new telemetry system and redesign the prototype's solar gain surface

way since our beginnings in 2010. Our design objectives have always been centered on improving vehicle aerodynamics, achieving greater energy efficiency in electronic and electric circuits, increasing solar gain with light and highly efficient photovoltaic circuits and on seeking balance among storing capacity, weight and the requirements from competition circuits".

The team is currently immersed in a process of internal organization. With regards to technical aspects, their plans include a new telemetry and sensing system, as well as the optimization of the vehicle's dynamics, integrating

maximum steering adjustment has been achieved", he says.

As team coordinator professor Antonio Guerrero points out, "we have gone a long

maximum efficiency wheels and improving the in-house designed electronics. The solar prototype will also be redesigned, increasing the solar gain surface.

"Every year, vehicle performance is improved, although there is still a lot to do, because our goal is to achieve good results at Shell's Eco-marathon" explains Antonio Guerrero. According to the university professor, each generation of UPCT Solar Team students "has made significant contributions that help us to improve the capabilities of the vehicle, and hopefully soon we will be very competitive."

For the time being, in order to get ready for the next edition of the Solar Race in Murcia, the team is focused on strengthening its tenets. Among them is innovation, as a pillar of the renewable energy sector; technology, a pervasive industrial requirement; professionalism which now involves life-long multidisciplinary learning; and efficiency, which is obviously a must in solar-electric prototypes.

### At the speed of light.

1. The UPCT's Solar racing car during an urban stretch of the competition. 2. The Anibal prototype, one of the vehicles designed by the UPCT Solar Team. 3. Members of the team at the Green Prix of Valencia, held in Cheste.





# Winners also in the labor market

Participating in UPCT Racing teams: a springboard for employment. Some of the best automotive companies value the experience achieved by students, both at garages and in circuits

**A**part from the knowledge acquired and the experience gained and the emotions felt while preparing and launching the prototypes onto the race track, participating in Racing teams at the UPCT comes with a great reward: many a plus point in the CV.

Companies highly appreciate the fact that job applicants have gone through the actual implementation of a technological project in a competitive context, as exemplified in the cases of members of the three UPCT teams who have already been successful at getting a job. "In order to carry out a Project in Engineering we need to get

in touch with both national and international companies.

We must undergo very intense negotiation processes in English with suppliers from all over the world, including companies from China, USA or Germany", explains Daniel Gomariz.

For example, this has enabled Fátima Alonso to obtain a paid internship at Mercedes Benz Headquarters in Stuttgart, or Francisco Javier Jiménez to work for one of SEAT's auxiliary companies implementing Engineering developments for the motor industry.

In the latter case, Jimenez got the job



### Success inside and outside the circuit.

1. Members of the UPCT Racing Team at Silverstone circuit.
2. MotoUPCT members at Cartagena Motor Racing Circuit.
3. Fátima Alonso, from the UPCT Racing Team.
4. Daniel López, during his visit to one of Pirelli's stands.







**Success inside and outside the circuit.**  
 1. Thorough work at the garage. 2. Francisco Javier Jiménez, sitting in the UPCT Racing Team's racing car. 3. Tuning up the vehicle. 4. Lap of honour of the UPCT's motorcycle at the end of the race.



having no previous work experience, thanks to the expertise acquired studying Mechanical Engineering at the UPCT and being in charge of the electronics of single-seaters competing in Formula Student. "What you do within the team has nothing to envy, budget aside, to what big brands do in real competition," he says.

**The UPCT brand**

Through their presence at Formula Student competitions since 2008 (in which they will participate again at the end of August in Montmeló) the UPCT team has made a name for itself which is now very well-known abroad. So much so in fact, that 26-year-old Daniel López Díaz de Rada got his own place in the team that participates in the prestigious Tourist Trophy competition of electric motorcycles, while he was doing his Erasmus year at the Brunel University in London.

opportunity to apply what you've learned in class and get to know the business world".

This success is also shared by members of the MotoUPCT and the UPCT Solar Team. Many of them have found a job or work placement thanks to the knowledge acquired through their experience in this kind of competitions.

It is also the case of José Daniel Camacho, currently doing an internship at Murcian multinational Italkit which manufactures motorcycle components. Among his duties is the design of parts for new components and their testing.

**«Belonging to a team is a great experience that helps you get in contact with many companies of the sector»**

Another example is Antonio Andrés Lopez, who received two special awards for his final degree project -"Design of a chassis for a 250cc racing motorcycle for MotoStudent III2"- and several other awards at the San José ceremony,

Other members of the UPCT Racing Team who have found a job immediately after (or even before) finishing their studies are José Luis Aguayo Zaragoza, who works for Hefame, or José Manuel Carrillo García and Víctor José Borja Pérez, who work for Gas Natural.

from both the School of Industrial Engineering and the Mtorres company. This has also given him the opportunity to do an internship at one of Mtorres's sub-contractors, where he performs design tasks.

The latter encourages students to become part of the team because "it is a great experience that gives you the

The same thing happens to members of the UPCT Solar Team, currently working or doing internships with the Mtorres group or at several renewable energy companies.





# The soul of the teams



Patricio Franco, Horacio Sánchez and Antonio Guerrero are the UPCT professors responsible for Racing teams. Their effort makes the continuity of projects possible



### Three professors for three great teams.

1. Antonio Guerrero (left) during the team's presentation before the Solar Race in 2012. 2. Horacio Sánchez (first left) with the runner-up team at MotoStudent 2010. 3. Patricio Franco in the garage with members of the UPCT Racing Team.

They are the heart and soul of the Racing teams, the ones breathing life into the projects carried out by students from the Universidad Politécnica de Cartagena since 2008, when the UPCT Racing Team was first created, then the MotoUPCT and the UPCT Solar Team. Patricio Franco Chumillas, Horacio Sánchez Reinoso and Antonio Guerrero González, professors at the UPCT, are in charge of leading and teaching the design and development of racing vehicles participating in the most important competitions in the world at university level.

## Fostering the projects has left its mark on the professors, both personally and professionally

The three recall how exciting but above all how complex the origins of the team were. "The first years of our participation in the Formula

SAE / Formula Student were really the hardest for me, because it was the first time we faced the huge number of calculations, decisions, proposals, discussions, assembly, tests, reports, etc. that we had to perform", says Patricio Franco.

Antonio Guerrero's memories are similar: "I took it with the intensity and conviction that I apply to all research or business projects I lead. It was the only way to give the necessary momentum to the project, getting it definitely started and thus fulfilling our commitments".

Their efforts have paid off in form of three consolidated teams that renew their workforce season after season.

This is the case of MotoUPCT, whose maintenance is guaranteed "thanks to the hard-working capacity of the team members responsible for each of the working groups in which we are divided: engine, structural design, manufacturing, aerodynamics, electrical and electronics," indicates Horacio Sanchez.

"We have now reached the stage I had aimed for from the beginning. The students adopt the initiative to make technical im-

provements that make the team more competitive, and the responsibility to face competitions autonomously", explains professor Antonio Guerrero.

Inevitably, promoting the projects has also left its mark on the professors' personal and professional lives. "It has been a terrific experience for me at the educational level and it always makes me feel great pride to see that students get to develop a range of professional skills and abilities -both generic and cross-sectional- which companies expect to actually find in them", admits Patricio Franco.

For Horacio Sánchez, the experience of MotoUPCT has gone further, changing his teaching approach in compliance with the Bologna Process. "MotoStudent has taught everyone that university education must involve a better transmission and assimilation of knowledge, integrating and connecting all the lessons learned, the expertise and the acquisition of useful and applicable skills", he says.

A concept shared by Antonio Guerrero: "It's a different way of teaching. Engineering tasks not only require technical knowledge but also skills and abilities. The activities performed in the team require the same."

The three professors claim how important it is for UPCT students to be members of a competition team. "Besides an unforgettable experience at the highest level, students find out that much of the knowledge acquired during their engineering studies is applicable to practice," says Horacio Sanchez. In this regard, he remembers that over the years various UPCT professors have conducted numerous End of Studies Projects (PFC) and End of Degree Reports (TFG) that were based on experiences in competition.

"This is a unique opportunity for their future career, because thanks to their work within the team they are able to really acquire the maximum degree of practical knowledge and technical skills and accordingly complement the subjects they study at the UPCT" says Patricio Franco. To which Antonio Guerrero adds: "The benefits lie in the group's successes and failures, which lead to very formative and unforgettable experiences."



# The necessary input of collaborators

Numerous companies and institutions offer their material and economical support to the UPCT teams. A vital aid to manufacturing prototypes

All members of the three UPCT competition teams agree on this idea: without support, the project would not be possible. Such is the importance of collaborators, business partners and sponsors, who ultimately enable the designed vehicles to be manufactured and raced on the circuit.

The list of companies and institutions that support the teams of the Politécnica is so long, that it would be impossible to include it here in its entirety. However, some of the cooperation agreements are outstanding for the present and future of the UPCT teams. Among them, the one signed by the University with the Politécnico Secondary School (IES) of Cartagena. "We program and develop machining strategies, and also define and perform the designs created by the UPCT Engineering team", explains María Dolores Carrión, Head of the Mechanics Department of the Politécnico.



As UPCT Professor Horacio Sanchez points out, the current agreement would not have been possible "without the coordination responsible of MotoUPCT, José Daniel Camacho. According to Sánchez, this has helped him get a contract as an engineer at Italkit. "There is no doubt that the great achievements we have made would not have been possible without the participation of the IES Politécnico and of sponsors".

The Tecnoescape company, specializing in the motorcycle sector, also collaborates with team MotoUPCT. Mostly, this company has provided lubricants required for the team's prototypes. "We are confident that our support will contribute to the team's success and to the improvement of the sector in our region," says José Otón, manager of the company. He admits his surprise at the ability of UPCT students to build a bike fit for competition.

Another one of the companies that collaborate with UPCT teams is Renault. The towing and scrapping company has been supplying the UPCT Racing Team with parts needed to build their vehicles. "When they offered to collaborate in this project, we did not hesitate," says Andrés Nicolás Belmonte, from Renault's Management Department.

That was also the response of the Federation of Metal Companies of the Region of Murcia (FREMM) when the UPCT Racing Team requested their help. "As entrepreneurs, we like competition and being up there with the best. The electric car is an example of how to add and join efforts, so that everyone wins: university, business and society", says the president of FREMM, Juan Antonio Muñoz.

Their active support to the UPCT teams is shared by many companies, such as Tecnoescape, Renault, AVL, RCM Levante, MT Helmet, RS Components, Italkit, Turbokit, Motos Cano, Carmelo Berlanga, Albacolor, Global Racing Oil, Multymak, H43 Hernández, Shiro, Tuttiscooter, Guzmán Automatismos, Banco Santander, Bereco Motors, AML, Disfrimur, Speed&Torque and King Kebab, among others; as well as by institutions like the Cartagena Motor Racing Circuit, and Cartagena City Council.







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