

# SILVERSTONE 5-7 JULY 2013.

## FORMULA STUDENT

Institution of  
**MECHANICAL  
ENGINEERS**



A close-up photograph of a Mercedes-Benz racing engine, showing the silver valve cover with the Mercedes-Benz logo and the word 'Mercedes-Benz' in black. The engine is surrounded by various mechanical components and hoses, all in a dark, industrial setting.

Mercedes-Benz

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Our next Student intake will be in Autumn 2014. To apply for a place on the scheme, please visit [www.mercedes-amg-hpp.com/careers](http://www.mercedes-amg-hpp.com/careers). Applications are open for a limited time, with assessment centres taking place in early 2014.

For more information, please visit [www.mercedes-amg-hpp.com](http://www.mercedes-amg-hpp.com) or visit our stand at Formula Student.

**MERCEDESAMG**  
HIGH PERFORMANCE POWERTRAINS

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## RULES OF ENGAGEMENT

Despite the organisers taking all reasonable precautions, unavoidable accidents can happen. In respect of these, we must make clear the rules of engagement for all participants and visitors.

Motorsport may be dangerous and persons attending this event do so entirely at their own risk.

It is a condition of admission that all persons having any connection with the organisation and/or conduct of the event, including owners of the land and the drivers and owners of the vehicles are absolved from all liability arising out of accidents, howsoever caused, resulting in damage and/or personal injury to spectators, pass and ticket holders, or their goods and vehicles.

This event is held under the General Regulations of the MSA (incorporating the provisions of the International Sporting Code of the FIA), the FSAE & Formula Student Rules and Regulations, Final Instructions and any written instructions that the organisers issue for the event.

MSA Permit COE 76877.



# WELCOME



## ROSS BRAWN OBE

**TEAM PRINCIPAL  
MERCEDES AMG PETRONAS  
FORMULA ONE TEAM**

### FORMULA STUDENT PATRON

Formula Student has been helping to develop world-class engineers for 15 years now – and this year's event should be as exciting as ever.

I'm delighted to be continuing in my role as Patron this year. Formula Student remains a fantastic challenge for students to undertake and encourages a high level of innovation, which I am particularly passionate about.

The competition continues to go from strength to strength. This year, 149 student teams from 32 countries have registered, 54 from UK universities.

Practical experiences are vital to any engineer. In the Formula Student competition, teams have to tackle all aspects of engineering in order to excel. They learn about the importance of working to specific budgets and deadlines, and within various different regulations. With this experience, many young people who take part in Formula Student go on to work within F1 and the wider automotive industry.

We often employ new engineers at the MERCEDES AMG PETRONAS Formula One Team who have participated in Formula Student, and many of our more experienced team members have also taken part. The competition remains an excellent 'breeding ground' for exciting, innovative young engineers and I am sure that I will once again be impressed by the quality of the entries.

Good luck to everybody who is taking part this year. I hope that your hard work pays off, and I look forward to meeting many of you at the event.



## JON HILTON

**CHAIRMAN  
FORMULA STUDENT**

Welcome to Formula Student 2013.

This year the competition celebrates its 15th birthday. From its humble beginnings in 1998, when only a handful of teams took part, to the truly global event it has evolved into, Formula Student continues to get bigger and better every year.

Mainly this is down, of course, to the students taking part – Formula Student attracts some of the most inventive and talented young engineers from around the world and their ingenuity, skill and dedication never fails to impress everyone involved in the competition. I'm especially looking forward to seeing all the advances there will be in this year's cars.

This year, 54 of the teams are from UK universities and there are more Indian teams than ever (8). A team from Oman will take part for the first time in Formula Student history – as well as teams from as far afield as Nigeria, Pakistan and Turkey.

I would like to say a special thank you to our partners - Jaguar Land Rover; Mercedes AMG; National Instruments and Shell – and the Gold Sponsors, Robert Bosch UK, MIRA, ATL and PTC Concurrent Engineering. We are extremely grateful for their support.

Good luck to all the teams taking part, and I look forward to seeing you at Silverstone.

# INTRODUCTION

Welcome to the largest student motorsport event in the world.

Each year Formula Student (FS) challenges university students from around the world to design and build their own single-seat racing car, which is then put to the test at the famous Silverstone Circuit. University teams from multiple disciplines work together, developing creative solutions, building teamwork and communication skills, and learning how to deliver projects to budget and deadlines.

Formula Student is:

- A high-performance engineering project
- An unmatched demonstration of real-world engineering experience for engineering employers and the motorsport industry
- An intense, ten-month long project, teaching students teamwork, business skills and technical ability

FS has been run by the Institution of Mechanical Engineers since 1998, and since then tens of thousands of competitors have come through the competition, with graduates now featuring in every Formula 1 team. In our fifteenth year, we've got a lot of celebrating to do in 2013!

## WHAT WE DO

Offering teams the opportunity to undertake real-life challenges and logistics, and develop the skills they'll need when they go on to work in industry, FS's key aims are to inspire the next generation about where they can go in engineering and address the skills shortage in the sector.

## THE CHALLENGE

At the start of each academic year, students are given this challenge:

"A manufacturing firm has asked you to develop a production prototype for a single-seat race car for autocross or sprint racing. The target customer for the final product is a non-professional racer, with high standards for performance and value for money."

## WHERE WOULD YOU GO FROM HERE?

The year's work:

- Except for defined safety standards, there are few restrictions on the overall design, to encourage innovation – in fuel, design, materials and engine

- As the year goes on and the car is built, all the elements of the project must combine – and teams have to make important real-life choices about design, cost and sustainability
- In July, teams come together for three days of testing, presentations and live competition
- At Silverstone, they are judged by representatives from across industry sectors who scrutinise the cars inside and out, as well as on cost, fuel economy, design and business viability

## FIND OUT MORE

This guide introduces the scoring (page 04), awards (page 06) and has full details on each car in the running in 2013 (from page 20).

You can also read more about previous competitors who've gone on to have successful careers in motorsport and engineering on page 08.

And don't miss out on seeing the current MERCEDES AMG PETRONAS F1 showcar, Honda Yuasa Racing's BTCC showcar and Jaguar Land Rover's Terra Pod obstacle course – check out the map on page 90.

## WINNERS

1998	University of Texas at Arlington, USA
1999	Rochester Institute of Technology, USA
2000	California State University, Pomona, USA
2001	Georgia Institute of Technology, USA
2002	Georgia Institute of Technology, USA
2003	University of Toronto, Canada
2004	RMIT University, Australia
2005	University of Toronto, Canada
2006	University of Toronto, Canada
2007	RMIT University, Australia
2008	University of Stuttgart, Germany
2009	University of Stuttgart, Germany
2010	TU Munich, Germany
2011	University of Stuttgart, Germany
2012	Chalmers University of Technology, Sweden

# EVENTS AND SCORING

Teams can either enter a running car or compete with just a design concept, allowing them to spread the design and build process over 2 years. The information below is regarding the largest category, Class 1, but the table gives the points allocation for all categories.

## TESTING TIMES

As Formula Student aims to develop well-rounded engineers, each team is assessed not only on their car's performance and their understanding of the engineering behind their design, but on their overall business proposal. This is done in a series of static and dynamic events.

## STATIC EVENTS

### Design 150 points

Students must be able to explain how their car's materials, components, and systems come together and how their design meets the needs of the intended market.

### Business Presentation 75 points

In this event, the judges play the role of the potential investors. Each team has to present a business case that sells their concept to them.

### Cost and Sustainability 100 points

Here teams provide an accurate estimate of the cost of their car in a limited production. They should be able to show to the judges where they've spent the money and added value. They are also required to understand how much energy is required to produce their powertrain.

## DYNAMIC EVENTS

Before being allowed out on to the track to compete in any of the dynamic events, the teams must first pass technical and safety scrutineering, as well as the tilt test and brake and noise tests. There are five dynamic events, all designed to test different aspects of the car's performance – an important part of any team's business case.

### Skid Pad 50 points

In motorsport straight line speed isn't everything so the skid pad lets teams show how well their car goes round corners. Cars need to have good lateral grip to complete a figure of eight in the quickest possible time.

### Acceleration 75 points

This event focuses on the car's powertrain performance and drivability and on the suspension's ability to provide maximum tyre grip. The measure of acceleration is the total time it takes to travel down Silverstone's pit straight from a standing start.

### Sprint 150 points

This tests the car's manoeuvrability and handling qualities on a tight 800m course. To do well, cars have to be quick as well as nimble around the corners.

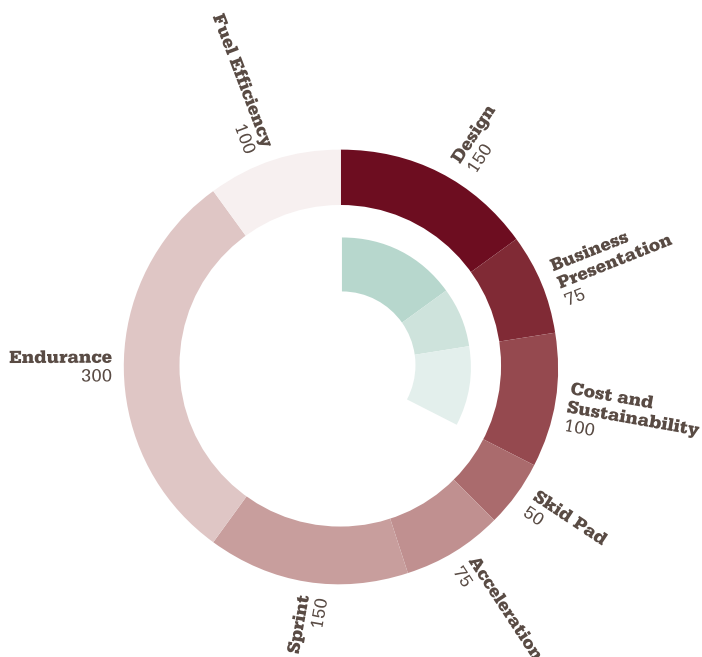
### Endurance 300 points

The biggest test of the teams is the 22km endurance race where cars have to prove their durability. There is also a mandatory stop, driver change and hot restart that really tests reliability and the team's ability to efficiently make changes to pedal positions, seats etc.

### Fuel Efficiency 100 points

Efficient design is about more than how the car looks. Customers will expect their car to be as green and fuel efficient as possible. Top electric cars should achieve 125 grams of CO<sub>2</sub> per km during the endurance trial.

Event	● Class 1	● Class 2
Design	150	150
Business Presentation	75	75
Cost and Sustainability	100	100
Skid Pad	50	
Acceleration	75	
Sprint	150	
Endurance	300	
Fuel Efficiency	100	
<b>Total</b>	<b>1000</b>	<b>325</b>



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# AWARDS

## AWARDS TO BE GIVEN ON SATURDAY 6 JULY

Sponsor	Award	Prize
Formula Student	Class 2 Overall Winner	-
Institution of Mechanical Engineers	Best Cost Analysis in Class 2	-
Institution of Mechanical Engineers	Best Business Presentation in Class 2	-
Institution of Mechanical Engineers	Design Event Winner in Class 2	-
Institution of Mechanical Engineers	Best Class 1 Cost and Sustainability Analysis	-
Racecar Engineering	Best Class 1 Business Presentation	-
Shell	Engineering Excellence Award	-
Jaguar Land Rover	Innovation in propulsion systems	-
Jaguar Land Rover	The best use of virtual methods to achieve vehicle dynamic targets and FS event performance	-
Mercedes AMG High Performance Powertrains	Class 1 Best Powertrain Installation of an Internal Combustion Engine	-
Mercedes AMG High Performance Powertrains	Class 1 Best High Voltage Powertrain Implementation	-
National Instruments	Measurement and Control Award - UK and Ireland	T-shirts for winning team
National Instruments	Measurement and Control Award - International	T-shirts for winning team

## AWARDS TO BE GIVEN ON SUNDAY 7 JULY

Formula Student	Class 1 Overall Winner	£1,000 + free entry to FS2014
Formula Student	Class 1 Runner-up	-
Formula Student	Class 1 Third Place	-
MERCEDES AMG PETRONAS Formula One Team	Class 1 Design Winner	-
MERCEDES AMG PETRONAS Formula One Team	Class 1 Design Runner-Up	-
Institution of Mechanical Engineers	Acceleration Winner	-
Institution of Mechanical Engineers	Skid Pad Winner	-
Institution of Mechanical Engineers	Sprint Winner	-
Institution of Mechanical Engineers	Endurance Winner	-
SAE International	Overall Dynamics Events Winner	\$500USD
Formula Student	Top Individual Driver	-
Formula Student	Most Efficient Internal Combustion Engine Car	-
Shell	Most Efficient Car	-
Allan Staniforth Award	Best Newcomer in Class 1	-
Craig Dawson Award	Most Valuable Team Member	-
Institution of Mechanical Engineers	Most Effective Communications Strategy	A half day full scale wind tunnel testing, and a series of Aerobytes articles published in Racecar Engineering





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# CASE STUDIES



**BERNADETTE (BERNIE)  
COLLINS, 27**

## TRANSMISSION DESIGN AT MCLAREN RACING



I took part in Formula Student in 2008 and 2009 as part of the Queen's University Belfast team. In my first competition I worked in brake design, before moving on to become team leader, with responsibility for suspension design.

FS was my first introduction to working in motorsport and the trackside environment and as such was very important and shaped where I am today. Until my involvement with FS, I was unsure what I should do with my mechanical engineering degree. The one thing I've taken from it is the importance of communication and team work. Plus, no design can be too simple.

In my year as team leader, the biggest challenge was to try and bring the team and all the resources together to find a workable solution. The time and money constraints always make it difficult especially while trying to graduate with a good degree. In my first year as brake designer the brake disc shattered during the testing and we never got the car to the track. That was a very challenging few days.

There are many fond memories of FS but maybe the best one is completing my acceleration run down the old start/finish straight at Silverstone. Everyone fancies themselves as a bit of a driver and that was a brilliant experience. Also, my first run in the car during testing and feeling how stable and secure something that the team had designed and built together was. I also found out on the last day of FS that I had got the graduate position with McLaren.

FS gave me an insight into many areas of car design, but most importantly, exposed me to the difficulties that can arise in either manufacture or car-build. It encouraged me to design things with those issues in mind. It also allowed me to work with a wide range of people from senior lecturers to technicians and the experience gained from each of those people and the ability to seek out and communicate with them has been very useful.

The competition allows practical application of the techniques and skills learned during an engineering degree. It gives a really good view of the different aspects of a career in motorsport and the trackside environment. It is hard work at the time but the rewards make it worthwhile, and there are lots of fun moments along the way.

I still keep in touch with my old university team and lecturers and try when I can to attend the event in Silverstone. It's always very interesting to look at the various designs from the teams, which is something you don't really get to do as a competitor. I've also recently attended team presentations in local schools to encourage younger people to consider engineering as a career.

“““

**FS GIVES A REALLY GOOD VIEW OF THE DIFFERENT ASPECTS OF A CAREER IN MOTORSPORT AND THE TRACKSIDE ENVIRONMENT.**



**MIKE SEXTON, 28**

**MECHANICAL ANALYSIS  
ENGINEER AT BAE SYSTEMS**

**BAE SYSTEMS**

“““

**MY BIGGEST CHALLENGE  
WAS THE MANAGEMENT  
OF SO MANY DIFFERENT  
PEOPLE AND CHARACTERS.**

I actually took part in Formula Student four times between 2005 and 2009, with my roles including team manager, driver and technical director.

Even though I'd competed in FS Class 1 in 2006 and 2007, I graduated and left the competition having never completed the endurance event at FS. With the opportunity of a postgraduate degree, I had a final chance to enter in 2009.

My fondest memory was the relief and the congratulations from the team as I pulled up in the pits having completed the endurance test, which we actually placed first in, and becoming the first ever UK team to do so.

My biggest challenge was the management of so many different people and characters, and trying to get them all to work together to achieve the same goal of a single car design. In one year it also required the hard decision to radically restructure the team and reduce the head count.

I learnt many things from FS, not least the broad technical knowledge that a practical engineering project like this could provide. A significant lesson was the importance of improvement and development – each FS entry I worked on showed progression in design and performance, and feedback received from the static events was always fed into the subsequent year's work.

I also learned the value of testing and validation – partly because I realised that I often should have done more, and also because of the depth of understanding that you could further gain about a part or system, regardless of the fact that you may have spent the past week designing it non-stop.

Even so, I left the competition knowing there was more I would do if I had the opportunity. That to me was one of the big attractions of FS. University degrees are all about building knowledge and understanding on a subject, and trying to develop you as a person. I would recommend doing FS because, as an engineer, I would never have had the chance to work on such a practical project which encompasses a huge variety of fields both in and away from engineering, and couldn't have developed the skills I have today. I also got to meet Damon Hill!

My current role is based around the testing and analysis of products and systems, and I use many of the simulation techniques that I applied to my FS projects. I have also applied my experiences of prototyping and systems design to produce test rigs and product demonstrators. I have volunteered at FS every year since my final entry in 2009. I have also taken roles as a scrutineer and event captain on various dynamic events, and I hope to use my experience of participating to help maintain the high standards with which the event is run.



**HANNAH HAMMOND, 31**

**PROJECT ENGINEER  
AT CLAYTEX SERVICES**



I competed in Formula Student in 2005 as part of the Loughborough University team. I was finance manager and also responsible for bodywork manufacturing.

FS taught me a lot of skills which I couldn't have gained from textbooks, especially around project management and people skills. You learn how to work successfully in a team, raising funds and balancing the finances and meet deadlines. Formula Student really helped me gain in confidence as an engineer at the beginning of my career. It really pushed me, and things didn't always go to plan but I proved to myself that I could get the job done.

My biggest challenge during FS was time management, which I guess is probably a big challenge for everyone who takes part. The FS team was a totally extracurricular activity at Loughborough when I took part, which meant it was all on top of the work I was doing in my automotive engineering degree. It was very hard not to let FS dominate all my time; I had to schedule both my course and FS work very carefully.

My current role is as project engineer for a company called Claytex. My work is focused on modelling and simulation of vehicles, at the moment I am working on a driver simulator for a motorsport application. Technically my current role isn't related to what I did when I took part in FS, but the experience I gained was much wider than that and it is these broader project and people skills which I draw on now.

My fondest memory of FS is definitely the camaraderie within the Loughborough team. The experience of taking part in FS was really intense as I was in my final year at university, and it really tested my ability to work in a group at times. Our team was great fun to work with and it was this that got you through the tough bits. I still see some of the guys now, eight years after I competed, and it's always great fun.

I would most definitely recommend taking part in FS. It can give you a great body of experience to help you to make the first steps in your engineering career following university. I have volunteered as a design judge at FS a number of times since I competed. Sadly, due to work commitments I won't be able to be involved this year but I hope to be back judging in 2014.

“““

**FS REALLY PUSHED ME, AND THINGS DIDN'T ALWAYS GO TO PLAN BUT I PROVED TO MYSELF THAT I COULD GET THE JOB DONE.**



## **THOMAS WEBER, 28**

**DEVELOPMENT ENGINEER  
AT SWD AG STATOR  
UND ROTORTECHNIK,  
SWITZERLAND**



I took part in Formula Student for four consecutive years as part of ETH Zurich University's team, Switzerland. I had a number of roles, ranging from drivetrain designer to driver.

I have many fond memories of FS in Silverstone, but the most intense was watching our car Simplon finish the wet endurance event in 2009. Before the start of the endurance challenge, we had to change from slicks to intermediates and in the process damaged a hub because of a jammed wheel nut. We were able to repair the hub in Delft's truck and start the endurance late, resulting in a two-minute penalty. But because the weather conditions were a bit better and there was less oil on the track, we more than made up for the time penalty and won overall Dynamics, as well as claiming third place overall.

My biggest personal challenge was time management. While spending a lot of time on the project, I also had to attend the lectures and exams at university and wanted to spend some time with my wife and daughter. To be honest, FS often took top priority, because it's a once-in-a-lifetime opportunity.

During FS, I gained experience in many engineering topics like design, materials and testing, but also other areas like project planning and management. Working together in a team impressed me just as much as witnessing the entire product life cycle. While the technical challenges are very different, both FS and projects I work on now have budget, manpower and time constraints which must be managed. Doing so efficiently is just as important as keeping a high level of innovation and quality.

FS is a great personal adventure and complements the rather academic university education with hands-on experience. That's something a lot of employers are looking for and which gives you a head start in the working environment. Or in other words: this might be your only chance to design and build a racecar, then race it on different F1 tracks around the world, and not pay for it. It's great fun.

I still like to be involved with the competition – I volunteered as a design judge in 2012 and gladly give advice to new students doing FS.

**““”**

**FS IS A GREAT PERSONAL  
ADVENTURE AND  
COMPLEMENTS THE RATHER  
ACADEMIC UNIVERSITY  
EDUCATION WITH HANDS-  
ON EXPERIENCE.**

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The team at Mercedes AMG High Performance Powertrains are responsible for the design, development and manufacture of Formula 1 engines and hybrid systems, as well as specific high-end engineering projects for road cars such as the SLS AMG E-Cell.

Based in their state of the art Technology Centre in Brixworth, Northamptonshire, the company has supported Formula Student since 2010. Mercedes AMG High Performance Powertrains runs successful Graduate and Placement Student programmes and many of the students currently on the schemes have previously taken part in the Formula Student competition.

For more information please visit [www.mercedes-amg-hpp.com](http://www.mercedes-amg-hpp.com)



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# VOLUNTEERS

**Jon Hilton FIMechE** Formula Student Chairman  
**Richard Folkson FIMechE** Chief Judge  
**Andrew Deakin MIMechE** Vice Chairman

## **Business Presentation Judges**

**Craig Powers**  
**Elliot Brinkworth**  
Ayotunde Adebajo  
Alan Anderson  
William Ashford  
Richard Atkins  
Nick Bailey  
James Barry  
Ian Bell  
Peter Bell  
Raphaela Bihl  
John Butler  
Trevor Cave  
Paul Chapman  
Naveed Choudry  
Steve Clark  
James Colgate  
Vincent Considine  
Sagar Depala  
Alan Fitzgerald  
Marc Fry  
Mark Hassall  
Philip Hodgkinson  
Raymond Hodgkinson  
Robert Marwood  
David McGhee  
Paul McMorran  
Mark Pepperell  
Thomas Pink  
Sheila Raynor  
John Saville  
Martin Simmonds  
Alistair Spence  
Daren Spencer  
Alexandra Stapleton  
Mark Tapscott  
James Taylor  
Paul Taylor  
Brian Walker  
Tony Walker  
Ian Wallbridge  
Nadine Young

## **Cost, Sustainability and Manufacturing Judges**

**Richard Hale**  
**Darren Cashman**  
Graham Bailey  
Matthew Bees  
Daniel Bodimeade  
Mike Bottley  
Daniel Buckler  
Julie Cheung  
John Connolly  
Neil Cooper  
John Dangerfield  
Andy Eastlake  
Marvin Eptom  
James Fallas  
Chris Glover  
Steve Harry  
Ben Horne  
Gareth Jones

Athanasios Kolios  
Stephen Malyon  
Alan March  
Frank Marsh  
Sean McGrath  
Padraig McGuigan  
Michael Odenwald  
David Paramo  
Sarswati Patel  
Chris Peain  
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Steven Savage  
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Mark Williams  
Terry Wilson  
Jason Wright  
Shenli Zhang

## **Design Judges**

**Neill Anderson**  
**Alex Hickson**  
Samir Abid  
Carl Bailey  
Scott Bain  
Anthony Barnicott  
Paul Beever  
Steve Benn  
Sukhi Bhogal  
Charisis (Harry) Bikas  
Matthew Brewerton  
James Brown  
Joe Burnell  
Owen Carless  
Marco Carnà  
Dimitrios Chantzis  
Steven Clark  
Pat Clarke  
Jez Coates  
Alex Coignac-Smith  
John Corrigan  
Tony Crouch  
Robert Dewhurst  
Gordon Dowdey  
Gregory Edwards  
John Eldridge  
Jason English  
David Evans  
Alan Flavell  
Steven Foster  
Benedikt Fries  
Bryan Gallagher  
John Gentry  
Adrian Gill  
Joao Ginete  
David Gould  
Geoff Grose  
Miguel Guedes  
Thomas Hale  
Julian Happian-Smith  
Mike Hart

James Hope  
Will Horgan  
Helen Jackson-Garside  
Steve Johnson  
Johann Kastern  
Natalie Keeler  
Timo Keinanen  
Philip Kelly  
Pierre Kerrou  
Philip Major  
Joe Marsh  
Jonathan Marshall  
Keith Martin  
Ruairaidh McDonald-Walker  
Lyn McWilliam  
Pablo Mendoza-Villafuerte  
James Montgomery  
Andrew Morritt  
Robert Neilson  
Alex Ng  
Sean O'Mahony  
Robert Oxley  
Matthew Packham  
Gareth Pemberston  
Rod Pickup  
Keith Ramsay  
Roger Ratley  
Nadine Reinhold  
Tom Rendell  
Carlos Riba  
Horst Rönnebeck  
Gerard Sauer  
Andrew Saunders  
Dean Scott  
Anthony Smith  
David Smith  
Robin Stafford Allen  
Lewis Stead  
Daren Steward  
Alexandra Sye  
Mike Tanswell  
Oliver Taylor  
Karol Tomczyk  
Grant Tuff  
Kevin Ukoko-Rongione  
Timo Völkl  
Oliver Webb  
Matthew Webster  
Matthew Wilkin  
Simon Williams  
Geoffrey Willis  
Gary Woods  
Thomas Yates

## **Scrutineers and Dynamic Volunteers**

**Dan Jones**  
**Andy Ringland**  
Jack Allery  
Howard Ash  
Richard Bailey  
Chris Baker  
Alberto Ballesta  
Phil Barber  
John Barlow

## **Key Lead judges**

Dan Beeston  
Vikki Benn  
Adrian Chell  
Alastair Clarke  
Alicja Crome  
Andrew Crome  
Thomas Cullinane  
Geoff Deakin  
Chris Drew  
Stephen Driffield  
Richard Entwisle  
Robert Foxon  
Ahmed Gohar  
Jennifer Guan  
Anthony Hinkley  
George Hopkins  
Gwyn Jenkins  
Mike Jenkins  
Scott Johnston  
Jonathan Jones  
Kate Jones  
Shrey Khire  
Matthew Lambkin-Smith  
Juan Manzano  
Tim McCann  
Mats Menger  
Owain Parry  
Thomas Pawley  
Richard Pearson  
Sebastian Price  
Gary Priestner  
Nicky Richards  
Alison Roberts  
Michael Royce  
Suzanne Royce  
Momodou S. Ceessay  
Vipul Saxena  
Mike Sexton  
Nathan Sharp  
Blake Siegler  
Chris Slevin  
Dallas Smith  
Mina Sobhy Girges  
Eryk Sokolowski  
Erick Solis  
Joe Staton  
Jonathan Stevens  
Malcolm Thomson  
Krishna Tej Tirumalasetti  
Jake Wallis  
Wen Han Yap  
Alexey Yashin

## **General Volunteers**

Ella Barnes  
Tom Cilvert  
Dominic Hurrell  
Samy Kahouadji  
Nicola Raynal  
Robert Spall  
William Spall  
Douglas Stormonth Darling



Good luck to all FS2013 teams

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# PARTICIPATING TEAMS

## CLASS 1

Car	University	Team Name	Abbreviation	Country	Fuel	Page
1	Chalmers University of Technology	Chalmers Formula Student	Chalmers U. of Tech.	Sweden	P	21
2	Delft University of Technology	Delft University of Technology Racing Team	Delft U. of Tech.	The Netherlands	P	21
4	TU Munich	TUfast Racing Team	TU Munich	Germany	E85	22
5	University of Stuttgart	Rennteam Uni Stuttgart	U. of Stuttgart	Germany	E85	22
7	Oxford Brookes University	Oxford Brookes Racing	Oxford Brookes U.	UK	P	23
8	UAS Graz	Joanneum Racing Graz	UAS Graz	Austria	P	23
10	TU Graz	TU Graz Racing Team	TU Graz	Austria	P	24
11	University of Sunderland	Su Racing	U. of Sunderland	UK	P	24
12	Loughborough University	LUMotorsport	Loughborough U.	UK	P	25
13	Karlsruhe Institute of Technology	KA-RaceIng C	Karlsruhe Institute of Tech. (KIT)	Germany	E85	26
14	Karlsruhe Institute of Technology	KA-RaceIng E	Karlsruhe Institute of Tech. (KIT)	Germany	E	26
15	University of Strathclyde	University of Strathclyde Motorsport	U. of Strathclyde	UK	P	27
16	University of Hertfordshire	UH Racing	U. of Hertfordshire	UK	P	27
17	Norwegian University of Science and Technology	Revolve NTNU	Norwegian U. of Science & Tech.	Norway	P	28
18	Lancaster University	Lancaster Racing Team	Lancaster U.	UK	P	28
19	Aristotle University of Thessaloniki	Aristotle Racing Team	Aristotle U. of Thessaloniki	Greece	P	29
20	University of Limerick	University of Limerick Racing	U. of Limerick	Ireland	P	29
21	University of Southern Denmark	SDU Vikings	U. of Southern Denmark	Denmark	E	30
22	UAS Amberg-Weiden	Running Snail Racing Team	UAS Amberg-Weiden	Germany	P	30
23	University of Bath	Team Bath Racing	U. of Bath	UK	P	32
24	University of Liverpool	University of Liverpool Motorsport	U. of Liverpool	UK	P	32
25	Indian Institute of Technology, Bombay	IIT Bombay Racing	IIT Bombay	India	E	33
26	University of Stuttgart	GreenTeam Uni Stuttgart	U. of Stuttgart	Germany	E	33
27	TU Dresden	Elbflorace Formula Student Team TU Dresden e.V.	TU Dresden	Germany	E	34
28	University of Kassel	Herkules Racing Team	U. of Kassel	Germany	P	34
29	Kingston University	KU e-Racing	Kingston U.	UK	E	35
30	University of Warwick	Warwick Racing	U. of Warwick	UK	E85	35
32	Birmingham City University	BCU Racing	Birmingham City U.	UK	P	36
33	ETH Zurich	AMZ Racing	ETH Zurich	Switzerland	E	36
34	Yildiz Technical University	YTU Racing	Yildiz Technical U.	Turkey	P	37
36	UAS Dortmund	Race-Ing. Team	UAS Dortmund	Germany	P	38
37	TU Darmstadt	TU Darmstadt Racing Team e.V.	TU Darmstadt	Germany	E	38
38	University College London	UCL Racing	UCL	UK	P	39
39	Ain Shams University	ASU Racing Team	Ain Shams U.	Egypt	P	39
40	Leibniz University of Hanover	Horsepower Hannover	Leibniz U. Hannover	Germany	E	40

Car	University	Team Name	Abbreviation	Country	Fuel	Page
42	RWTH Aachen	Ecurie Aix Formula Student Team RWTH Aachen e.V.	RWTH Aachen	Germany	P	40
43	De Montfort University	DMU Racing	De Montfort U.	UK	P	41
44	University of Ulster	UUJ FS2013	U. of Ulster	UK	P	41
46	UAS Regensburg	Dynamics e.V.	UAS Regensburg	Germany	P	42
47	Brunel University	Brunel Racing	Brunel U.	UK	P	42
48	University of the Basque Country	Formula Student Bizkaia	U. of the Basque Country	Spain	E	43
49	Delhi Technological University	Defianz Racing	Delhi Technological U.	India	P	44
50	University of Leicester	University of Leicester Racing	U. of Leicester	UK	E	44
51	Vellore Institute of Technology	Team Ojas	Vellore Institute of Tech.	India	E	45
52	National Institute of Technology Calicut	Team Unwired	National Institute of Tech. Calicut	India	P	45
53	UAS Kiel	Raceyard E	UAS Kiel	Germany	E	46
54	Karlstad University	Clear River Racing	Karlstad U.	Sweden	P	46
55	University of Huddersfield	Team HARE	U. of Huddersfield	UK	P	47
57	École Nationale d'Ingénieurs de Metz	ENIM Formula Student	ENIM	France	P	47
58	University of Paderborn	UPBracing Team e.V	U. of Paderborn	Germany	E85	48
59	Tecnun, University of Navarra	Tecnun Formula Student	Tecnun, U. of Navarra	Spain	P	48
60	Indian Institute of Technology, Kharagpur	KART	IIT Kharagpur	India	P	50
61	University of Sussex	Mobil 1 Team Sussex	U. of Sussex	UK	P	50
62	UAS Regensburg	regenics e.V.	UAS Regensburg	Germany	E	51
63	TU Kaiserslautern	Kaiserslautern Racing Team	TU Kaiserslautern	Germany	E	51
64	University of Bologna	UniBo Motorsport	U. of Bologna	Italy	E85	52
65	University of Belgrade	Road Arrow team	U. of Belgrade	Serbia	P	52
66	University of Exeter	Exeter Racing	U. of Exeter	UK	P	53
67	Heriot-Watt University	HWRacing	Heriot-Watt U.	UK	P	53
68	National University of Sciences & Technology	Formula NUST Racing	National U. of Sciences & Tech.	Pakistan	P	54
69	University of Stavanger	Formula Student Team UiS	U. of Stavanger	Norway	P	54
70	UAS Coburg	CAT-Racing	UAS Coburg	Germany	P	55
71	KTH Royal Institute of Technology	KTH Racing	KTH – Royal Institute of Tech.	Sweden	E	56
72	University of Aberdeen	TAU Racing	U. of Aberdeen	UK	P	56
73	Thomas More Mechelen-De Nayer	Thomas More Innovation	Thomas More Mechelen – De Nayer	Belgium	P	57
74	University of West Bohemia	Racing Team Pilsen	U. of West Bohemia	Czech Republic	P	57
76	Linköping University	ELiTH Racning	Linköping U.	Sweden	P	58
77	Indian Institute of Technology, Roorkee	IIT Roorkee Motorsports	IIT Roorkee	India	P	58



<b>Car</b>	<b>University</b>	<b>Team Name</b>	<b>Abbreviation</b>	<b>Country</b>	<b>Fuel</b>	<b>Page</b>
78	Sheffield Hallam University	SHU Racing	Sheffield Hallam U.	UK	P	59
79	University of Maribor	UNI Maribor Grand Prix Engineering	U. of Maribor	Slovenia	P	59
81	Lund University	LURacing	Lund U.	Sweden	P	60
82	Liverpool John Moores University	LJMU Racing	Liverpool John Moores U.	UK	P	60
83	Universidad Europea de Madrid	Formula UEM	U. Europea de Madrid	Spain	E85	61
84	University of Cagliari	unicar	U. of Cagliari	Italy	P	62
85	University of Padua	Race UP Team	U. of Padua	Italy	P	62
86	Coventry University	Phoenix Racing	Coventry U.	UK	P	63
87	Cardiff University	Cardiff Racing	Cardiff U.	UK	P	63
88	University of Parma	UniPR Racing Team	U. of Parma	Italy	P	64
89	Tyumen State Oil and Gas University	Formula Neftegaz	Tyumen State Oil and Gas U.	Russia	P	64
90	University of Portsmouth	UPRacing	U. of Portsmouth	UK	P	65
91	University of Birmingham	UBRacing	U. of Birmingham	UK	P	65
92	ESTACA	ESTACA Formula Team	ESTACA	France	P	66
93	University of Surrey	TEAM SURTES	U. of Surrey	UK	P	66
96	UAS Zwickau	WHZ Racing Team	UAS Zwickau	Germany	E	68
97	Wroclaw University of Technology	PWR Racing Team	Wroclaw U. of Tech.	Poland	E85	68
99	City University London	City Racing	City U. London	UK	P	69
100	University of Central Lancashire	UCLan Race Engineering	U. of Central Lancashire	UK	E85	69
101	Dublin Institute of Technology	FormulaDIT	Dublin Institute of Tech.	Ireland	P	70
102	Warsaw University of Technology	WUT Racing	Warsaw U. of Tech.	Poland	P	70
108	University of Sheffield	Sheffield Formula Racing	U. of Sheffield	UK	P	71
111	Transilvania University of Brasov	BlueStreamline	Transilvania U. of Brasov	Romania	P	71
113	AGH University of Science and Technology	AGH Racing	AGH U. of Science and Tech.	Poland	P	72
118	University of Glasgow	UGRacing	U. of Glasgow	UK	P	72
123	Hamburg University of Technology	e-ignition Hamburg	Hamburg U. of Tech.	Germany	E	73
140	Group T International University College	Formula Group T	Group T Int'l U. College	Belgium	E	74
146	Politecnico di Torino	Squadra Corse	P. di Torino	Italy	E	74
151	University of Southampton	Southampton University Formula Student Team	U. of Southampton	UK	P	75
158	University of Burgundy – ISAT	ISAT	U. of Burgundy – ISAT	France	P	75
161	Manchester Metropolitan University	MMU Racing	Manchester Metropolitan U.	UK	P	76
164	Karel de Grote University College	Fastrada	Karel de Grote U. College	Belgium	E85	76
177	University of Dundee	DRIVE	U. of Dundee	UK	P	77
181	University of Hull	Hull University Formula Student	U. of Hull	UK	P	77
187	Caledonian College of Engineering	Caledonian Team Oryx	Caledonian College of Eng.	Oman	P	78
190	Slovak University of Technology	STUBA Green Team	Slovak U. of Tech.	Slovakia	E	78
195	Dalhousie University	Dalhousie Formula SAE	Dalhousie U.	Canada	P	79

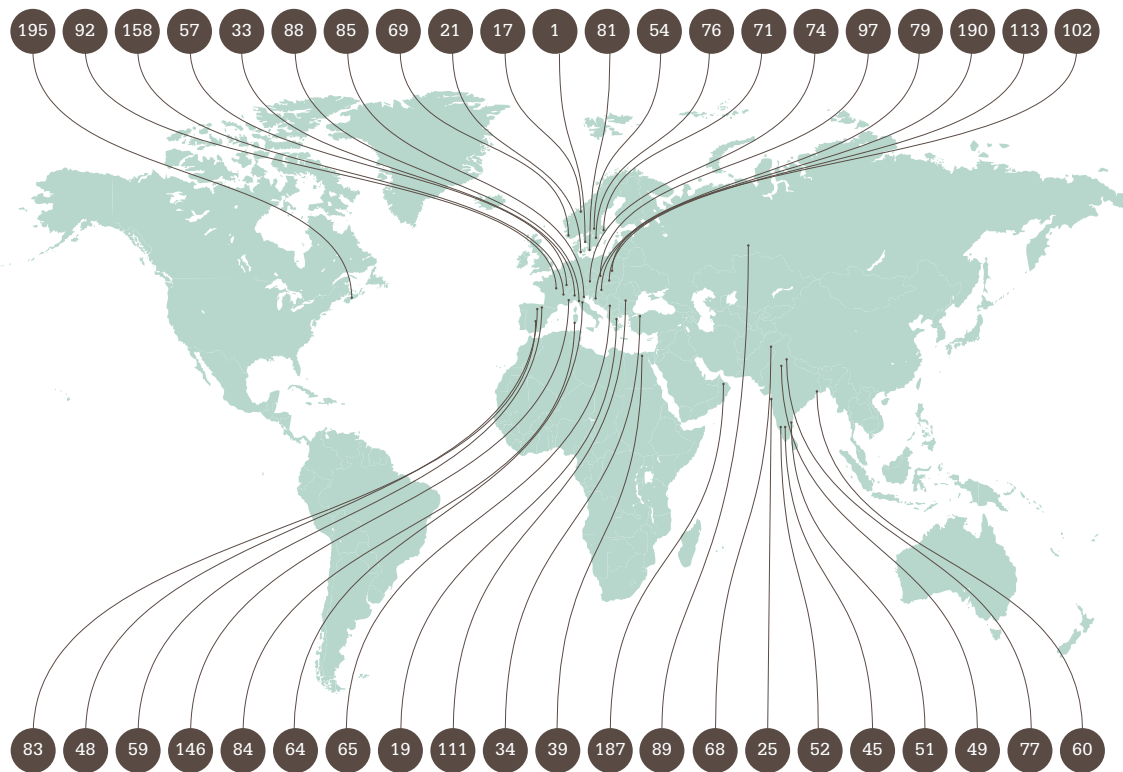
## CLASS 2

University	Team Name	Abbreviation	Country	Fuel	Page
Cairo University	Cairo University Racing Team	Cairo U.	Egypt	P	80
Helwan University	HFS racing team	Helwan U.	Egypt	P	80
Menoufyia University	Menoufyia University Team MFS	Menoufyia U.	Egypt	E85	80
Tanta University	MEC Auto FS Team	Tanta U.	Egypt	P	80
SKEMA Business School	SKEMA Racing Team	SKEMA Business School	France	E	81
University of Iceland	Team Spark	U. of Iceland	Iceland	E	81
University of Florence	Firenze Race Team	U. of Florence	Italy	P	81
Anambra State University	Nuta_Bolts Team	Anambra State U.	Nigeria	P	81
Polytechnic Institute of Leiria	Formula IPLEiria	Polytechnic Institute of Leiria	Portugal	A	82
Karlstad University	Clear River Racing Electric Division	Karlstad U.	Sweden	E	82
Aston University	Aston Racing	Aston U.	UK	E	82
Brunel University	Brunel Masters Motorsport	Brunel U.	UK	P	83
Durham University	Durham University Formula Student	Durham U.	UK	E	83
Imperial College London	Imperial Racing Green	Imperial College London	UK	A	83
Swansea University	Swansea University Race Engineering	Swansea U.	UK	P	83
University of Bath	Team Bath Racing	U. of Bath	UK	P	84
University of Cambridge	Full Blue Racing	U. of Cambridge	UK	P	84
University of Derby	Drammo Engineering	U. of Derby	UK	A	84
University of Glasgow	UGRacing	U. of Glasgow	UK	P	85
University of Hertfordshire	UH Racing	U. of Hertfordshire	UK	P	85
University of Manchester	University of Manchester Formula Student	U. of Manchester	UK	P	85
University of Newcastle	Newcastle Racing	Newcastle U.	UK	E	85
University of Northampton	Northampton	U. of Northampton	UK	E	86
University of Warwick	Warwick Racing Class 2	U. of Warwick	UK	P	86
University of the West of England	UWE Racing	U. of the West of England	UK	P	86

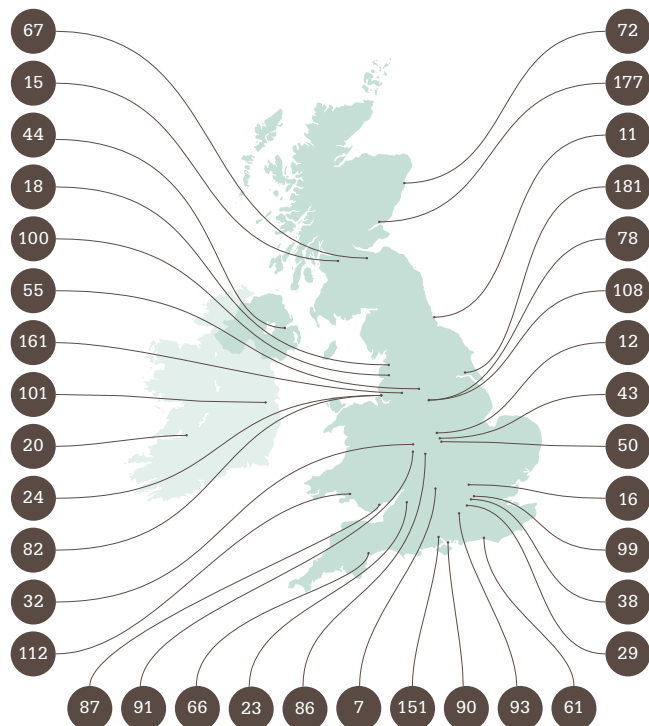


# CLASS 1 PARTICIPATING TEAMS

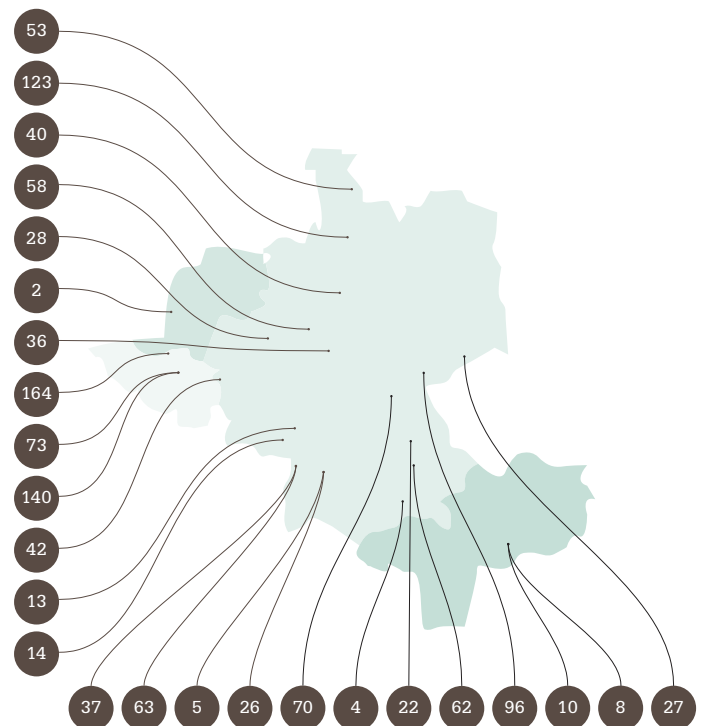
## WORLDWIDE



## UK & IRELAND



## GERMANY, AUSTRIA, SWITZERLAND & THE NETHERLANDS



01

CHALMERS UNIVERSITY OF TECHNOLOGY SWEDEN

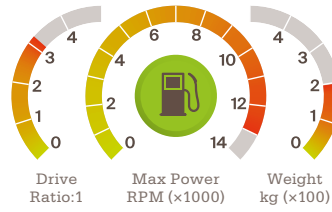


Starting with a new team every year, Chalmers Formula Student has a great challenge in front of us. Since last year's team was very successful, there is a lot of pressure to build an even better vehicle. To further increase performance, a thorough analysis of the factors that make a Formula Student car fast was undertaken. The result of this study was a vehicle weighing almost 20% less than in 2012, as well as increased aerodynamic downforce, all while maintaining high power output. Two major design decisions were large contributors to the decrease in weight. Firstly, going from a

tubular space frame to a space frame/carbon fibre hybrid, and secondly, using 10" instead of 13" wheels. The brilliant properties of carbon fibre have been used not only in the monocoque, but also in the rim shells, intake system, seat, and aerodynamic devices. A focus throughout the design phase has been to decrease weight, which has resulted in many eye catching light-weight solutions. The true goal of this project is to allow students to gain valuable experience in a real engineering project at a competitive level.

We deliver the engineers of tomorrow.

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 3040mm/1230mm/1410mm/1530mm

**Track** 1210mm/1210mm

**Car weight** 197kg

**Weight distribution** 125kg/140kg

**Suspension** Front: Double unequal length a-arms, pull rod actuated horizontally mounted dampers. Rear: Double unequal length a-arms, push rod actuated horizontally mounted dampers

**Tyres** 18.0x7.5-10 Hoosier

**Wheels** 10", 7.52" wide hybrid rim, Aluminum center piece, CFRP wheel shell

**Brakes** Front: 4 piston calipers, 190mm steel discs

**Rear: 2 piston calipers, 180mm steel discs**

**Chassis** Hybrid with steel tubular spaceframe rear, CFRP monocoque in front of main roll hoop

**Engine** Yamaha FZ6 in line four

**Bore/stroke/cylinders/cc** 65.5mm/44.5mm/4 cylinder/600cc

**Fuel type** 99 RON unleaded

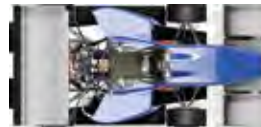
**Fuel system** Sequential port injection

**Max power/max torque** 65kW @ 13000rpm/63Nm @ 9000rpm

**Transmission** Single 428 chain

**Differential** Drexler limited slip differential

**Final drive** 3.20:1



02

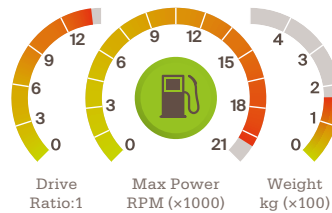
DELFT UNIVERSITY OF TECHNOLOGY THE NETHERLANDS



The Delft University of Technology (DUT) Racing Team consists of seventy students from different faculties of TU Delft. The team has a record of building lightweight and agile cars. The previous two years, the team took on the challenge of taking the lightweight concept to the electric racing class and implemented full torque vectoring with four-wheel-drive. This year, the team sought to integrate aerodynamics in the overall concept of the car. The DUT13 is the result of 12 years of experience, a systematic approach in

design and project management and a year of hard work by dedicated team members. By combining four-wheel-drive, aerodynamics and advanced control systems whilst sticking true to the Delft Concept ('lightweight, efficient and fast!') the team has been able to design their most competitive car so far. With features such as regenerative braking, slip ratio control, torque vectoring and a full-width 'venturi-tunnel', the DUT13 is a worthy addition to the DUT Racing fleet.

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2908mm/1072mm/1409mm/1530mm

**Track** 1200mm/1200mm

**Car weight** 169kg

**Weight distribution** 119kg/118kg

**Suspension** Double unequal length A-Arms. Front push rod actuated in-line SDS and rear direct actuated vertical SDS. No anti-roll bar.

**Tyres** 18x6 R10 Hoosier LC0

**Wheels** 10x7 two piece rim Al-CFRP

**Brakes** Aluminium composite. Full floating. 190mm diameter Chassis Hybrid with steel tubular spaceframe rear, CFRP monocoque in front of main roll hoop

**Chassis** Full composite monocoque with integral aluminium front hoop

**Engine** 4x modified AMK DT5-14-10. 20.000RPM

**Bore/stroke/cylinders/cc** -/-/-/-

**Fuel type** Electrons

**Fuel system** 6.3kWh, 144S2P LiPo

**Max power/max torque** 20000RPM/27Nm @ 8000RPM

**Transmission** Two stage fixed gearing (spur and planetary system)

**Differential** Active Yaw Rate Control

**Final drive** 14.25:1



## 04

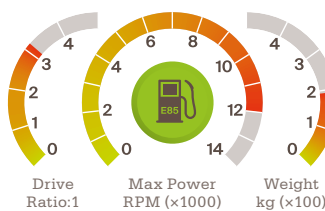
### TU MUNICH GERMANY



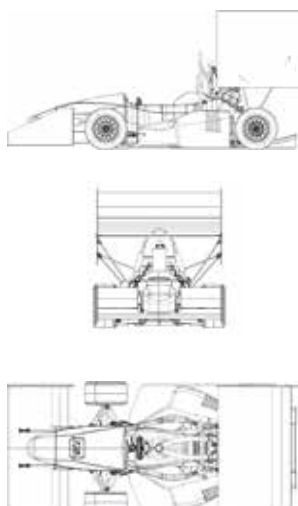
In September 2012, a team of 64 young and motivated students started to develop nb013 for the TUfast Racing Team. And after a lot of hard work we were proud to roll out the new car out of our shop in May 2013. Our main focus was developing a well-balanced car which could be successful in each discipline. For this we saved a lot of weight on many parts of

the car and added a full-blown aerodynamics package. We are excited to compete with all the other teams and get to know if they did a good job. And after a hard day full of work, we would be happy to chat with you guys about our car and have a good time. Just come over and visit us, we brought some specialties from Munich.

#### TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 3131mm/1458mm/1310mm/1580mm
- Track** 1150mm/1110mm
- Car weight** 192kg
- Weight distribution** 122kg/138kg
- Suspension** Double unequal length A-Arm. Pull rod actuated horizontally oriented Sachs spring/damper unit
- Tyres** Hoosier 19.5x7.5-10 R25B
- Wheels** 7.5x10, 3pc, CFRP Shells, Al Center
- Brakes** Front: 4 piston, 180mm dia. Rear: 2 piston, 156mm dia.
- Chassis** One piece monocoque
- Engine** 2007 Kawasaki ZX6-R, in line four
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** E85
- Fuel system** Two stage multipoint injection
- Max power/max torque** 68.5kW @ 12000rpm/60Nm @ 10000rpm
- Transmission** chain #520
- Differential** Drexler torque sensitive limited slip differential
- Final drive** 3.18:1



## 05

### UNIVERSITY OF STUTT GART GERMANY

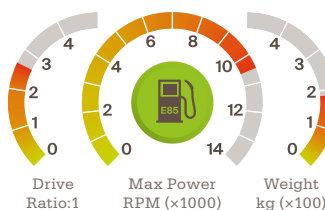


Rennteam Uni Stuttgart has been a German Formula Student participant since 2006, consisting of 41 students in the current F0711-8 team. Divided into six sub-teams, 32 technicians designed and developed the racing car, while the organisational team managed the work in the background. The racing car is powered by a 599cc Honda engine with four cylinders and up to 85hp. The chassis consists of a one piece monocoque in the front. The steel space frame was adjusted to the monocoque in order to achieve

good serviceability. It houses the engine and drivetrain. The new push-rod system at the front axis is a remarkable new development for the new F0711-8. Breaking with tradition, the F0711-8 was equipped with an aerodynamical kit, consisting of a front wing, a rear wing and a diffuser.

Breaking new ground with the F0711-8, the Rennteam Uni Stuttgart is looking forward to encountering new challenges and to replicating our previous successes.

#### TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 3000mm/1014mm/1350mm/1630mm
- Track** 1160mm/1140mm
- Car weight** 185kg
- Weight distribution** 122kg/131kg
- Suspension** Double unequal length A-Arms, push rod actuated spring and damper, U-type antiroll bar
- Tyres** 18.0x7.5-10 R25B Hoosier front and rear
- Wheels** 3 piece CFRP-aluminum rim
- Brakes** Front: floating discs, aluminum floaters, fixed mounted calipers, 195mm dia. Rear: 185mm dia.
- Chassis** One piece monocoque in the front, tubular steel spaceframe in the rear
- Engine** 2005 Honda CBR 600RR four stroke in line
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** E85
- Fuel system** Multi point fuel injection (8 injectors in two fuel rails)
- Max power/max torque** 85HP @10500rpm/65Nm @ 7500rpm
- Transmission** Single 520 chain
- Differential** Drexler Differential
- Final drive** 29:11





07

**OXFORD BROOKES UNIVERSITY  
UK**



OBR returns to Formula Student this year with our new car, Isis 13. Buoyed by the success of our top 10 finish in 2012, we've attempted to refine the strengths of the car that brought us our first silverware in five years and develop the weaker areas that were discovered at competition.

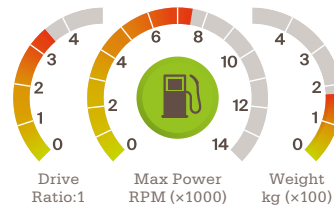
The car itself is very much an 'evolution, not revolution'. This was, in part, to help integrate new members into the project, having bid farewell to many of our most experienced members at graduation last summer. With some guidance

from alumni, we've worked on developing our tried-and-tested chassis to produce our first full aluminium monocoque.

Our development hasn't only been mechanical though. Aerodynamic devices make their first appearance on an Isis car for over 10 years. With our new diffuser we hope to boost overall car performance in autocross. After getting third place last year, it was felt that the car had more in reserve. We want to prove the car's potential by climbing to the top spot in 2013.



**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2716mm/1130mm/1280mm/1600mm
- Track** 1125mm/1095mm
- Car weight** 177kg
- Weight distribution** 85kg/92kg
- Suspension** FandR double unequal length wishbones w/pushrod actuated spring-dampers. Torsion FARB, T-Bar RARB
- Tyres** 20.0/6.2-R13 Avon FITO 9241 Front and Rear
- Wheels** 2pc Carbon Rim with 8 spoke aluminium centre, 14.2mm offset
- Brakes** F&R 220mm dia. Cast Iron discs, hub mount. Calipers - 4-pot/2-pot F/R.
- Chassis** Aluminium monocoque with steel roll hoops
- Engine** 2010 KTM 530 EXC
- Bore/stroke/cylinders/cc** 95mm/72mm/1 cylinder/510cc
- Fuel type** 99 RON Unleaded
- Fuel system** Bespoke single point fuel injection
- Max power/max torque** 37kW @ 7500rpm/52Nm @ 5250rpm
- Transmission** Single 520 chain
- Differential** Drexler LSD
- Final drive** 42:12

08

**UAS GRAZ  
AUSTRIA**

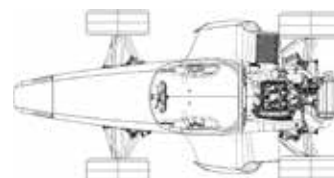
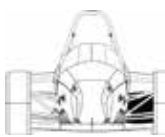
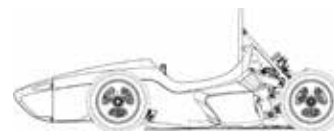
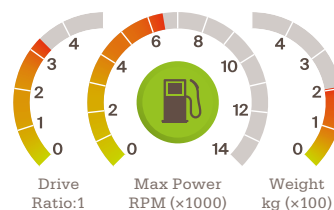


Joanneum Racing Graz is a highly motivated team from UAS Graz, Austria, known as 'The Weasels' due to our mascot. We have competed in Formula Student since 2004, building a new car every year. The team members change every year, which gives us new ideas and new passion, combined with the know-how of the experienced students. The basic team consists of approximately 25 automotive engineering students, supported by students from other courses.

As we traditionally use charged engines, the new car

is powered by a self-developed turbocharged 2-cylinder engine with direct injection. The chassis of the car is a lightweight single-piece CFRP-monocoque. Last year's car showed that the combination of a lightweight chassis and efficient but powerful turbocharged engine is competitive. The 2013 team has enhanced the engine technology and is keen on proving the competitiveness of our car. The team's goal is to surpass the achievements of the past years, to be even faster, even more innovative, true to our motto: beat the limits.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2725mm/1023mm/1423mm/1600mm
- Track** 1220mm/1080mm
- Car weight** 205kg
- Weight distribution** 120kg/153kg
- Suspension** Double unequal length A-Arm, pull rod actuated spring/damper (Oehlins TTX25), Adj. Roll bar
- Tyres** 20.5x7 R13 - Hoosier R25B
- Wheels** 6x13, 1 pc CFRP Rim
- Brakes** 4-Disk system, self developed rotors, adjustable brake balance
- Chassis** Lightweight single-piece CFRP-monocoque
- Engine** Self-designed 2-cylinder engine with turbocharger and direct injection
- Bore/stroke/cylinders/cc** 83mm/55mm/2 cylinder/595cc
- Fuel type** 98 RON
- Fuel system** High pressure direct injection with piezoelectric injectors
- Max power/max torque** 66kW @ 6500rpm/110Nm @ 4000rpm
- Transmission** 4-speed sequential gearbox
- Differential** 2010 Drexler LSD, integrated in gearbox
- Final drive** 3.313:1



# 10

## TU GRAZ AUSTRIA



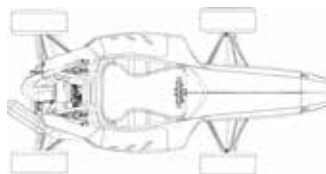
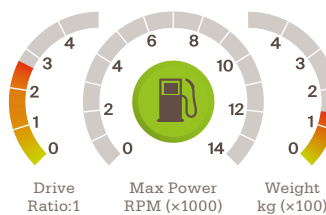
This year, the TUG Racing Team started with high hopes and expectations. We started off with our tenth anniversary celebrations, driving and comparing all the cars we have made in our long history. Then, when designing the new car, we took all the information we've gathered in those 10 years to build and optimise the new car, the TANKIA 2013.

For this season, we again concentrated on lightweight design. This resulted in a lot of newly designed parts for

our car. The newest TANKIA features 10 inch carbon rims, each weighing less than 800 grams, and a new steering rack made of carbon. We also used some of our old parts again, such as the titanium uprights and the multifunctional steering wheel. Livetelemetry and reliability were the main focus for our electronics team. The powertrain focused on improving and testing the 1-cylinder KTM engine we used in last year's car.



### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2678mm/1022mm/1375mm/1550mm

**Track** 1180mm/1150mm

**Car weight** 141kg

**Weight distribution** 107kg/102kg

**Suspension** Unequal length a-arms, front pull/rear push rod and bell crank actuated 4-way adjustable dampers

**Tyres** 18x6.0-10 Hoosier LCO

**Wheels** 6.5" wide, 2pc CFRP-rim

**Brakes** 4-disc system, self designed steel rotors, adjustable brake balance

**Chassis** One piece CFRP monocoque

**Engine** 2013/KTM 500 EXC

**Bore/stroke/cylinders/cc**  
95mm/72mm/1 cylinder/500cc

**Fuel type** 100 RON unleaded

**Fuel system** Student designed and built fuel injection, 2-spray preparation

**Max power/max torque**  
61 @ 7000rpm/9500

**Transmission** Single 520 Chain

**Differential** Drexler, multiplate limited slip differential

**Final drive** 12:32

# 11

## UNIVERSITY OF SUNDERLAND UK



The 2013 SU racing car is a novel design intended to provide high performance at a seriously low cost. To achieve this, the vehicle is designed to use 'off the shelf' standard parts wherever possible, integrated with specially designed interchangeable components in key areas, such as the suspension system. This offers key advantages both in terms of reduced manufacturing cost, and requires a low spares inventory for racing.

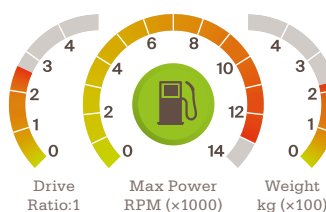
The base vehicle is designed to enable the customer to tune the vehicle to suit their particular events and, equally

importantly, the size of their racing budget. There are also a number of adjustable features on the vehicle, and some are reconfigurable to suit the individual needs of the user.

Our team consists of students in first, second and third years. We have team members not only from engineering, but also from departments as varied as primary education and media. Many of our team members have automotive or motorsport backgrounds and some of the third year automotive students have based their final project on the 2013 car.



### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
3097mm/1165mm/1273mm/1335mm

**Track** 1210mm/1334mm

**Car weight** 220kg

**Weight distribution** 115.2kg/172.8kg

**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper / Double equal length A-Arm. Push rod / pull rod actuated horizontally oriented spring and damper

**Tyres** 7.2/20.0-13 Avon / 7.2/20.0-13 Avon

**Wheels** 177.8mm wide 1 pc Al rim

**Brakes** Cast Iron, hub mounted, 220mm dia. Drilled / Cast Iron, hub mounted, 220mm dia. Drilled

**Chassis** One piece tubular spaceframe

**Engine** 2011 Aprilia SXV 550 V-Twin

**Bore/stroke/cylinders/cc**  
80mm/55mm/2 cylinder/549cc

**Fuel type** 99 RON unleaded

**Fuel system** Aprilia multi point fuel injection

**Max power/max torque** 52.2kW @ 13000rpm/65.9Nm @ 10900rpm

**Transmission** Single 520 chain

**Differential** Drexler limited slip differential

**Final drive** 2.6:1

12

LOUGHBOROUGH UNIVERSITY  
UK



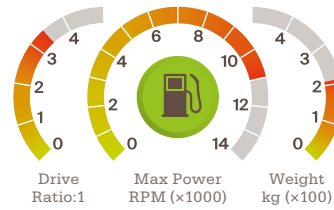
LUMotorsport is proud to present LFS13, its first all-new car in four years. The team has pushed hard this year to achieve this, and is confident that it will bring great success. The engine remains unchanged, the venerable Honda CBR600RR unit; however, the chassis, suspension and driveline have all received major overhauls.

The ethos with LFS13 is for simplicity. With this in mind, the new suspension design does away with anti-roll bars in favour of innovatively designed quick-change rockers. Significant weight savings in the

steel spaceframe chassis, billet aluminium uprights, wheels, bodywork and wiring loom have resulted in our lightest car ever.

The team at Loughborough operates as a small close-knit group, voluntarily and entirely in our spare time. This breeds impeccable care and attention to detail in every single component, ensuring a strong pride in what we produce. We will be attending both Silverstone and Hockenheim this year, and as ever aim to place top UK university and top 10 overall at each.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2800mm/1020mm/735mm/1535mm
- Track** 1300mm/1180mm
- Car weight** 210kg
- Weight distribution** 139kg/139kg
- Suspension** Double unequal A-Arm, pull rod front, push rod rear, Ohlins Cane Creek FSAE Spring Damper Unit
- Tyres** Hoosier R25A 20.5"x7"-13"
- Wheels** Braid 2 Piece 13"x7"
- Brakes** Front: 4 Pot AP Caliper, 220mm OD 4mm Steel Drilled Disc. Rear: 2 Pot AP Caliper, 205mm OD 4mm Steel Drilled Disc
- Chassis** Tubular spaceframe (Hybrid CDS and T45) with Tubular Rear Plate
- Engine** Honda CBR600RR10 Four Stroke In Line Four
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** 98RON
- Fuel system** Custom MPI
- Max power/max torque** 73bhp @ 11000rpm/61Nm @ 7000rpm
- Transmission** Single 520 Chain
- Differential** Drexler FSAE LSD Mk1
- Final drive** 24:7



MIRA ACADEMY

# Graduate Training Vacancies

We are looking for applications from individuals who are currently studying toward (or have been awarded) a fully accredited degree recognised for Chartered Engineer by the Engineering Council, in one of the following disciplines:

- Mechanical Engineering
- Automotive Engineering
- Electrical Engineering
- Electronic Engineering
- Mechatronics
- Maths
- Physics

## MIRA Graduate Training Scheme – Chartered Engineer

Typically, our Graduate Trainees follow a recognised development scheme which normally incorporates an initial two-year period, throughout which each Graduate Trainee spends time on various placements within the engineering departments. We find that on-the-job training is key to gaining knowledge of the core processes of the business. Towards the end of the two years, the Graduate Trainee would then apply for a permanent placement within the company and continue to develop in such a way as to be eligible to register with the Engineering Council.

Throughout the training scheme each Graduate Trainee is supported by MIRA to ensure they meet the requirements of the relevant engineering institution. We also work with our Graduate Trainees to ensure they have met all of the requirements to apply for and obtain Chartered Status.

Training will be provided in various forms e.g. on and off-the-job, coaching, mentoring as well as internal and external training courses. This training will provide information not just about the engineering aspects of the job, but will also cover essential business skills.

### Objectives of the Scheme

- To provide Graduate Trainees with the opportunities to explore the various specialities and technical fields available within MIRA
- To provide a structured training scheme which allows Graduate Trainees to make a significant professional contribution to our business
- To develop Graduate Trainees to a level of performance necessary to fulfil a permanent role within a key engineering department

### Further Information

For further information, please contact:  
**Beccy Atkin** Senior Personnel Officer  
**T:** +44 (0)24 7635 5610  
**E:** beccy.atkin@mira.co.uk



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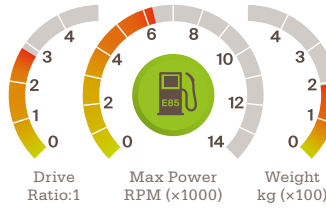
**KARLSRUHE INSTITUTE OF TECHNOLOGY GERMANY**



Being a team of about 70 students, KA-RaceIng from the Karlsruhe Institute of Technology (KIT) is organised in different subteams (eg suspension, monocoque, ...) with their own team leaders, and is designing and building two cars with one single team every year: one with a combustion engine and one with an electric drivetrain. The KIT13c is our seventh combustion car, the KIT13e is our fourth electric car and both combine the best of new ideas and validated concepts of the last years.

The KIT13c is the further development of the KIT12, which was developed with the design philosophy of simplicity, reliability and performance. The KIT13c runs a self designed two cylinder, turbocharged engine with a spray-guided piezo direct injection. Also a full aero package, a weight reduced (>5%) chassis and an easy tunable suspension system provide a well-rounded competitive car. With one of the earliest assembly completions in recent team history, plenty of time has been spent testing and tuning the car for reliability and overall success.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 3215mm/1369mm/1407mm/1565mm
- Track** 1220mm/1150mm
- Car weight** 195kg
- Weight distribution** 118.3kg/144.65kg
- Suspension** Front: Double unequal length A-Arms. Pull rod actuated KAZ damper with coil spring. Rear: Double unequal length A-Arms. Push rod actuated KAZ damper with coil spring
- Tyres** Front:Hoosier 20.5x7 R13 R25B Rear:Hoosier 20x7.5 R13 R25B
- Wheels** Student designed/ built CFRP rim 7x13"
- Brakes** Floating carbon-steel, hub mounted. Front: four piston monoblock caliper. Rear: two piston caliper
- Chassis** Front: Carbonfiber Monocoque. Rear: Space frame
- Engine** Student designed/ built AMG FS133
- Bore/stroke/cylinders/cc** 83mm/55mm/2/595
- Fuel type** E85
- Fuel system** Spray-guided piezo direct injection
- Max power/max torque** 70kW @ 6300rpm/120Nm @ 4800rpm
- Transmission** spur gear stage
- Differential** Drexler clutch pack limited slip differential, preloaded, adjustable bias ratios
- Final drive** 2.83:1



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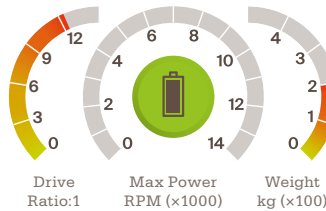
**KARLSRUHE INSTITUTE OF TECHNOLOGY GERMANY**



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The KIT13e is our first four-wheel drive car. The four motors are mounted to the chassis to reduce unsprung masses. We changed from 13 inch rims to 10 inch rims for that we made a new rim with a CFRP-rim base and an alloy rim star. To use the advantages of the four wheel drive we are working on improved traction control and a torque vectoring. For the new cars we developed an electrical actuated DRS in the rear wing.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 3035mm/1177mm/1430mm/1530mm
- Track** 1220mm/1150mm
- Car weight** 200kg
- Weight distribution** 126kg/142kg
- Suspension** CFRP-double A-Arm with Alloy Ends, uprights: FA: milled Alloy; RA: welded Steel sheet
- Tyres** Hoosier 18x7.5-10 R25B/ Hoosier 18x7.5-10 R25B
- Wheels** CFRP rim base, alloy rim star
- Brakes** Ventilated discs, two pistons brake caliper (FA/RA)
- Chassis** CFRP-Monocoque (Singlechassis)
- Engine** 4 IPM-Motors
- Bore/stroke/cylinders/cc** -/-/-/-
- Fuel type** Green race electrons
- Fuel system** Li-Po Battery
- Max power/max torque** 84kW/1110Nm
- Transmission** Two stages, planetary gear – spur gear
- Differential** None
- Final drive** 12.4:1



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UNIVERSITY OF STRATHCLYDE UK



USM's 13th Formula Student entry is the team's first ground-up redesign since its formation in 1999. Our car features a Suzuki LT-R450 single-cylinder engine and Hoosier 10" tyres. This year we focused more on cost and reliability while improving on-track performance, working closely with University of South Florida Racing to ensure a smooth transition to the new engine and sharing time, experience and resources to develop a collaborative engine package.

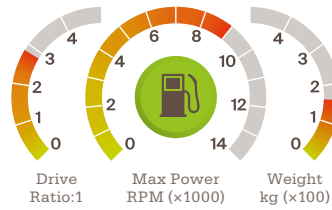
After winning the Cost Analysis event at FSG2012, USM are determined to maintain

a strong performance in static events for 2013. The team has worked hard to improve knowledge transfer by restructuring into technical sub-groups, compiling a comprehensive Engineering Report and establishing a dedicated IT suite with support from the University of Strathclyde Alumni Fund.

University of Strathclyde Motorsport would like to extend their thanks and gratitude to all team sponsors, partners and supporters. Without their help the team would not be able to compete at Formula Student competitions year after year.



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2488mm/1067mm/1413mm/1535mm

**Track** 1200mm/1180mm

**Car weight** 160kg

**Weight distribution** 114kg/114kg

**Suspension** Unequal length A-Arms. Front pull rod/rear push rod actuated spring/damper units

**Tyres** Hoosier LC0 6.0/18-10"

**Wheels** DWT Alumilite Sport Blue Label

**Brakes** Fully-floating cast iron rotors, Ø184mm, drilled, ISR 22-048/Wilwood PS-1 front/rear calipers

**Chassis** One piece TIG welded tubular mild steel spaceframe

**Engine** 2006 / Suzuki LT-R450K6

**Bore/stroke/cylinders/cc** 95.5mm/62.8mm/1 cylinder/450cc

**Fuel type** 99 RON Unleaded

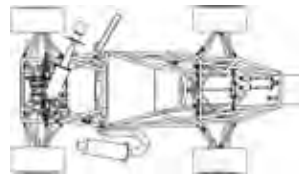
**Fuel system** Student designed fuel injection

**Max power/max torque** 41.75kW @ 9000rpm/44.05Nm @ 8000rpm

**Transmission** Single 525 Chain

**Differential** Drexler limited slip differential

**Final drive** 2.8:1



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UNIVERSITY OF HERTFORDSHIRE UK

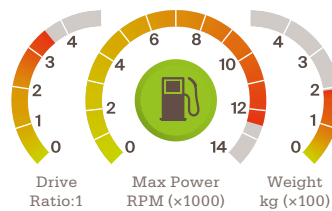


UH Racing has only one aim and that is to become the first UK team to win Formula Student UK. With a competitive performance in 2012, UH Racing looks to only improve. With a large team and a well-defined managerial structure combined with the broad range of knowledge from our 30 team members, UH Racing will once again be

a strong contender. Drawing upon a wealth of existing Formula Student knowledge the team has defined strict performance targets for each vehicle subsystem. This year the team continues to improve static event performance, while regularly reviewing vehicle design to ensure that we fulfil our maximum potential.



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2934mm/1125mm/1423mm/1550mm

**Track** 1190mm/1140mm

**Car weight** 195kg

**Weight distribution** 127kg/135kg

**Suspension** Double unequal length A-Arm. Pull and push rod actuated spring and coil-over damper, adjustable ARB.

**Tyres** 18.0"x6.0" - R25B Hoosier

**Wheels** 177.8mm

**Brakes** 2 piece steel tubular space-frame with bonded composite floor panel.

**Chassis** Yamaha YZF-R6

**Engine** 2006 / Suzuki LT-R450K6

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** 99 RON Unleaded

**Fuel system** Student design/built, multi-point fuel injection

**Max power/max torque** 65kW @ 12500rpm/58 @ 9000rpm

**Transmission** Single 520 Chain

**Differential** Salisbury Type Student Designed Adjustable Diff.

**Final drive** 11:39



17

**NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY NORWAY**

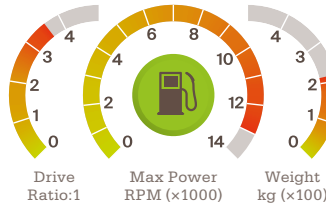


Revolve NTNU is a highly motivated and passionate team of 46 students from ten different engineering disciplines. Revolve NTNU is competing in Formula Student for the second time. The first year was very successful, and they won Best Newcomer at FSUK 2012. This year the team has built a faster and lighter car by improving and further developing last year's design. In addition, the car has plenty of new features. The team has expanded their focus on electronics, and also estab-

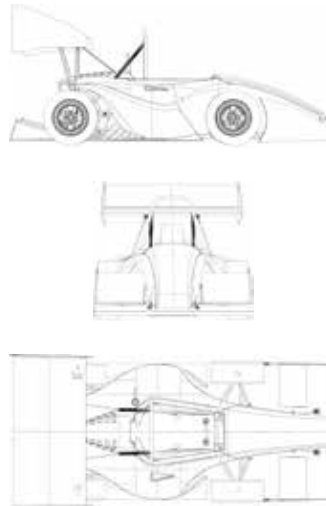
lished a group that works with aerodynamics. The research and development group is developing electronically adjustable dampers for this year's car.

The team is not just focusing on developing a fast car, but also the way the students work as a team and help them become the best engineers possible. Revolve NTNU think it is important for the students to get work experience through their studies. Revolve NTNU has great expectations for this year's competition.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 3212mm/1371mm/1432mm/1566mm
- Track** 1178mm/1178mm
- Car weight** 217kg
- Weight distribution** 138kg/150kg
- Suspension** Double wishbone. Pull rod actuated horizontally/Pull rod. Electronically adjustable dampers
- Tyres** Hoosier 521x178-300mm, R25B
- Wheels** 3 pc Aluminium with magnesium centre
- Brakes** Cast iron, hub mounted, 235mm front diameter and 215mm rear diameter
- Chassis** One piece tubular spaceframe
- Engine** Suzuki GSX-R 600 four stroke
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** 98 octane unleaded gasoline
- Fuel system** DTA S80 sequential fuel injection, stock injectors
- Max power/max torque** 90bhp @ 13000rpm/60Nm @ 7500rpm
- Transmission** Chain drive, Original gearbox, modified gear drum
- Differential** Drexler, limited slip differential
- Final drive** 3.62:1



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**LANCASTER UNIVERSITY UK**



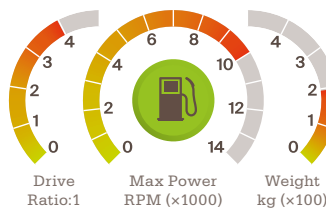
Lancaster Racing Team (LRT) is now in its fourteenth year and consists of thirteen fourth year engineering students studying for a Masters degree at Lancaster University. Each team member has been allocated a technical and non-technical role to ensure all aspects of the project are covered before competing in Formula Student 2013 in July.

The 2013 design has been focused on reliability in key areas to meet the team's objective and score consistently in all events. A key feature for LRT is a unique suspension system, Lancaster Links, which

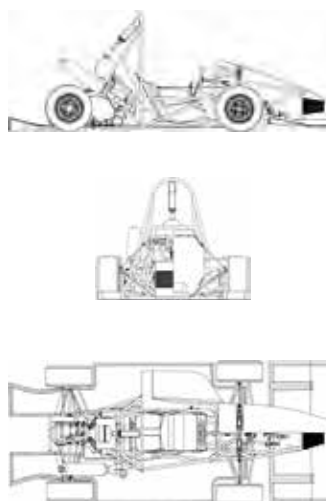
provides an alternative take on wishbone design to maintain optimum camber through cornering. Although the focus has been on reliability, the obvious development with the 2013 car is a carbon fibre floor pan and diffuser.

LRT would like to take this opportunity to thank all of our partners including Caparo, SeaTechnik, Moravia Steel, Shermanes Engineering and MSL Motor Vehicle Preparations. Their support has been vital and we look forward to arriving at Silverstone with a competitive race car, aiming to finish in the top twenty teams.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2800mm/1315mm/1400mm/1650mm
- Track** 1240mm/1150mm
- Car weight** 195kg
- Weight distribution** 121.8kg/141.2kg
- Suspension** Push rod actuated 'Lancaster Links' split system
- Tyres** 18.0x6.0x10" Hoosier R25B
- Wheels** 10" wide Keizer Al rim
- Brakes** Front: Wilwood PS-1. Rear: AP Racing 7003-2S0 with vented disks
- Chassis** Two peice steel tubular spaceframe
- Engine** Honda CBR600RR 07/08
- Bore/stroke/cylinders/cc** 67mm/42.5mm/ In-line 4 cylinders/599cc
- Fuel type** 99 RON unleaded
- Fuel system** Honda multiport fuel injection
- Max power/max torque** 64kW @ 10000rpm/60Nm @ 10000rpm
- Transmission** Single 520 chain
- Differential** Torsen T2
- Final drive** 4:1



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## ARISTOTLE UNIVERSITY OF THESSALONIKI GREECE

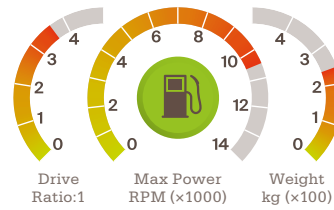


Aristotle Racing Team (ART) was formed in 2006 by a group of mechanical engineering students at the Aristotle University of Thessaloniki, Greece. Since its creation, ART has managed to develop two racing vehicles which competed in several European FSAE events. Having gathered knowledge and experience over the past years, ART has set forth on designing its third project. The current team consists of 26 members and

aims at developing a competitive single-seater. The team's design philosophy is centred around a lightweight and reliable construction. The latest vehicle features a chromo-moly tubular frame and redesigned suspension geometry. The frame houses a Honda CBR engine accompanied by a team-built dry sump lubrication system. It is the ambition of the team to succeed in FS 2013 by achieving another high overall ranking.



### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2691mm/1082mm/1387mm/1600mm  
**Track** 1230mm/1180mm  
**Car weight** 241kg  
**Weight distribution** 145kg/164kg  
**Suspension** Double unequal length A-Arm, pull rod/push rod actuated horizontally oriented spring and damper  
**Tyres** 6.2x20 R13 A45 Avon front, 7.2x20 R13 A45 Avon rear  
**Wheels** 6.0x13, +18mm offset, 2 pc Alloy Rim front, 8.0x13, +31mm offset, 2 pc Alloy Rim rear  
**Brakes** Floating, Steel, hub mounted. Front: 240mm outer diam., 184mm inner diam., grooved. Front: 220mm outer diam., 164mm inner diam., grooved  
**Chassis** Tubular space frame with rear aluminum plate  
**Engine** 2007 Honda CBR 600 RR 4 cylinder (PC40)  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599.4cc  
**Fuel type** Petrol  
**Fuel system** Student designed/built, fuel injection, sequential  
**Max power/max torque** 72hp @ 10500rpm/60Nm @ 7500rpm  
**Transmission** single 525 chain  
**Differential** Drexler limited speed Formula Student 2010  
**Final drive** 3.66:1

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## UNIVERSITY OF LIMERICK IRELAND



2013 is Limerick's second year in Class 1. We have completely redesigned our car, learning from team members in 2011/2012. We focused on the weaker aspects of the 2012 car and made improving them a priority. This year we have an improved chassis, in particular the rear. With the addition of a sub-frame with multiple detachable mounting points for components, we hope to remove most of last year's excess weight and run a lighter, faster car.

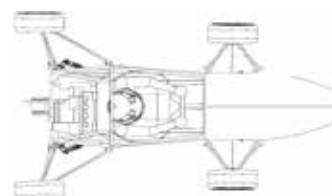
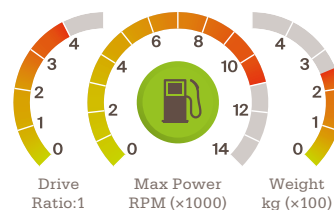
Thanks to the generous support from the Faculty of Science and Engineering at the

University of Limerick, we hope to become the top Irish team in Formula Student in the near future. We have an excellent team of volunteers, ranging from first year to postgraduate, who spend a large amount of their free time working on the project.

We recruit members from the entire faculty, which allows us to develop specialists in each aspect of the car. Our main objective is to set a solid foundation for our future members, helping them to develop our future cars into leading Formula Student cars.



### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2800mm/1010mm/1590mm/1650mm  
**Track** 1375mm/1560mm  
**Car weight** 250kg  
**Weight distribution** 135kg/185kg  
**Suspension** Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper on all wheels  
**Tyres** Dunlop S04 13" 170/510 and 210/570  
**Wheels** JB Wheels Superlights 13x7/13x9  
**Brakes** Hub mounted 200mm dia. vented disks  
**Chassis** T45 Steel tubular spaceframe with CNC milled aluminium rear subframe  
**Engine** 2003/Honda CBR600 Fri four stroke in line four  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 99 RON unleaded  
**Fuel system** DTA Fast ECU - Fuel injection  
**Max power/max torque** 47kW @ 11000rpm/55Nm @ 8200rpm  
**Transmission** 520 chain  
**Differential** Quaife Chain-drive sealed ATB Helical LSD differential (QDF7ZR)  
**Final drive** 4:1

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UNIVERSITY OF SOUTHERN DENMARK  
DENMARK

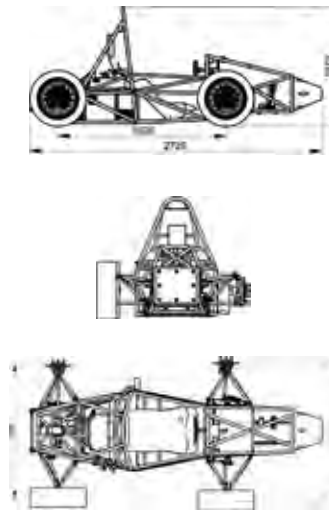
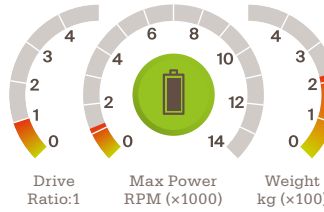


The current car is the sixth generation of the Viking cars. It has been developed by a team of 21 mechanical students and 19 electronic students. New features on this year's car include regenerative braking, along with a sophisticated traction control system in order to tame the 750 Nm that the motor produces. One of the major changes from last year's car has been to switch from

Li-ion batteries to Li-Po, which has a higher energy density. This, along with the regenerative braking, makes it possible to reduce the total weight of the car and make it more competitive. That is also why the main objective for the Viking VI is to end up in the top 10. We are convinced that this year's car is most competitive car so far, so we are very much looking forward to the competition.



TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2725mm/1073mm/1426mm/1535mm
- Track** 1250mm/1200mm
- Car weight** 218kg
- Weight distribution** 120kg/166kg
- Suspension** Double unequal length A-arms. Pull rod actuated horizontally oriented spring and damper
- Tyres** Hoosier 20.5x7x13 R25B
- Wheels** Hoosier 20.5x6x13 R25B
- Brakes** Full floating hub mounted Ø240mm custom discs. 4 piston calipers, adjustable brake balance
- Chassis** One piece tubular spaceframe
- Engine** Yasa-750
- Bore/stroke/cylinders/cc** -/-/-
- Fuel type** Electricity
- Fuel system** Sevcon Gen4 Size 8
- Max power/max torque** 100kW @ 380V/750Nm @ 360A
- Transmission** N/A
- Differential** Drexler 2010 V1 limited slip differential
- Final drive** 1:1

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UAS AMBERG-WEIDEN  
GERMANY



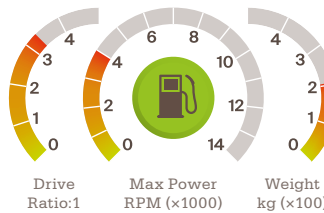
Since the foundation of the Running Snail Racing Team in 2004, the existing knowledge base has been used for the construction of the racecar and is continuously being expanded. Aside from our annual gain in students, the racing team is continuously increasing in development and innovation. The enormous extra work that every member of the team achieves overruns the dimension of effort of a normal student by far. This is how unexpected revolutions occur in automotive engineer-

ing as well as in marketing and organisational strategies. References for these are our full monocoque, the electric powertrain and the worldwide unique empty wheel carrier, as well as the considerable organisational effort that is necessary to keep driving this project on successfully.

Our previous achievements show how far the aid of our partners allowed us to proceed, for this we want to say thank you at this point.



TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2518mm/1230mm/1408mm/1540mm
- Track** 1210mm/1150mm
- Car weight** 204kg
- Weight distribution** 128kg/144kg
- Suspension** Double unequal length custom winded A-Arms. Pull rod actuated Öhlins TTX25 damper with custom springs. Front: Innovative hubless Uprights. Rear: Laser sintered Aluminium Uprights
- Tyres** 20.5x7.0-13 RB25 Hoosier
- Wheels** 1 pc CFRP Rimbase (front)/2 pc CFRP Rimbase & Aluminium Rimcenter
- Brakes** Front: two 2 piston ISR calipers, selfmade brake disks (perimeter arrangement). Rear: two 2 piston ISR calipers, selfmade brakedisks (tripod housing mounted)
- Chassis** Full CFRP monocoque, aluminium front hoop
- Engine** Enstroj Emrax LC
- Bore/stroke/cylinders/cc** -/-/-
- Fuel type** N/A
- Fuel system** N/A
- Max power/max torque** 85Kw @ 4000rpm/220Nm
- Transmission** DID 520 ERT 2
- Differential** Drexler limited slip Formula Student differential
- Final drive** 3.3:1



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UNIVERSITY OF BATH  
UK

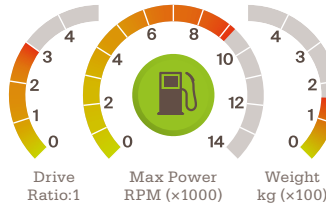


Team Bath Racing are entering the 2013 with high hopes for their 13th entry into Formula Student. For the first time, a CFRP monocoque and rear steel space frame chassis forms the foundation of the TBR13 vehicle. Coupled with a now well-established and lightweight Aprilia RXV550 powertrain, the team believe that they have the perfect balance between innovation and reliability, in a package that is not only lighter but also considerably stiffer than the previous 2012 Team Bath Racing entry.

As well as the move to a hybrid composite chassis,

advancements in vehicle aerodynamics, vehicle dynamics and powertrain systems such as variable intake geometry mean that the team of 25 engineers are building on the success of vehicles from previous years (including a fourth place at the 2012 Austrian competition) to ensure that they remain one of the top Formula Student teams in the UK. The advancements made by Team Bath Racing have remained possible due to the continued support of lead sponsor BP, as well as generous backing from other sponsors such as Williams Advanced Engineering and Cosworth.

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2845mm/1194mm/1324mm/1535mm

**Track** 1118mm/1050mm

**Car weight** 160kg

**Weight distribution** 116kg/112kg

**Suspension** Double wishbone, pull (F) and push (R) rod actuated coil-over damper, with anti-roll bars

**Tyres** Hoosier 18.0/6.0-10 LC0

**Wheels** CFRP with Aluminium centre, 254mm wide

**Brakes** Steel, hub mounted 180mm dia. Front: inboard 160mm dia. Rear: cross-drilled

**Chassis** Hybrid front CFRP and Al honeycomb monocoque and rear steel tubular space frame

**Engine** Aprilia RXV550 four stroke V-twin

**Bore/stroke/cylinders/cc**  
80mm/55mm/2 cylinder/552cc

**Fuel type** 99 RON unleaded

**Fuel system** Aprilia Fuel Injection

**Max power/max torque** 43kW @ 9250rpm/57Nm @ 5500rpm

**Transmission** Chain drive

**Differential** Drexler V3 Limited Slip Differential

**Final drive** 3:1



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UNIVERSITY OF LIVERPOOL  
UK



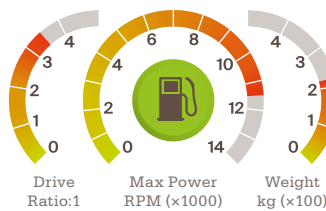
ULM are proud to be competing with our eighth car. Since 2005, we have competed at Silverstone and, in more recent years, at international events also. This year's team of nearly 40 comprises primarily third and fourth year MEng students.

Our 2013 strategy has been focused on striving for design optimisation. ULM008, this year's car, has been designed with both dynamic performance and product viability as priorities. The team has moved to a 4 cylinder engine to deliver the power and reliability required

for competition, with a student designed sump ensuring it is perfectly suited to the car. Dynamic performance has been a particular focus for the driver integration, which includes a reclined driver position and use of more dedicated race controls. The team's move to CFRP bodywork has resulted in a stunningly sleek car, whilst allowing for a reduced overall weight.

The team wish to thank their sponsors for their continued support. Without their help, the team's efforts would not be possible.

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2930mm/1150mm/1430mm/1700mm

**Track** 1220mm/1180mm

**Car weight** 220kg

**Weight distribution** 140kg/148kg

**Suspension** Double, unequal, non-parallel A-Arm suspension, pullrod-actuated Ohlins shock absorbers

**Tyres** R25B Hoosier

**Wheels** 7" Aluminium split-rim, custom Al 2014 centre

**Brakes** AP Racing, double POT front, single POT rear, 220mm dia.

**Chassis** One piece tubular spaceframe

**Engine** 2008 Yamaha YZF R6

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599cc

**Fuel type** 98 RON unleaded

**Fuel system** Multi-point injection system with DTA S80 ECU

**Max power/max torque** 60kW @ 11,500rpm/57Nm @ 9000rpm

**Transmission** Single 520 chain

**Differential** 2010 FSAE Drexler LSD

**Final drive** 3.46:1



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## INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY INDIA

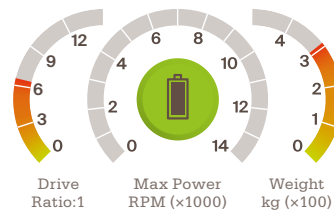


This is the second time IIT Bombay Racing is participating in Formula Student UK. Based on our capability and leveraging on last year's experience, we have focused all our energies into making the 2013 season a glorious one. We'd like to specially mention our sponsors NRB Bearings, Agni Motors, Bosch and IIT Bombay for believing in our efforts.

Pat Clarke told us "To finish first, you have to first finish". So, IIT Bombay Racing has approached Formula Student 2013 with the modest ambition of completing all events.

The milestones achieved during the season were: implementation of an active Electronic Differential system for optimum vehicle handling; following set timelines for the design process despite heavy academic commitments; establishing a Content Management System with formal protocols for making and storing designs, documentation, online discussions and maintaining project timelines; weekly design reviews and establishing the Freshmen Summer Internship programme. The best performers are invited to become Junior Engineers for the team.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2416mm/1256mm/1398mm/1560mm  
**Track** 1245mm/1245mm  
**Car weight** 310kg  
**Weight distribution** 174kg/204kg  
**Suspension** Double unequal length A-Arm. Push rod/Pull rod actuated horizontally oriented spring and damper  
**Tyres** 521x152-330 Hoosier  
**Wheels** 140mm wide, Single piece Al Alloy Rim  
**Brakes** Cast Iron, hub mounted, 240mm dia. Drilled  
**Chassis** Tubular Steel Spaceframe  
**Engine** Agni Motors Permanent Magnet DC  
**Bore/stroke/cylinders/cc** Max rpm 6000; Rear wheels driven independently/-/-/  
**Fuel type** Electric  
**Fuel system** LiPo pouch cells; 20s (2 such batteries in parallel); Nominal Voltage 74V; Peak Voltage 84V; Capacity 64Ah (one cell); Total Energy 9.4Kwh  
**Max power/max torque** 30kW (per motor)/54Nm @ 5600rpm (per motor)  
**Transmission** 2-step gearbox with helical gears  
**Differential** Electronic Differential Slip Control with RPM ratio control  
**Final drive** 6.51:1



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## UNIVERSITY OF STUTTGART GERMANY



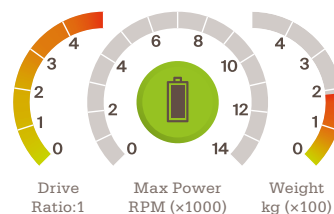
The GreenTeam Uni Stuttgart e.V. was founded in 2010, one of the first FS electric teams. Our team consists of 25 engineers and 10 members for organisation.

We developed our car using a sustainable scientific approach, improving performance and constantly reducing production costs through our own developments, for example in electronics. When planning our new car, the E4, we pictured the perfect electric racecar: reliable, energy-efficient and with advanced vehicle dynamics. To do this, we have changed

nearly every part of our car: new monocoque, 10" wheels, 4WD, self-developed motors, full aerodynamic package and a straight lightweight design, as well as a self-designed control unit and accumulator management system. We made these changes to defend our position as the best German electric team and to try to become world champion.

The GreenTeam Uni Stuttgart e.V. is sponsored by Daimler AG, AMK, Dekra and many more companies which believe in our project and support our passion for engineering.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2900mm/1074mm/1413mm/1530mm  
**Track** 1210mm/1160mm  
**Car weight** 190kg  
**Weight distribution** 126kg/132kg  
**Suspension** double unequal length A-Arm, pushrod actuated nearly horizontally oriented spring and damper  
**Tyres** 457x190.5 Hoosier  
**Wheels** 177.8mm wide, 3 part hybrid rims (carbon rim well, aluminum star)  
**Brakes** alloy steel disc, 190mm diameter drilled  
**Chassis** full carbon fibre monocoque  
**Engine** Electric motor spec (permanent magnet synchronous machine)  
**Bore/stroke/cylinders/cc** -/-/-/  
**Fuel type** Electric  
**Fuel system** Electric  
**Max power/max torque** 92kW/1010rpm  
**Transmission** Front: planetary gear. Rear: spur gears  
**Differential** electronic torque vectoring  
**Final drive** Front: 7.4:1, Rear: 6.5:1



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### TU DRESDEN GERMANY



Elbflorace consists of 60 members developing a race car. Although about 95% of the team is male, we are proud to have a female Team Captain. She is responsible for co-ordinating the entire project and represents the team. She is supported by our Chief Engineer and the technical and economical division manager.

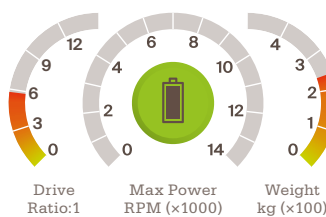
Evolution is a big theme this year. The third electric race car will pay tribute to what worked well in the past and surprise with new, innovative parts and qualities. We refined our self-developed

Battery Management System and improved bonding of the advanced cells by switching to a crimp connection. That makes it possible to change a single cell without wasting a whole stack of 24 cells. We increased the maximum performance of the engine from 72kW to 100kW. The motors and inverters are easier to maintain and we also will use them by 600V to be more efficient.

With our guideline "E-Star" (Education, Safety, Team, Award and Reliability) we expect a successful season in 2013.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2600mm/1150mm/1380mm/1550mm

**Track** 1200mm/1150mm

**Car weight** 240kg

**Weight distribution** 144kg/164kg

**Suspension** Front: double unequal length A-Arm, pull-rod actuated, vertically orientated damper/spring. Rear – double unequal length A-Arm, push-rod actuated, vertically orientated damper/spring

**Tyres** 205/510 R 13 Conti

**Wheels** 6.5x13, 3 piece, aluminium, central nut

**Brakes** Alloy steel brake discs, hub mounted, dia. f/r: 239mm/235mm, drilled. Front: 4-piston caliper front. Rear: 2 piston caliper

**Chassis** monocoque

**Engine** Siemens 1FE1 permanently excited synchronous motor

**Bore/stroke/cylinders/cc** -/-/-/-

**Fuel type** Electric power

**Fuel system** -

**Max power/max torque** 85kW/105Nm

**Transmission** 1:5.8

**Differential** Electric

**Final drive** 5.8:1

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### UNIVERSITY OF KASSEL GERMANY

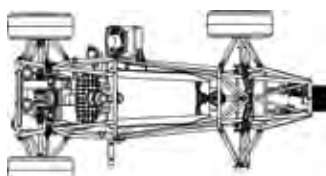
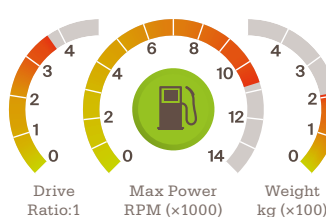


The Herkules Racing Team of the University of Kassel was founded in 2009 and has participated in the Formula Student competition since 2011. After the great success we achieved with our last two cars, we are looking forward to compete in 2013 with an even better developed and lighter car. To accomplish this goal we build on the experience we have

gained within the last three years to improve our existing concepts and to significantly reduce our identified weaknesses. Besides our ambition to get into the top 20 this season, it is our intention to create and provide a basis which drives a continuous improvement of our team and car to open the door for ongoing success.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2750mm/1109mm/1400mm/1620mm

**Track** 1200mm/1160mm

**Car weight** 210kg

**Weight distribution** 123kg/155kg

**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

**Tyres** 20.5x7.0-13 Hoosier

**Wheels** 7.0x13, 31mm offset, 1pc Alrim

**Brakes** Self developed rotors; alu-floater; front 220mm, rear 208mm discs

**Chassis** Tubular space frame

**Engine** Suzuki GSX-R 600 k8

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** 98 RON unleaded

**Fuel system** Fully sequential single point injection

**Max power/max torque** 69.85kW @ 10750 rpm/65Nm @ 9500rpm

**Transmission** Single 530 chain

**Differential** Drexler limited slip differential

**Final drive** 48:13

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**KINGSTON UNIVERSITY UK**

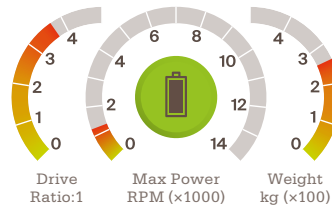


The team at Kingston University is made out of individuals from several different backgrounds and disciplines of engineering and, most importantly, different years of study.

Kingston University has for the first time gathered together all the skills necessary to get a car for the first time in Formula Student. The support from all members of the team and academic staff has been immense, never through any car project have so many different students and academics been working so close together to produce something as challenging as this.

The team has been structured depending on system requirements, the project leader oversees all the work carried out and takes responsibility for making decisions that affect the whole team, the operations manager ensures that all operations are clearly planned out and all tasks are completed. The team has been split into all sections according to the systems that are required to put together a single seated race car: vehicle integration, chassis and suspension, electrical and powertrain.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 2200mm/1105mm/1329mm/1600mm

**Track** 1240mm/1220mm

**Car weight** 260kg

**Weight distribution** 197kg/131kg

**Suspension** Double unequal length A-arm. Push rod actuated spring and Damper. Rear pull rod actuated

**Tyres** 20.5x7-13

**Wheels** 7" wide, 13" diameter

**Brakes** Cast Iron Hub Mounted, front 265mm, rear 254mm

**Chassis** One piece tubular spaceframe

**Engine** Yasa 750

**Bore/stroke/cylinders/cc** -/-/-

**Fuel type** Electric

**Fuel system** LiFePO4 battery cells 7kWh

**Max power/max torque** 100kW @ 1250rpm/750Nm

**Transmission** Single Chain

**Differential** -

**Final drive** 3.71:1



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**UNIVERSITY OF WARWICK UK**



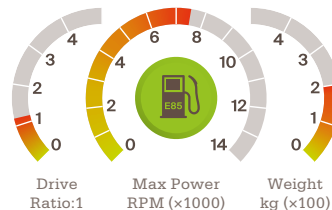
Warwick Racing is a team of 23 fourth-year engineering students, who have designed and manufactured a single-seat racer, moving towards a sustainable composite monocoque design in future years. The team is split into three separate academic design projects: body structures, chassis dynamics and powertrain, using a systems approach to produce an overall design.

Reliability, serviceability and sustainability is the WR3 design ethos, aiming to provide a trustworthy car for the competition, and proving that it is

possible to provide sustainable motorsport without compromising on performance.

The body structures team produced a steel spaceframe with bamboo body work, a bamboo honeycomb structural load floor and volcanic rock fibre seat. The powertrain team converted a KTM single cylinder engine to run on sustainable E85 and designed a bespoke drivetrain set up, while the chassis dynamics team have improved the suspension, steering, uprights/hubs, pedals, and brakes systems focusing on reliability and serviceability.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 2675mm/1065mm/1520mm/1550mm

**Track** 1335mm/1250mm

**Car weight** 200kg

**Weight distribution** 120kg/148kg

**Suspension** Front and Rear double wishbone setup with Ohlins dampers. Front with pull, rear with push rods

**Tyres** AVON 6.2/20-13

**Wheels** 13" diameter, 6.5" width, 2 piece aluminium wheels

**Brakes** 4-piston AP racing callipers with bespoke stainless steel drilled discs each wheel

**Chassis** Steel tubular Spaceframe with Bamboo body panels

**Engine** KTM 525

**Bore/stroke/cylinders/cc** 95mm/72mm/1 cylinder/510cc

**Fuel type** E85

**Fuel system** Bosch EV14 fuel injector, Bosch Motorsport fuel pump

**Max power/max torque** 50bhp/45Nm

**Transmission** KTM SMR gearbox

**Differential** Front differential taken from a Suzuki King Quad

**Final drive** 1.18:1



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**BIRMINGHAM CITY UNIVERSITY  
UK**



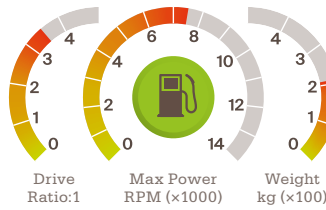
The BCU Racing FS team is comprised of second-year students from the motorsport technology and automotive engineering courses. The team is organised into four systems: controls, frame and bodywork, powertrain and suspension and steering.

The main objective for 2013 has been to produce a quality vehicle of an entirely new design, focusing in particular upon reducing weight and placing it strategically, in order to have a low, well-centred weight distribution. This has been achieved by placing the driver in a very reclined

position, shifting their weight lower and more forward in an attempt to counteract the weight of the powertrain package. Consequently, the space under the driver has been utilised to house the fuel tank and radiator packages, meaning no side pods are needed and the rear of the car can be shortened.

For the powertrain, a single cylinder engine has been converted from a carburettor to fuel injection, to tailor it more for the needs of the competition. Further tuning of the engine aims to regain the performance lost by the regulated restrictor.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2716mm/885mm/1404mm/1908mm
- Track** 1200mm/1200mm
- Car weight** 210kg
- Weight distribution** 125kg/153kg
- Suspension** Double L-Arm Wishbones with Push (front)/Pull (rear) rod actuated horizontally oriented spring and damper
- Tyres** 20.6"×6"×13" R25B Hoosier
- Wheels** 13" Compomotive CXR-155mm wide
- Brakes** Single Pot Wilwood Calipers with 220mm dia. Custom Stainless Steel Discs
- Chassis** One piece tubular spaceframe
- Engine** 2002 Husqvarna TE610e Single Cylinder Four Stroke
- Bore/stroke/cylinders/cc** 98mm/76.4mm/1 cylinder/575cc
- Fuel type** 95 RON Unleaded
- Fuel system** Custom Fuel Injection
- Max power/max torque** 27kW @ 7500rpm/45Nm @ 6000rpm
- Transmission** Single 520 chain
- Differential** Drexler V1 LSD
- Final drive** 3.5:1



33

**ETH ZURICH  
SWITZERLAND**



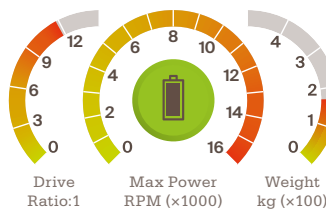
The team was founded in 2006 and after competing in the combustion class for three years, we switched to a pure electric drivetrain in 2010. Uniquely, the team consists of students from four different Swiss universities while being the only Swiss team in the competition.

After winning our first competition with Furka in 2010 (winning Class 1A at Silverstone), we further developed the electric concept from season to season. Starting with a self-developed motor in 2011,

a full aero-package in 2012 and a 4WD concept for this season. Once again, the car features an AMZ motor and a carbon fibre monocoque.

2012 was our most successful season and we are trying to further improve our performance for this year. As every year, we have built a car that should maximise our points in a typical Formula Student competition. We are looking forward to a great competition in Silverstone!

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2930mm/1240mm/1410mm/1550mm
- Track** 1200mm/1160mm
- Car weight** 170kg
- Weight distribution** 107kg/131kg
- Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented air springs and oil dampers
- Tyres** 18.0×6.0-10 Hoosier LC0/R25B
- Wheels** 6.5" single-piece CFRP
- Brakes** Floated, hub mounted, 190mm dia., water-jet cutted
- Chassis** Single Piece CFRP Monocoque
- Engine** 4×AMZ M3 electric motor
- Bore/stroke/cylinders/cc** Inner runner/DC/4 cylinder/4×1000cc
- Fuel type** Red Ampère-Bugs
- Fuel system** Lithium Polymer Accumulators
- Max power/max torque** 4×35kW @ 16000rpm/4×28Nm @ 0rpm
- Transmission** 1.5 stage planetary gear box
- Differential** None
- Final drive** 11.8:1





P  
Petrol



E85  
85% Ethanol  
15% Gasoline



E  
Electric



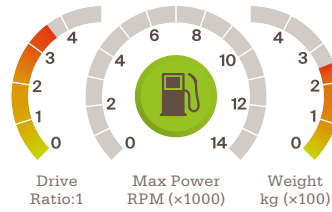
A  
Alternative/  
other



YTU Racing team was founded in 2011 with 20 engineering students who have diverse backgrounds including mechanical, electrical and industrial engineers. All members of our teams work on different subgroups (engine calibration, powertrain, chassis, aerodynamics, business group, cost group etc) to do best. As a first year Class 1 team, our aim is to pass all tests, finish the endurance race and take a good line on overall.

“”  
**OUR AIM IS TO PASS ALL TESTS, FINISH THE ENDURANCE RACE AND TAKE A GOOD LINE ON OVERALL**

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 1750mm/1210mm/1520mm/1525mm
- Track** 1300mm
- Car weight** 250kg
- Weight distribution** 130kg/130kg
- Suspension** Double unequal length A-Arm, push rod actuated horizontally oriented spring and damper.
- Tyres** 530/180mm - 13" Pirelli GP3 Series
- Wheels** 330.2mm
- Brakes** Cast Iron hub mounted 220mm dia. 4 disk, hydraulic brake system
- Chassis** One piece tubular spaceframe
- Engine** 2088/Honda CBR 600 RR four stroke
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** 99 RON unleaded
- Fuel system** Honda multi point fuel injection
- Max power/max torque** 60kW/60Nm
- Transmission** Single chain Differential Quaife Torsen differential
- Final drive** 3.6:1



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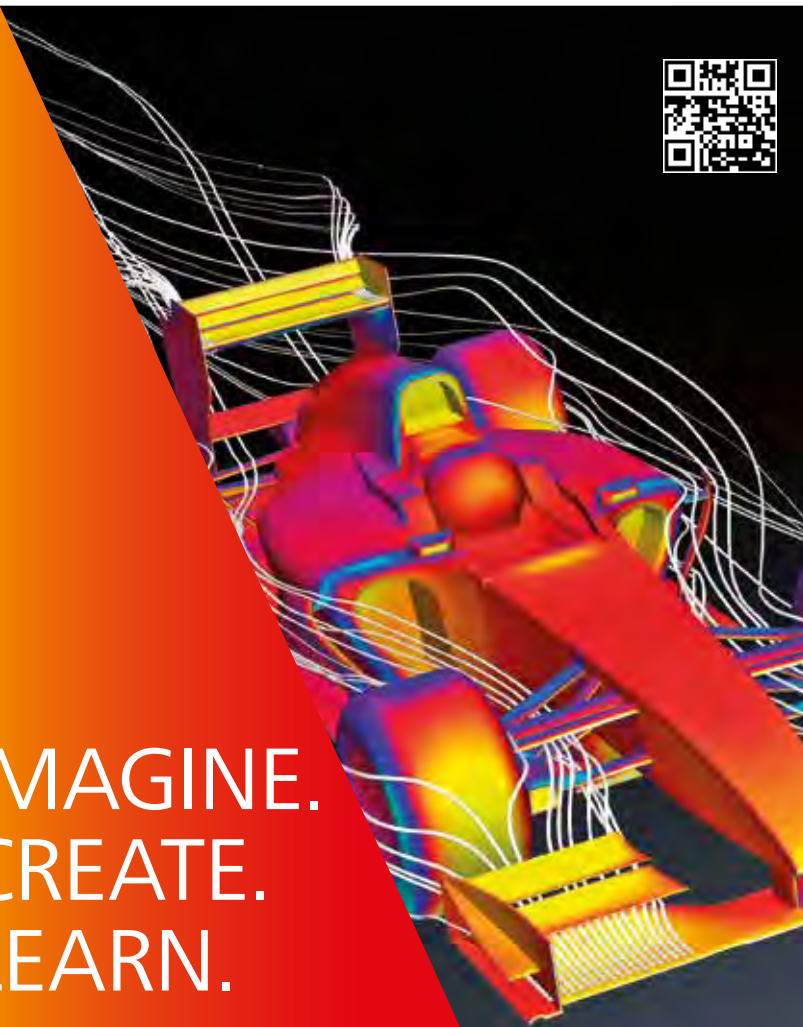
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IMAGINE.  
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36

**UAS DORTMUND  
GERMANY**

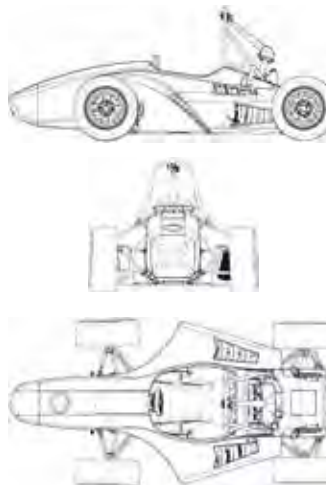
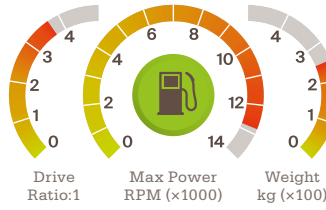


The Race-Ing. team of the University of Applied Sciences and Arts Dortmund has participated at Formula Student events for four years. The team structure as well as the infrastructure has been expanded and optimised. With an average number of 15 team members over the years, the Race-Ing. Team works in two year development periods. This means a fully new developed race car every two years with a forceful optimised second year version in between.

For this FS season, the RI-ölf is a new development of about 20 committed students. Like every vehicle made by Race-Ing., the RI-ölf has a carbon fibre monocoque. New this year is a divisible rear for better maintenance. The aim for the RI-ölf is a consistent weight reduction while not losing durability to provide high racing performance. Furthermore it is the team's intent to be in the 20 best German Formula Student teams. The Race-Ing. team wishes you an amazing event and good luck for the competition to all teams!



**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2720mm/987mm/1348mm/1640mm
- Track** 1200mm/1150mm
- Car weight** 252kg
- Weight distribution** 153kg/167kg
- Suspension** Double unequal length A-Arm. Pull rod actuated vertically oriented damper/Double unequal length A-Arm. Push rod (rear) actuated vertically oriented damper
- Tyres** 20.5x7.0-13 Hoosier
- Wheels** 6.5x13/10mm offset/3pc Al Rim with Mg center
- Brakes** 4-Disc-system, 240mm diameter, driver adjustable bias bar, two 34mm opposing pistons/calipe
- Chassis** Carbon fibre monocoque with honeycomb core, divisible rear for easier maintenance
- Engine** 2001/HONDA PC35/ four cylinders inline
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599.4cc
- Fuel type** RON 100 unleaded
- Fuel system** trijekt ECU, sequential injection
- Max power/max torque** 65kW @ 12800rpm/61Nm @ 10300rpm
- Transmission** Chain drive, single 525 chain
- Differential** Drexler limited slip differential
- Final drive** 3.71:1

37

**TU DARMSTADT  
GERMANY**



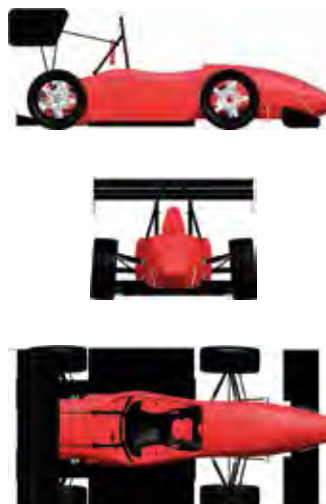
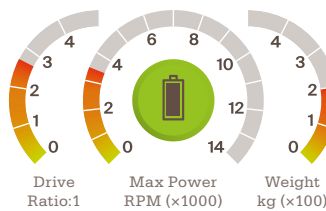
The TU Darmstadt Racing Team (DART) is participating in FSUK for the fifth time. Over 50 highly motivated students from various fields of study are working on this year's car, the theta2013. In creating a completely new chassis and suspension, we decided to take the know-how from last year's electrical powertrain and start with a new model.

one motor. Following last year's development of an aerodynamically optimised undertray, we are introducing a full aerodynamic package, including rear and front wings. Despite all these new features, our main aim was to reduce the weight of the car to the lowest in our team's history.

We have used a two-motor concept and a newly designed torque vectoring. The main component of our drivetrain is a self-designed gear box, providing each wheel at the rear axle with the power of

As in previous years, DART-Racing stands for innovative and progressive design. Also, we would like to thank all sponsors and supporters who make our participation in Formula Student events possible.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2500mm/1200mm/1415mm/1525mm
- Track** 1200mm
- Car weight** 200kg
- Weight distribution** 121.2kg/146.8kg
- Suspension** Double unequal a-arm, pull-rod actuated horizontally oriented air spring and damper
- Tyres** Pirelli 185/40 R15
- Wheels** Carbon/aluminium hybrid, 7" rim width
- Brakes** Steel, hub mounted. Front: 220mm dia. Rear: 200mm dia.
- Chassis** Single Piece Carbon Fibre Monocoque
- Engine** 2x Enstroj Emrax
- Bore/stroke/cylinders/cc** 228mm/86mm/-/-
- Fuel type** Electric
- Fuel system** 144 LiPo cells @ 144s1p
- Max power/max torque** 80kW @ 3469rpm/220Nm @ 3469rpm
- Transmission** One gear, two stage gearbox
- Differential** Electronic differential
- Final drive** 2.68:1





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UNIVERSITY COLLEGE LONDON UK



UCL Racing is situated within the University College London Mechanical Engineering workshops in the heart of central London. The team is proud to present its new design for this year's entry, after a recent absence from Formula Student.

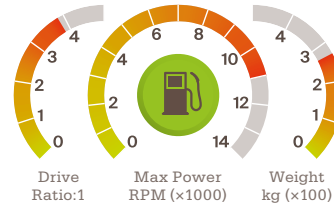
Our particular focus has been on designing for reliability. This has been achieved by extensive on-track testing with a range of sensors to improve the way in which we understand the car and has allowed the team to make data driven decisions. By placing just as much emphasis on testing and setup, as well as design and

build, we hope to maximise our overall score.

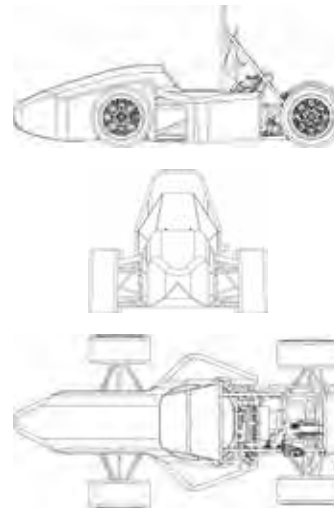
As a relatively new team, we have had to work to a very tight budget but are confident that our hard work will lead to a respectable position in the Formula Student 2013 rankings. It has been a thoroughly exciting project and we look forward to participating in all the static and dynamic events at Formula Student 2013.

UCL Racing would like to thank all its sponsors and contributors to the team, with special thanks to Tim Baker, RM Engineering and UCL Business.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2640mm/1300mm/1440mm/1580mm
- Track** 1215mm/1200mm
- Car weight** 270kg
- Weight distribution** 136kg/202kg
- Suspension** Double Asymmetrical Wishbones, push rod Actuated Diagonally Orientated Spring and Damper System
- Tyres** 20.5x7.0 – 13 Hoosier
- Wheels** 203mm Compomotive CXR 13" Aluminium
- Brakes** Cast Iron Drilled – Hub Mounted 220mm dia/single inboard 296mm dia
- Chassis** One Piece Tubular Spaceframe
- Engine** 1998 Honda CBR600F3 4 stroke in line 4
- Bore/stroke/cylinders/cc** 65.5mm/45.2mm/4 cylinder/599cc
- Fuel type** 99 RON Unleaded
- Fuel system** Student Designed Single Port Fuel Injection
- Max power/max torque** 60.7kW @ 11000rpm/54.99Nm @ 6000rpm
- Transmission** Single 530 Chain
- Differential** Student designed Limited Slip Differential
- Final drive** 3.85:1



39

AIN SHAMS UNIVERSITY EGYPT



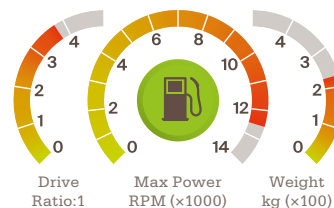
ASU Racing Team was founded in 2010 by a group of automotive engineering students. After the Egyptian revolution, the team was inspired to improve the economic state of the country and act as a research team to contribute to the Egyptian automotive industry.

We are now a big family of three sub-teams, who design and manufacture one-seat racing cars, eco-cars and remotely operated underwater vehicles. Along with the technical teams, the ASU Racing team is managed by alumni and crew members with planning,

management and marketing skills. One of our team values is continuity and integration; that's why every single experience through the past years was exploited. This helped the team to improve the car's features and use new concepts including a lighter frame, a horizontal suspension system and conceptual design of an engine management system and shifting by wire mechanism.

The team is very grateful to the support of their sponsors and believers: Bavarian Auto Group, Egypt fibre and the Industrial Control Group.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2260mm/1120mm/745mm/1650mm
- Track** 1600mm/1670mm
- Car weight** 225kg
- Weight distribution** 123kg/172kg
- Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper
- Tyres** 20.5x6.0-13 Model 43128 Hoosier
- Wheels** 6.5" wide, 4 pc Alu. Rim
- Brakes** Cast steel, mounted on hub by M12 bolts, 240mm dia. Drilled
- Chassis** One piece tubular spaceframe
- Engine** 2003/Honda CBR 600RR four cylinder inline four stroke – 16 valve
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** Petrol 95 unleaded
- Fuel system** Honda multi point fuel injection
- Max power/max torque** 50kW @ 12550rpm/58Nm @ 10500rpm
- Transmission** Close-ratio six-speed Single chain
- Differential** Torsen LSD FSAE 012000
- Final drive** 3.75:1



40

**LEIBNIZ UNIVERSITY OF HANOVER  
GERMANY**

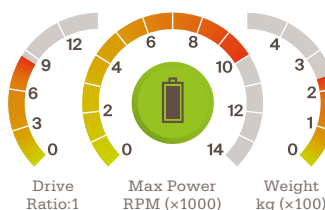


HorsePower Hannover e.V. was founded in 2007 by a group of 10 engineering students. Our first events were Silverstone and Hockenheim in 2009 with the RacePony09, which was a combustion car. Learning from 2009 meant that we produced the winning combustion car at Barcelona, the RH10. After this success HorsePower sought new paths and began constructing an electric race car. The eH11 was born. In 2011, we made substantial progress in the static events and the first steps in electrified mobility.

In 2012 the eH12 was born, with which we attended FSUK and FS Spain. Once again in Barcelona, HorsePower Hannover won a trophy: the Best Teamwork Award! By retaining the know-how, and establishing new structures of organisation, our team of more than 45 interdisciplinary students are looking forward to a great season. Our vision is for HorsePower to be a sustainable network with our partners, a place to educate our team members in addition to their studies, and a place to have much fun in an innovative project.



**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 2917mm/1285mm/1410mm/1575mm  
**Track** 1220mm/1180mm  
**Car weight** approx. 235kg  
**Weight distribution** approx. 145kg/158kg  
**Suspension** Double unequal length A-Arm, front Pull and rear Push rod actuated horizontally orientated spring and damper  
**Tyres** Continental Formula Student 2013 tires; size: 205/510 R 13,  
**Wheels** Rim size: 7 Jx13 , 3 pc Mg, Al rim, tire size: 205/510 R 13,  
**Brakes** Stainless steel, laser cut, hub mounted, 220mm dia.  
**Chassis** One piece tubular steel spaceframe  
**Engine** 2x AMK DT5-26-10-P0W-10000  
**Bore/stroke/cylinders/cc** -/-/-/ permanently excited synchronous motor with 20kw nominal/effective power and 43kw peak power each  
**Fuel type** electric  
**Fuel system** Lithium-ion polymer batteries  
**Max power/max torque** 86kw @ 10000rpm/51Nm @ 10000rpm for each motor  
**Transmission** Two-stage spur gear transmission  
**Differential** Electric differential (torque vectoring)  
**Final drive** 8.5:1

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**RWTH AACHEN  
GERMANY**

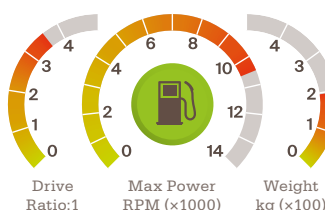


Ecurie Aix, the Formula Student team at RWTH Aachen University, was founded in 1999 as one of the first teams in Germany.

The name 'Ecurie Aix' is a reference to the team's 'international' home base in the German city of Aachen, which lies right at the border of Belgium and the Netherlands. 'Aix' is derived from Aachen's French name: Aix-la-Chapelle. 'Ecurie' means 'racing stable' or 'racing team' in French and has been chosen

in respect to a very successful Belgian motorsports team named Ecurie Francorchamps. Racing has a history in the region around Aachen – race-tracks like the famous Nürburgring and Spa-Francorchamps are just a one-hour drive away. The team has competed in Formula Student events in the US and Europe since 2002. It built its first electric car in 2010, in order to compete at the first electric event at Hockenheim.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 3040mm/952mm/1440mm/1600mm  
**Track** 1250mm/1200mm  
**Car weight** 196kg  
**Weight distribution** 129kg/134kg  
**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper. ARB at rear axle  
**Tyres** 20.5x7.0-13 R25B Hoosier  
**Wheels** 7x13,-25mm offset, 1 pc Al Rim  
**Brakes** Floating, steel, hub mounted, 240mm/230mm dia. Drilled  
**Chassis** Two piece CFRP Frame  
**Engine** Kawasaki ZX6R-9F four stroke in line four  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599.4cc  
**Fuel type** RON 99 unleaded  
**Fuel system** Student designed/ built fuel injections  
**Max power/max torque** 63kW @ 10500rpm/60Nm @ 8700rpm  
**Transmission** Single Chain  
**Differential** Drechsler clutch pack limited slip, 46Nm preload  
**Final drive** 3.58:1



43

DE MONTFORT UNIVERSITY UK

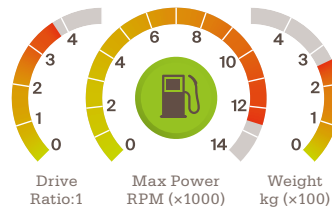


After two years of hard work, this will be the first year that we at DMU Racing have taken a car to the Formula Student competition. After a steep learning curve in regards to both the management and practical aspects of running a Formula Student team, we believe that we have had a very productive year, with such a tight-knit group working as a team we have managed to reach our goal of attending the Formula Student 2013 competition.

As it is our first year at the competition, our designs for the car have been aimed at ease of manufacture and reliability. The car itself is quite basic with the main aims of practicality and efficiency in order to attempt to finish every event.

We have been lucky enough to gain sponsorship from: Nylcast, Cummins, Rimstock Wheels, Proshift Technologies, Megasquirt, Total Clothing and www.weldingslag.co.uk

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2779mm/1200mm/1500mm/1610mm
- Track** 1260mm/1220mm
- Car weight** 260kg
- Weight distribution** 117kg/143kg
- Suspension** Front: upright assembly, control arms and steering rack link. Back: non-parallel unequal length control arms
- Tyres** Avon Racing Slicks 7.2x20
- Wheels** Team Dynamics 13" Al Rims
- Brakes** AP Calipers and Pads, Custom disk 240mm dia. Hub mounted.
- Chassis** One piece tubular steel frame
- Engine** 2007 Honda CBR-600 RR
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** Petrol 95 unleaded
- Fuel system** Honda multi point fuel injection (modified)
- Max power/max torque** 55kW @ 12550rpm/58Nm @ 10500rpm
- Transmission** Close-ratio six-speed Single chain
- Differential** Torsen LSD FSAE 012000
- Final drive** 3.75:1



44

UNIVERSITY OF ULSTER UK

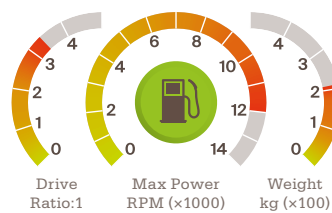


The team comprises ten students, one project supervisor and the assistance of the University's trained technicians. The team members will each be responsible for and take charge of various sections of the car and relate back through the technicians and project supervisor with regards to parts and manufacturing ability for their elements. This is a relatively small team.

The broad vehicle concept is an entry-level class of single seat, open-wheel formula racing, designed to give beginners a stepping stone into the formula racing scene at a fraction of

the cost of the competition. The main considerations are reliability, cost, simplicity and ease of use. As the target market is amateur racers, the car must be built to last. This will require a more robust design than that of our competitors involving the use of mild steel tubular chassis, but not at the expense of performance. The added rigidity and strength through the use of mild steel and detailed design will in fact increase performance through less torsional movement within the chassis, giving the car more manageable handling characteristics.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2800mm/1400mm/1460mm/1762mm
- Track** 1111mm/1232mm
- Car weight** 210kg
- Weight distribution** 130kg/160kg
- Suspension** Double unequal length A-arm. Push, 1 coil-over shock absorber mounted at 35 deg on each wheel
- Tyres** 7.2/20.0-13 Avon
- Wheels** 200mm wide, 2 pc Al Rim
- Brakes** Cast Iron, hub mounted, 215mm dia. Drilled hydraulic disc
- Chassis** Tubular spaceframe
- Engine** 2006/Yamaha YZF-R6 four stroke in line four
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/610cc
- Fuel type** RON Unleaded
- Fuel system** Yamaha multi point fuel injection with YCC-T
- Max power/max torque** 62Kw @ 12000rpm/55Nm @ 11000rpm
- Transmission** Single 520 chain
- Differential** Quaife automatic biasing differential
- Final drive** 44:13



# 46

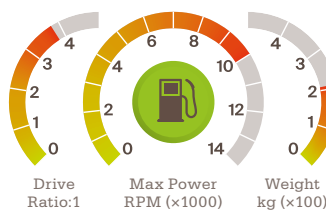
## UAS REGENSBURG GERMANY



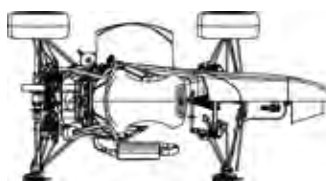
The Dynamics e.V. is one of two FSAE teams at the University of Applied Sciences Regensburg. With the RP13c (Racing Performance 2013 Combustion), we have built our sixth car since our foundation in 2006, while our partner team regenics e.V. has built their third electric powered car. Creating innovation and participating in challenging competitions have always been our motivation. Driven by accuracy with fastidious attention to detail, we are looking forward to a great event in Silverstone 2013.

“”  
**CREATING INNOVATION AND PARTICIPATING IN CHALLENGING COMPETITIONS HAVE ALWAYS BEEN OUR MOTIVATION.**

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2700mm/1086mm/1432mm/1575mm  
**Track** 1250mm/1250mm  
**Car weight** 210kg  
**Weight distribution** 130kg/147kg  
**Suspension** Double unequal length A-Arms in front and rear; pullrod in front; pushrod in rear; ARB front and rear  
**Tyres** Continental C13  
**Wheels** 7.0x13" O.Z. Racing wheels with self developed centerlock system  
**Brakes** 4-Disk system, self developed rotors, radial mounted brake calipers  
**Chassis** Hybrid CFRP-Monocoque with tubular steel rear  
**Engine** Honda CBR 600 RR PC37, 2003-2005  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 99 RON unleaded  
**Fuel system** Mass Air, Manifold Pressure, Throttle Pos., Crank Pos.  
**Max power/max torque** 68kW @ 10000rpm/65Nm @ 9000rpm  
**Transmission** Belt drive, 4 speed gearbox  
**Differential** Optimized clutch pack limited slip differential  
**Final drive** 3.8:1



# 47

## BRUNEL UNIVERSITY UK

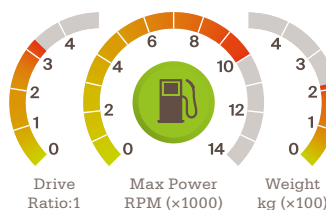


Brunel Racing has gone back to basics this year, with the aim of bringing a reliable and tested car to the event. The team has opted to move away from the hybrid chassis design used for the past few years, in favour of a simpler tubular spaceframe design. Despite the car being called BR14 this will in fact be the team's 15th year building a car. However, only a few team members actually have any

experience of Formula Student, with most of the team being new arrivals this year. The team are hoping this year will become the first chapter in a new era of success for Brunel Racing.

Everyone at Brunel Racing would like to thank all of our partners for their support, without which none of what we have achieved would be possible.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2800mm/1090mm/1370mm/1580mm  
**Track** 1200mm/1175mm  
**Car weight** 215kg  
**Weight distribution** 133kg/150kg  
**Suspension** Double unequal length A-arm. Front pull/rear push rod actuated spring and damper  
**Tyres** 20.0x7.5-13 Hoosier  
**Wheels** Braid 13" Al Rim  
**Brakes** Hub-mounted cast iron discs, 220mm dia  
**Chassis** Steel tubular spaceframe  
**Engine** Yamaha YZF-R6 four stroke inline four  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 99 RON unleaded  
**Fuel system** Bosch multi point fuel injection  
**Max power/max torque** 56kW @ 10000rpm/60Nm @ 8500rpm  
**Transmission** Single 520 chain  
**Differential** Drexler limited slip differential  
**Final drive** 3.3:1





P  
Petrol



E85  
85% Ethanol  
15% Gasoline



E  
Electric



A  
Alternative/  
other

# UNIVERSITY OF THE BASQUE COUNTRY SPAIN



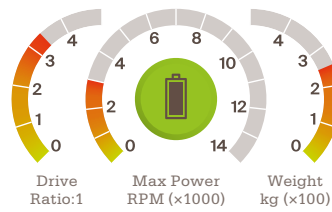
Compromise, teamwork, innovation and training are the foundations of our team, which has been active since 2008. Our new team members are internally trained so that the team's know-how grows every year. Practice and training are everything for us: all our designs are tested on simulators and on the track, and our drivers practice as much as possible with our single-seaters.

For the 2013 season, we have made a big step forward, integrating an electric tractive system. Great effort has been carried out to optimise the

power/weight ratio of our energy accumulator, efficient power consumption and optimisation of the transmission. Moreover, we have fulfilled one of our main objectives: weight reduction. To that end, new materials such as carbon fibre and aluminium have been incorporated instead of steel, and an optimised steel-tubing frame has been designed.

This, in combination with our brand new aerodynamic package, which has been rigorously tested on the track, will ensure the competitiveness of our new FSB2013.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 3200mm/1250mm/1402mm/1610mm

**Track** 1220mm/1160mm

**Car weight** 253kg

**Weight distribution** 166kg/165kg

**Suspension** Double unequal length A-Arm. Pull rod actuated diagonally oriented front dumpers and push rod actuated horizontally oriented rear dumpers

**Tyres** 20.5x7-13 Hoosier 43162

**Wheels** 7"x13"+31mm/2 pc A1 Rim

**Brakes** Steel Alloy, hub mounted, diameter: 255mm/220mm. Laser cut

**Chassis** Steel AISI 4130 tube spaceframe

**Engine** EMRAX liquid cooled motor

**Bore/stroke/cylinders/cc** Nominal Voltage: 355.2/Power 1min/2min/cont: 80/50/40rpm/Efficiency: 93-96%/Number of pair of poles: 10

**Fuel type** Electric

**Fuel system** Electric

**Max power/max torque** 80kW @ 3000rpm/220Nm @ 1000rpm/40kW @ 3000rpm/130Nm @ 1000rpm

**Transmission** Single 520 chain. Pinion-sprocket drive

**Differential** Drexler Salisbury adjustable limited slip differential

**Final drive** 3.4:1



## LIQUID CONTAINMENT & FLUID HANDLING SYSTEMS

MOTORSPORT | MARINE | AVIATION | DEFENCE & SECURITY | SUBSEA | INDUSTRIAL | INFLATABLES | SPECIAL PROJECTS

### LAND



### AIR



### SEA



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**DELHI TECHNOLOGICAL UNIVERSITY  
INDIA**



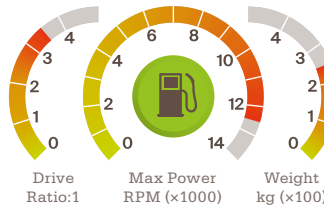
Defianz\_Racing represents Delhi Technological University, India. The team consists of 15 undergraduates from mechanical, automotive, production and electronics engineering courses.

The main objective of the team has been to build a lightweight, responsive and cost-effective race car. This year's chassis has been designed in close co-ordination with other vehicle departments, resulting in a lighter frame than previous years. We have been aggressively involved in the designing of uprights, bell cranks, intake manifold, exhaust systems among other

mechanisms. We have also been involved in experimenting with new manufacturing materials and hope to address any reliability issues from previous cars. The team is composed of five major departments that work in tandem to optimise efficiency – chassis and bodyworks, brakes and steering, engine and drivetrain, suspension and marketing and administration.

The car is shipped through air cargo and has members dedicated for all logistics. ONGC, Loctite, DZUS, Jindals among others have been supporting the team.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase**  
2770mm/1210mm/1290mm/1650mm

**Track** 1150mm/1100mm

**Car weight** 250kg

**Weight distribution** 127kg/191kg

**Suspension** Pushrod actuated unequal double-wishbone at front and rear, with pushrod-rocker-damper assembly in vertical plane perpendicular to longitudinal axis of car. ARB at front

**Tyres** Hoosier R25A 20.5x6 – 13

**Wheels** BBS 13" Aluminium alloys

**Brakes** Stainless steel 230mm diameter, front and rear Brembo fixed dual piston callipers

**Chassis** One piece tubular spaceframe

**Engine** Honda CBR600 F4i 600cc

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/600cc

**Fuel type** 99 Ron Unleaded

**Fuel system** Honda PGM-FI

**Max power/max torque** 81kW @ 12500rpm/63Nm @ 10000rpm

**Transmission** Single Chain Drive

**Differential** Quattro Limited Slip Differential

**Final drive** 3.5:1



50

**UNIVERSITY OF LEICESTER  
UK**

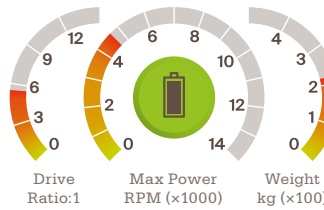


We are UoL Racing and we are proud to be participating in FSUK for the first time. Our team consists of a very small core group and several contributing project students. We aim to finish in the top half of the table and complete every event.

The team made a bold design decision early in 2012 to make the ULR-01 a fully electrical vehicle. One of our university's strengths is in its electrical degree, but more significantly, the electric racecar market is a fast-growing industry and it poses a greater multi-disciplinary and more interesting design challenge.

To utilise the benefits of a fully electrical car, we have implemented and developed our own motor controller, which employs active differential drive through the two electric motors. We have also developed our own BMS and charger, allowing us to achieve maximum performance and reliability from our batteries. We have reduced our unsprung mass by opting for 10" wheels and carbon fibre suspension rods. We plan to feedback live car information and camera footage using our self-developed telemetry system.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase**  
2610mm/1255mm/1408mm/1540mm

**Track** 1245mm/1245mm

**Car weight** 220kg

**Weight distribution** 103.4kg/116.6kg

**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

**Tyres** 19.5x6.5-10 Hoosier

**Wheels** 10"x7" Keizer 2 pc Forged Aluminium Rim

**Brakes** Mild Steel, Hub mounted, 201mm dia., drilled with AP Racing calipers.

**Chassis** One piece tubular spaceframe CDS mild steel

**Engine** 2x Agni 95R's

**Bore/stroke/cylinders/cc** -/-/-/-

**Fuel type** Electric

**Fuel system** 11.1V 3S Overlander Supersport Batteries

**Max power/max torque** 65kW @ 4650rpm/68Nm @ 0-4650rpm

**Transmission** Double Chain

**Differential** Electronically Controlled Active Differential

**Final drive** 5.5:1



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**VELLORE INSTITUTE OF TECHNOLOGY INDIA**



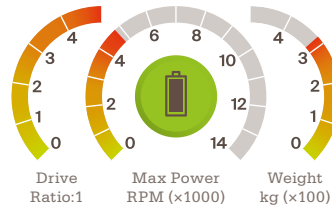
Team Ojas is the official Formula Student electric team of VIT University and is also one of the only two electric teams from India. OJAS, the Sanskrit word for energy, perfectly captures the tough Indian competitive spirit which all the members in the team aim to bring to this competition. The team participated in its first ever FS in 2012 with a hybrid vehicle; this year we aim for a pure electric car which is energy-efficient and eco-friendly.

The team is highly organised and is broadly split into two divisions, technical and marketing, which are again

divided into sub-divisions. Sheer determination, utmost sincerity and more importantly synchronisation between all members across divisions, has ensured the team deliver a world-class product within our deadlines.

The team has received tremendous support from corporate giants such as Bharat Forge, Transformers & Rectifiers Ltd, Da Milano, Bender-DE, Sona Koyo Steering Systems Ltd, Punj Lloyd, Safexpress Pvt Ltd, Radnik Exports and SAP Computers. Technical support from Schneider Electric was also pivotal to the team's progress.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 3010mm/1355mm/1485mm/1650mm

**Track** 1284mm/1254mm

**Car weight** 320kg

**Weight distribution** 190kg/191kg

**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper with an anti roll bar in the front

**Tyres** 165/60r13 Bridgestone Potenza

**Wheels** 139.7mm wide, Single Piece Alloy steel Rim

**Brakes** Mild Steel, Hub mounted, 201mm dia., drilled with AP Racing calipers

**Chassis** One piece tubular spaceframe

**Engine** 2x Agni 95R in Series

**Bore/stroke/cylinders/cc** -/-/-/-

**Fuel type** Li ion batteries, 8.88kWhr

**Fuel system** -

**Max power/max torque** 54kW @ 4800rpm/108Nm

**Transmission** Compound gear train with single 520 chain

**Differential** Quaife automatic torque biasing differential

**Final drive** 5:1



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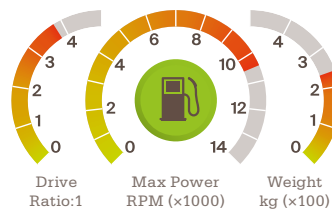
**NATIONAL INSTITUTE OF TECHNOLOGY CALICUT INDIA**



Hailing from Kerala, Team Unwired represents the National Institute of Technology Calicut (NITC), one of India's most prestigious technical institutes. The main objective of Team Unwired is to gain knowledge progressively and to bring engineering to life. Gaining enormous support from high profile companies like Kennametal India Ltd and the generous alumni association of NITC, Team Unwired has been able to design and fabricate its first FS racecar, Kennametal

Unleashed 1.0. Carefully crafted by a family of 20 team members, it achieves a 0-60km/h speed in 4.1 seconds with a top speed of 100km/h. Elegantly designed bodywork, front and rear wings, a dry sump system, and paddle shifter are some of the daring features our rookie team has been bold enough to attempt. Team Unwired has set concrete goals to be the top team among the participants competing from India, and to be the best rookie team of the season.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 3186mm/1395mm/1530mm/1651mm

**Track** 1270mm/1219.2mm

**Car weight** 240kg

**Weight distribution** 139kg/169kg

**Suspension** Double unequal Length A arm, Push rod actuated, spring and damper oriented inclined to vertical

**Tyres** 508x153 - 330 Hoosier

**Wheels** 140mm 1pc Al alloy wheels

**Brakes** Front: 190mm disc, hub mounted/ Rear: 254mm disc, inboard mounted

**Chassis** One piece tubular spaceframe

**Engine** 2008/Honda CBR 600RR

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** 99 RON unleaded

**Fuel system** Honda multi point fuel injection

**Max power/max torque** 70hp @ 10500rpm/40Nm @ 9000rpm

**Transmission** Single 520 Chain

**Differential** Torsen torque biasing differential

**Final drive** 3.8:1



## 53

### UAS KIEL GERMANY



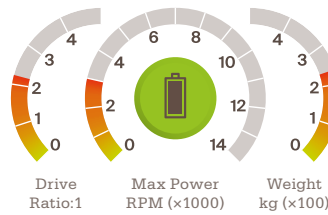
Raceyard is Germany's northernmost Formula Student team. We are located in Kiel, the sailing city of Germany. We are organised into six departments: suspension, frame, electric, powertrain, accumulator and non-constructive. This year, we paid special attention to the electrical part of our car. We designed our own BMS and developed a torque-vectoring-system. With the BMS we

were able to save weight by customising it to our individual requirements. To improve handling, we added to our adaptive slip control the newly developed torque-vectoring-system.

A further innovation is our bodywork. It is based on polypropylene Twin-Wall Sheets which provides the benefits of weight (1kg/sqm) and savings of time and money (~5€/sqm + processing).



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2749mm/952mm/1375mm/1600mm

**Track** 1200mm/1200mm

**Car weight** 235kg

**Weight distribution** 150kg/153kg

**Suspension** Double unequal A-Arm. Pushrod. Nearly horizontally/diagonal oriented spring and damper

**Tyres** 205x70 R13, Hoosier R25B

**Wheels** 205x70 R13, Hoosier R25B

**Brakes** AP-Racing, hub mounted, 235mm/215mm outer diam., laser cut

**Chassis** One piece tubular spaceframe

**Engine** Emrax (produced by Enstroj)

**Bore/stroke/cylinders/cc** -/-/-/

**Fuel type** LiFePo

**Fuel system** -

**Max power/max torque** 3000RPM/220Nm  
140kW/2x240Nmx2.22

**Transmission** spur-toothed gear drive

**Differential** electrical differential

**Final drive** 2.22:1

## 54

### KARLSTAD UNIVERSITY SWEDEN



Thanks to our lead sponsor Duroc Machine Tools, Clear River Racing is representing Karlstad University for the sixth time. The team consists of 34 students with a wide range of engineering specialities.

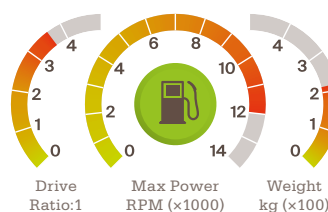
This year we have focused mainly on nimbleness and minimising weight - making simple, cheap and reliable solutions has been in mind through the whole design and manufacturing phase. Working in our well-equipped workshop, we have the ability to manufacture almost everything ourselves.

This year's car offers an aerodynamic package, to max-

imise downforce. Resulting from this is an integrated front wing into the nose cone, a three-parted adjustable rear wing and a diffuser. Side pods are designed to increase the air flow through the cooler. Usage of 10" tyres to achieve less unsprung mass and faster heating of the tyres, along with an engine integrated into the chassis to increase torsional rigidity, are just a few new applications made for this year's car. The length of the chassis has also been reduced by 200mm. CRR13 has a self-designed dashboard, showing essential information to the driver.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2940mm/1150mm/1396mm/1550mm

**Track** 1180mm/1140mm

**Car weight** 215kg

**Weight distribution** 133kg/150kg

**Suspension** Double unparallel unequal length A-Arm. Push-/pull actuated spring and damper

**Tyres** 18.0x6.0-10 Hoosier

**Wheels** 7" wide, 2 pc centerless Al Rim

**Brakes** Steel, hub mounted, fully floating. 200mm dia. drilled wavediscs

**Chassis** Steel tubular spaceframe

**Engine** 2005 Yamaha YZF-R6 four stroke in line four

**Bore/stroke/cylinders/cc**  
65.5mm/44.5mm/4 cylinder/599cc

**Fuel type** 99 Ron unleaded

**Fuel system** Stock Yamaha fuelrail, Denso fuel injectors, link G4 extreme engine management

**Max power/max torque** 63kW @ 12000rpm/58Nm @ 8500rpm

**Transmission** Single 520 chain

**Differential** Drexler LSd

**Final drive** 40:11



55

UNIVERSITY OF HUDDERSFIELD UK



Team HARE is a dedicated and driven team consisting of 25 engineering students. With the team's high enthusiasm for motorsport and engineering, we hope to draw on our past successes to deliver strong results.

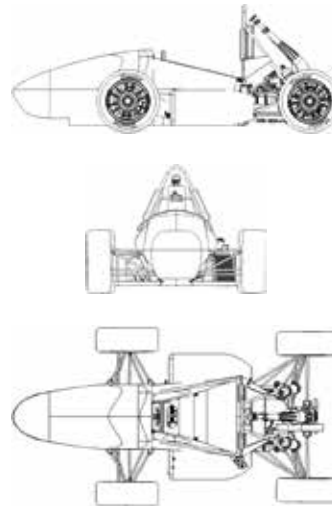
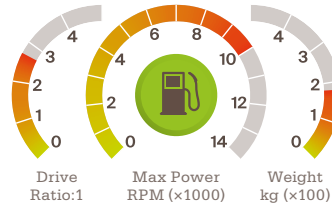
Since the team's first entry in 2001, it has seen some key developments in design, including adopting the lighter KTM EXC 500 engine. To continue our development, we have returned to the old adage 'simplify and add lightness' by concentrating on maximising the performance of each part through intelligent design. This year, the team has also

focused on key aspects such as reliability, serviceability and setup for four main areas of design. We have upgraded our steering system to allow drivers to extract as much performance as possible, the cockpit area has been increased to improve driver comfort, and our fuel system and drivetrain have been changed for serviceability and reliability.

HARE-13 wouldn't have happened without support from our sponsors. We would like to express deepest thanks to Cameron, Denso, Tri-cast, Nimbus, Titan, G&G motorsport and Protection & Performance.



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2699mm/1060mm/1523mm/1550mm  
**Track** 1320mm/1260mm  
**Car weight** 180kg  
**Weight distribution** 120kg/128kg  
**Suspension** Front: Double unequal length carbon fibre wishbones – pull rod actuated with Ohlins dampers. Rear: Double unequal length carbon fibre wishbones – push rod actuated with actuated Ohlins dampers  
**Tyres** Hoosier 20.5x7x13 R25B  
**Wheels** 190mm wide, 1 pc centre locking 13" OZ Aluminium  
**Brakes** Front: AP Racing 4 pot calipers, 240mm drilled floating disc. Rear: AP Racing calipers, 216mm drilled floating disc  
**Chassis** One piece tubular  
**Engine** Spaceframe 2013 KTM EXC 500  
**Bore/stroke/cylinders/cc** 95mm/72mm/1 cylinder/510cc  
**Fuel type** 99 RON unleaded  
**Fuel system** Cytec external pump, Single port injection, Motec  
**Max power/max torque** 60HP @ 10000rpm/52Nm @ 6000rpm  
**Transmission** Single 520 chain  
**Differential** Drexler, Limited slip  
**Final drive** 2.7:1

57

ÉCOLE NATIONALE D'INGÉNIEURS DE METZ FRANCE

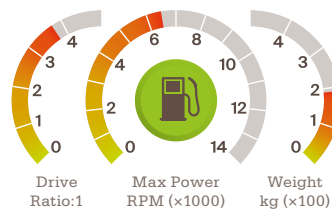


Each year Formula Student marks another step in the progress and the improvement of our performance. The fundamental choices undertaken on the project EFS005 Fearless gave us good results, so this year will continue on this path. For the EFS006 DragonBlast our objectives are:

- Optimise the engine performance by modifying the intake and exhaust
- Improve the ground contact system
- Increase the overall efficiency of the car by integrating a telemetry system
- Reduce the overall schedule by three months to be able to run and debug the car from April onwards.



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2795mm/1061mm/1410mm/1613.5mm  
**Track** 1180mm/1150mm  
**Car weight** 190kg  
**Weight distribution** 127kg/127kg  
**Suspension** Double unequal A-Arm, pull rod actuated spring / damper, adjustable roll bar  
**Tyres** Hoosier 19.5x6.5-10 R25B and WET  
**Wheels** 6x10, 24.4mm offset, 2 pc Al Rim  
**Brakes** AP Racing, 17.8mm bore front/rear with driver adj. bias bar  
**Chassis** Steel tubular frame  
**Engine** KTM 525 EXC  
**Bore/stroke/cylinders/cc** 95mm/75mm/1 cylinder/510cc  
**Fuel type** 99 RON unleaded  
**Fuel system** Electronic fuel injection  
**Max power/max torque** 38kW @ 6500rpm/50Nm @ 6000rpm  
**Transmission** Chain drive #520  
**Differential** Drexler limited slip  
**Final drive** 3.75:1

# 58

## UNIVERSITY OF PADERBORN GERMANY



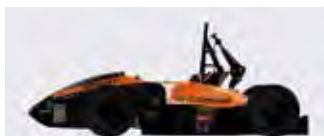
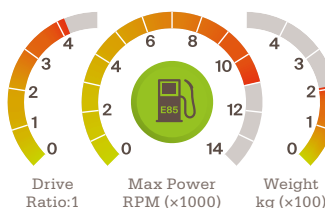
The UPBracing Team e.V. was founded in 2006 by seven engineering students. The PX213 is our seventh car with a combustion engine and we are participating at Silverstone for the third time.

In 2013 we are using a hybrid frame construction with a CFRP monocoque combined with a tubular steel rear frame. This year's focus was on improving the reliability of the car, in addition to designing a well engineered race-car with some new developed lightweight parts. We've also done a lot of work on the analysis of vehicle

dynamics, with a self-developed measurement system.

The UPBracing Team currently consists of 30 students from different faculties of the university. We are a self-organised Formula Student Team with young, highly motivated members. Our passion for motorsport and engineering motivates us to go the extra mile and act beyond our obligations. The PX213 is a further milestone in the history of UPBracing. In the long run, we want to compete with the best teams around the world.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2800mm/1100mm/1400mm/1600mm

**Track** 1170mm/1150mm

**Car weight** 205kg

**Weight distribution** 136kg/137kg

**Suspension** Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper

**Tyres** 20.5x7.0-13 R25B  
Hoosier/20.5x7.0-13 R25B Hoosier

**Wheels** 3 pc. CFRP Wheel Rim base and Al Wheel center

**Brakes** 4 Disk system, self developed rotors, adjustable brake balance

**Chassis** Hybrid Frame with CFRP monocoque in the front and tubular steel frame in the rear

**Engine** Suzuki GSR600 K6, modified for E85

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599cc

**Fuel type** E 85

**Fuel system** self designed/built fuel sequential injection system

**Max power/max torque** 60kW @ 11000rpm/63Nm @ 9000rpm

**Transmission** Single 520 Chain drive

**Differential** Drexler chain driven limited slip differential

**Final drive** 4.2:1



# 59

## TECNUN, UNIVERSITY OF NAVARRA SPAIN



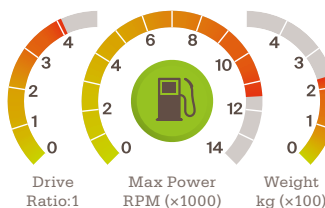
"Build a car, build a team, build yourself." This is the slogan we have followed during every Formula Student season, and we will kick off our fourth Formula Student UK race with the same slogan.

With the experience we've gained from previous seasons, we have maintained our philosophy of a reliable and user-friendly single seater, but we're taking a step forward in the powertrain area. This year we present the FSTEC'13, a car developed by 50 student enthusiasts from different degree programmes at Tecnun, the engineering school of the University of Navarra.

This season's main work has focused on the powertrain, but we haven't forgotten about other important areas such as the suspension set up, the careful use of composites in specific parts of the car and the car's electronics. The aim of all the work done in the months prior to competition has been to maximise performance with only a minimal increase in cost.

With all these ingredients plus our motivation, determination and commitment, we will give everything we have at the legendary circuit at Silverstone.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2800mm/1296mm/1440mm/1650mm

**Track** 1250mm/1250mm

**Car weight** 229kg

**Weight distribution** 143kg/154kg

**Suspension** Double unequal length A-arm. Pull rod actuated Sachs RD 36-2 spring/damper units

**Tyres** 7.2/20.0 - R13 A45 AVON

**Wheels** Braid Formrace 16 alloy 7x13"

**Brakes** Cast iron drilled discs, hub mounted 260mm/250mm diameter

**Chassis** Steel tubular space frame. CFRP floor

**Engine** 2005/Suzuki GSX-R 600 K4/K5 four stroke in line four

**Bore/stroke/cylinders/cc**  
65.5mm/44.5mm/4 cylinder/599cc

**Fuel type** 98 RON Unleaded

**Fuel system** Multipoint injection with stock GSX-R Nippon Denso injectors, 4 injectors close to inlet valves

**Max power/max torque** 82hp @ 11500rpm/52Nm @ 8700rpm

**Transmission** Single 525 R3 chain

**Differential** Drexler multiple disc limited slip differential

**Final drive** 4.1:1



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**INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR INDIA**

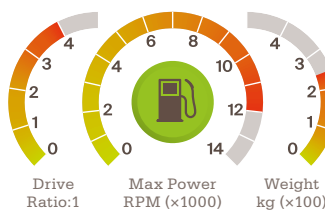


This will be our third car at FS. The salient features in K-2 are superior steering and suspension geometry, intake manifold design, improved packaging and driver comfort in comparison to the previous cars. With optimised rod selection and design, we managed to achieve a lighter chassis close to 10kg lighter than before. Improved packaging of the suspension and steering parts is another crucial design advancement.

We have received support from Skoda, ONGC, Balm-er&Lawrie as our major partners

for FS 2013 and have associated with Duke Fashions, National Instruments, Magod Laser, Ricardo and Auto Cluster for various partnerships. We'd like to thank our institute authorities, faculty and alumni for their neverending support towards the project. Having finished and optimising our vehicle, we are now waiting for the onset of FS 2013 with bated breath! We hope to not just match but to improve upon our previous performances at the event. Good luck to the other teams! See you at Silverstone!

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 2740mm/1125mm/1458mm/1620mm  
**Track** 1260mm/1220mm  
**Car weight** 245kg  
**Weight distribution** 152kg/161kg  
**Suspension** Double unequal length A-Arm. Pull rod actuated spring/damper. Adj. Roll bar and similar system with push rod actuation in the rear  
**Tyres** 20x7.0-13 R25B Hoosier  
**Wheels** 7" wide, 1 pc Al Rim, 17mm neg. offset  
**Brakes** 200mm petal shaped, slotted rotors. Front: Dual piston floating calliper. Rear: Single piston floating calliper.  
**Chassis** One piece tubular spaceframe  
**Engine** 2008/Honda CBR 600RR engine  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 99 RON  
**Fuel system** Honda multi point fuel injection  
**Max power/max torque** 70.6kW @ 12000rpm/62.3Nm @ 9000rpm  
**Transmission** single 425 chain  
**Differential** Quaife limited slip differential  
**Final drive** 4:1



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**UNIVERSITY OF SUSSEX UK**



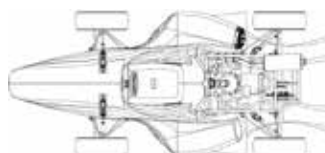
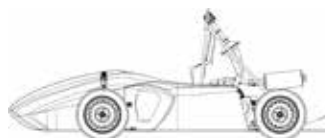
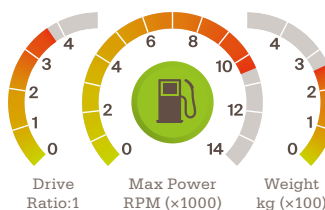
Mobil 1 Team Sussex is now in our eighth year. Nine current team members participated in the construction of our 2012 car, and the team has tried to capitalise on this experience throughout the design phase of the TS-13. The team aim to be one of the top five UK teams at FS 2013.

We have made significant advances on the bodywork. A full carbon-fibre unit including fully ducted side pods, detachable upper covers, and a groundplate with integrated rear diffuser has completely revolutionised the appearance of this year's car - a feat made

possible only through the exceptional help and support offered by new sponsor FBFX Robotic Milling - producing polystyrene patterns for the carbon fibre bodywork identical to CAD models.

In addition, the team is proud to announce further sponsorship from DGS Quality Assurance, whose assistance has been a significant boost to our efforts. Much of the team's success throughout the year is attributed to the consistent, high quality support offered by their sponsors, patrons and advisors, whose input has proved invaluable.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 3140mm/1265mm/1360mm/1700mm  
**Track** 1200mm/1205mm  
**Car weight** 260kg  
**Weight distribution** 131.2kg/196.8kg  
**Suspension** Double unequal length A-Arm. Push rod 4-way adjustable spring damper/ Double unequal length A-Arm. Pull rod 4-way adjustable spring damper  
**Tyres** 6.2/20.0-13 Avon A45 Avon  
**Wheels** Braid Formrace 16 , 13"x6"  
**Brakes** AP Racing CP4227-2S0 Caliper, Hub mounted 240mm ventilated disc/ AP Racing CP4226-2S0 Caliper, Hub mounted 240mm ventilated disc  
**Chassis** One piece tubular steel space frame  
**Engine** 2005 Honda CBR600 F4i four-stroke inline four  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 99 RON unleaded  
**Fuel system** Multiport, sequential portfuel injection, sytec fuel pump  
**Max power/max torque** 75kW @ 10500rpm/60Nm @ 7000rpm  
**Transmission** Single 525 chain  
**Differential** Quaife Initial Slip differential  
**Final drive** 3.71:1



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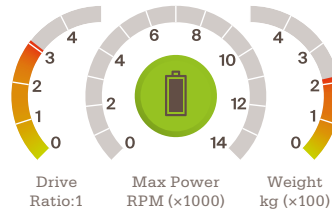
UAS REGENSBURG GERMANY



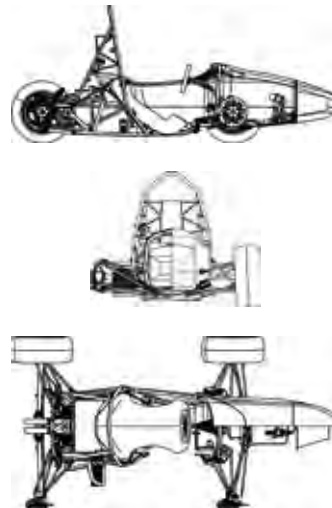
Regenics e.V. is one of two FSAE teams at the University of Applied Sciences Regensburg. With the RP13e (Racing Performance 2013 electric), we have built our third car since our foundation in 2010, while our partner team Dynamics e.V. has built their sixth combustion car. Creating innovation and participating in challenging competitions have always been our motivation. Driven by accuracy with fastidious attention to detail, we are looking forward to a great event at Silverstone 2013.

“”  
**DRIVEN BY ACCURACY WITH FASTIDIOUS ATTENTION TO DETAIL, WE ARE LOOKING FORWARD TO A GREAT EVENT IN SILVERSTONE 2013.**

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2710mm/1145mm/1445mm/1575mm  
**Track** 1250mm/1250mm  
**Car weight** 215kg  
**Weight distribution** 130kg/147kg  
**Suspension** Double unequal length A-Arms in front and rear; pullrod in front; pushrod in rear; ARB front and rear  
**Tyres** Continental C13  
**Wheels** 7.0x13" O.Z. Racing wheels with self developed centerlock system  
**Brakes** 4-Disk system, self developed rotors, radial mounted brake calipers  
**Chassis** Hybrid CFRP-Monocoque with tubular steel rear  
**Engine** 2x Enstroj Emrax (Permanent excited synchronous motor)  
**Bore/stroke/cylinders/cc** -/-/-/  
**Fuel type** Electric  
**Fuel system** -  
**Max power/max torque** 2x 60kW/2x 200Nm  
**Transmission** Synchronous belt drive  
**Differential** Separated axes  
**Final drive** 3.08:1



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TU KAISERSLAUTERN GERMANY

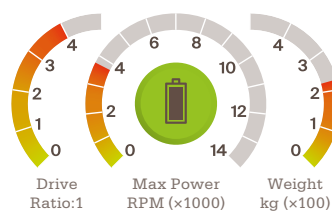


The Kaiserslautern Racing Team was founded in 2007 as the team of the Technical University. In 2008 we started with our first-year car with monocoque at the Formula Student competitions. Since the beginning of 2010 we are also officially working together with UAS Kaiserslautern.

After building four combustion cars, we developed our first electric car for last year's competition, on the basis of the slightly adapted combustion chassis. This year we made

a huge step and designed a completely new monocoque and kinematics to be better able to deal with the specific problems of an electrically driven car. The accumulator concept got a little more progressive and was also completely manufactured by ourselves this year. Our concept furthermore includes several improvements in the two motors that drive the rear wheels as well as in the inverters controlling them and that have been programmed to realise an electric differential.

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2500mm/1135mm/1335mm/1525mm  
**Track** 1150mm/1050mm  
**Car weight** 225kg  
**Weight distribution** 132kg/161kg  
**Suspension** Double unequal length A-Arm. / Pull rod front and rear / Mountain bike dampers  
**Tyres** Keizer CL 10  
**Wheels** Cutlery steel, hub mounted, dia.: 200mm front/180mm rear, waterjet cut  
**Brakes** 4-Disk system, self developed rotors, radial mounted brake calipers  
**Chassis** single piece monocoque and accumulator container outside with an additional side impact structure  
**Engine** 2 Vues AFW 507G (each rear wheel driven separately)  
**Bore/stroke/cylinders/cc** -/-/-/  
**Fuel type** N/A  
**Fuel system** N/A  
**Max power/max torque** 28.9kW @ 3741rpm/73.7Nm @ 3741rpm  
**Transmission** self designed single spur gear, one per motor  
**Differential** electrically emulated  
**Final drive** 4:1



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UNIVERSITY OF BOLOGNA  
ITALY



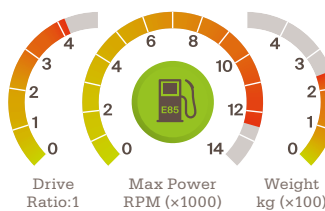
Team UniBo Motorsport was born four years ago with just 15 members. In 2013, our team has 70 team members, divided into four groups: electronic, vehicle, powertrain and marketing.

Our Powertrain Division develops the engine control system, calibrates and tests performance. Our vehicle team designs, builds and tests all mechanical components. Electronic Division designs, builds and tests all electronics boards, and developed the telemetry system. The Marketing Division find sponsors, organise events, manages the website and prepares team information.

The 2012-2013 UniBo race-car evolved from our previous prototype: robotised gearbox, improved lubrication system, detailed fluid-dynamics analysis. 2013 developments are the new airbox and redesigned intake runners, new throttle valve, new exhaust system, electronic control and actuation of clutch and gearbox. We have also revised the engine, with individual cylinder calibration and control of fuel injection and spark advance, plus the driver can select up to six different engine calibration datasets in real time, via steering wheel buttons.



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2775mm/1100mm/1376mm/1525mm

**Track** 1180mm/1170mm

**Car weight** 241kg

**Weight distribution** 160kg/149kg

**Suspension** Front: double unequal length A-arm. Push rod actuated vertically oriented spring and damper. Arb system with titanium blade. Rear: double unequal length A-arm. Push rod actuated horizontally oriented spring and damper. Arb system with titanium blade.

**Tyres** 20.5x7.0-13 R25B

**Wheels** O.Z 13"x7" monobloc

**Brakes** Brembo system with Cast Iron, hub mounted, 218mm dia. Drilled. Front: Brake caliper whit four pistons. Rear: Brake caliper whit two pistons.

**Chassis** One piece tubolare spaceframe whit aluminium box in rear of the vehicle

**Engine** GSX-R 600 k6-k7 four stroke in line

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599cc

**Fuel type** 104 E85

**Fuel system** Custom multi point fuel system. Magneti Marelli PSI injector

**Max power/max torque** 66.19kW @ 12500rpm/56Nm @ 9500rpm

**Transmission** Single 520 chain

**Differential** Limited slip differential whit clutch system

**Final drive** 4.17:1

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UNIVERSITY OF BELGRADE  
SERBIA



Road Arrow is the only Serbian team at Formula Student competitions and represents the University of Belgrade. Road Arrow was founded in 2010, and now has 25 team members – students with diverse engineering backgrounds, and institutions as sponsors who are supporting this project from the start. Some of our partners are: University of Belgrade, the Ministry of Science, Technol-

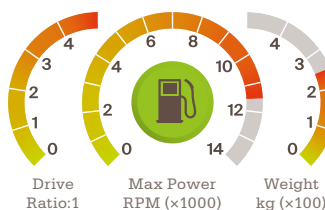
ogy and Development, AMSS, Microelectronica, Rotech, and others.

Our team is organised to work in teams, divided according to the part of engineering work in the vehicle.

The main objective of Road Arrow is to develop a vehicle with better performances than our previous car, and to be in the top 10 at Formula Student competitions.



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2900mm/1500mm/1200mm/1600mm

**Track** 1250mm/1200mm

**Car weight** 250kg

**Weight distribution** 115kg/205kg

**Suspension** Front: double unequal length A-arm, pull. Rear: push rod with spring and damper horizontally actuated.

**Tyres** 7.0/20.0-13" Avon

**Wheels** "OZ Superleggera C" 190mm wide Aluminium Rim

**Brakes** Front: 229mm dia. hub mounted, drilled, stainless steel (AISI 314). Rear: 220mm dia. hub mounted, drilled, stainless steel (AISI 314)

**Chassis** One piece tubular spaceframe

**Engine** 2009/Yamaha YZF-R6

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599cc

**Fuel type** 95 RON

**Fuel system** Yamaha multi point fuel injection

**Max power/max torque** 60kW @ 11500rpm/65Nm @ 9200kW

**Transmission** Single 520 chain

**Differential** Drexler

**Final drive** 5:1

66

UNIVERSITY OF EXETER UK

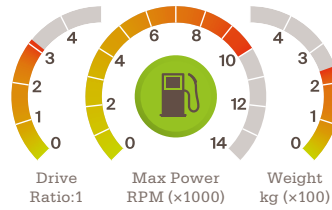


This is the University of Exeter's first ever Formula Student team and as such the car is based on simplicity and reliability. It is based around a steel space-frame chassis and a Honda CB 600 engine, both historical staples of the competition. A spool drive system has been used instead of a differential in order to increase the simplicity and cost-effectiveness of the design. The core team is 13 strong, all

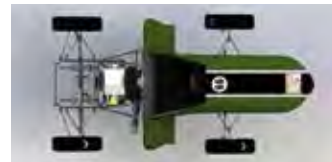
fourth year MEng students who have designed and built the car as their final year project. They have been ably supported by a selection of first, second and third years students assisting both inter and extra-curricularly.

The team would like to thank all their sponsors for their support including Thales, Aerocatch, Ricardo, DSG, Avalon sciences and the University of Exeter Annual Fund.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2800mm/1272mm/1450mm/1600mm
- Track** 1360mm/1360mm
- Car weight** 240kg
- Weight distribution** 124kg/186kg
- Suspension** Double equal length A-Arm. Push rod actuated horizontally oriented spring damper
- Tyres** 7.2/20.0-13 Avon
- Wheels** 177mm wide, 1 pc Al Rim
- Brakes** Cast iron, hub mounted, 247mm dia. Solid front/Cast iron, inboard, 214mm dia. Solid rear
- Chassis** One piece tubular spaceframe
- Engine** 1998 Honda CB 600F four stroke in line four
- Bore/stroke/cylinders/cc** 65mm/42.5mm/4 cylinder/599cc
- Fuel type** 99 RON unleaded
- Fuel system** Custom built multi point fuel injection
- Max power/max torque** 54.4kW @ 10000rpm/54.2Nm @ 7500rpm
- Transmission** Single 520 chain
- Differential** Spool drive
- Final drive** 3.14:1



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HERIOT-WATT UNIVERSITY UK

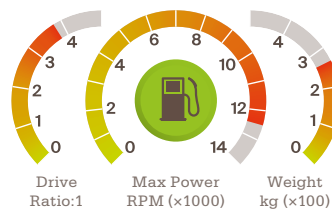


Now in its fourth year of competition, the HWRacing team are hungry and looking to make a massive leap forward in the competition. Last year's effort, the HWR-03, was regarded by the team as a fundamentally good car, let down only by one or two small issues. Using the lessons learned, HWRacing's main focus for the 2013 competition has been to improve the reliability of components on the HWR-04, specifically the engine and wheel assemblies. This has required a lot of consideration about which parts of the car

require a full redesign, namely the hubs and the uprights, and which parts require only minor refinements, such as the chassis and differential assembly.

With a team of 25 students from a variety of backgrounds, the team is confident it can achieve all of its goals in 2013. The HWRacing team would like to thank the School of Engineering and Physical Sciences at Heriot-Watt University and all of the team's partners for their continued support, without which this project would not have been possible.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2900mm/1280mm/1435mm/1610mm
- Track** 1300mm/1260mm
- Car weight** 263kg
- Weight distribution** 150kg/172kg
- Suspension** Double unequal length, non parallel A-arm, pullrod actuated top mounted dampers front and back
- Tyres** Avon: 170/505R13
- Wheels** 177.8mm wide, 2pc Al Braide Wheel
- Brakes** Cast Iron, 220mm dia. Machined (Front: Outboard/Rear: Inboard)
- Chassis** One piece tubular spaceframe
- Engine** 2006/Honda CBR600RR four stroke in line four
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** 99 RON Unleaded
- Fuel system** 99 RON Unleaded
- Max power/max torque** 62kW @ 12500rpm/60Nm @ 8000rpm
- Transmission** Single 525 Chain
- Differential** Honda EK9 Torsen helical differential
- Final drive** 3.8:1



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**NATIONAL UNIVERSITY OF SCIENCES & TECHNOLOGY PAKISTAN**

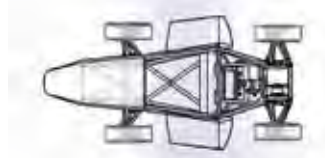
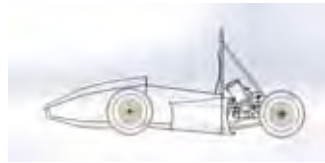
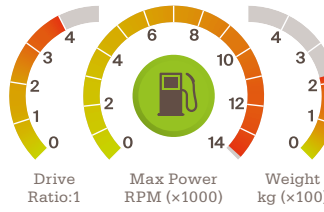


Formula NUST Racing is the only team from Pakistan at FS 2013. This is our second year and we are still learning about the ins and outs of the competition, so we have decided to avoid risks as much as possible. Our primary design objective is to build a car that is reliable enough to clear the endurance run. To ensure that, we have played safe and have focused on safety over performance. While manufacturing the car, cost has also been one of our biggest concerns.

In one aspect of the competition, we have left the mantra of orthodoxy and decided to do things differently. That aspect is related to the marketing of the project. An amalgam of road shows, media appearances and social media publicity, our marketing strategy is an extensive one, to say the least. Promotion of motorsports in our resident country is one of our primary objectives, and we have left no stone unturned to achieve it. Of course, none of this would have been possible without the support of our sponsors.



**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 2726mm/1183mm/1450mm/1650mm

**Track** 1200mm/1200mm

**Car weight** 220kg

**Weight distribution** 115.2kg/172.8kg

**Suspension** Double unequal length A-Arms. Push rod actuated longitudinally oriented spring and damper for the rear suspension and push rod actuated vertically oriented spring and damper for the front suspension

**Tyres** 20.5x7.0-13 R25B Hoosier

**Wheels** 203.2mm wide, 1 pc MS Rim

**Brakes** Cast Iron, hub mounted, 240mm dia. Cross Drilled

**Chassis** Tabular steel spaceframe

**Engine** 2008/Honda CBR-600RR four stroke in line four

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** 99 RON unleaded

**Fuel system** Dual Stage Fuel Injection (DSFI) with 40mm (1.6") throttle bodies, Denso 12-hole injectors

**Max power/max torque** 79.05kW @ 13850rpm/59.67Nm @ 11225rpm

**Transmission** Single 520 chain

**Differential** Automatic torque biasing differential by Quaife

**Final drive** 4:1

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**UNIVERSITY OF STAVANGER NORWAY**



The University of Stavanger are one of two teams from Norway this year, competing for the second year in a row. The team is divided into departments led by Masters and undergraduate students. First and second year students participate in the departments to gain experience and knowledge to be used in their further education and profession.

The car is designed with a thin carbon fibre body for a weight reduction. Also new this year is the introduction of front and rear wing for an

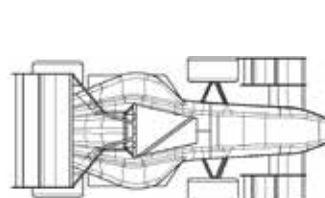
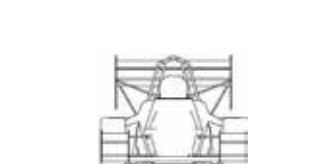
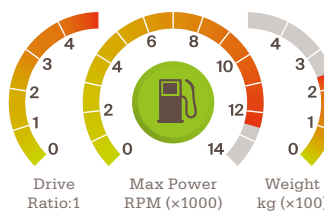
increase in the downforce. A 5% caster angle is used on the front suspension.

The team objective is to complete the competition with a car that performs its best. We hope to do it better than last year and to be the best Norwegian team in our class.

We want to thank our main sponsor Rosenberg. We also want to thank SKF, Propaint, Tekna, Lindeberg og Lund, University of Stavanger and University of Agder and other contributions in the workshop.



**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 3300mm/1150mm/1510mm/1600mm

**Track** 1290mm/1240mm

**Car weight** 240kg

**Weight distribution** 154kg/154kg

**Suspension** Double unequal length A-arm. Push rod actuated rocker connected to both spring/damper unit and ARB

**Tyres** 20.5x7.0 - 13 R25B Hoosier

**Wheels** Jongbloed Al Rim

**Brakes** Al, hub mounted, 228.6mm dia. drilled

**Chassis** One piece tubular spaceframe

**Engine** 2008 Suzuki GSX R600 four stroke

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** 95 RON unleaded

**Fuel system** Suzuki internal combustion 4-stroke piston

**Max power/max torque** 61.9kW @ 12500rpm/54Nm @ 10500rpm

**Transmission** Single 520 chain

**Differential** Drexler Limitid Slip Differential V1

**Final drive** 5:1





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UAS COBURG GERMANY



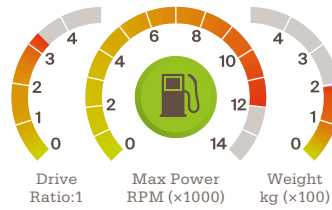
Founded in 2007, CAT-Racing will return to FSUK for the second time. Our 50 members, coming from all fields of engineering, are keen to perform with the C-13.

Increasing performance season by season is not just a question of wise planning and construction but also of deep data analysis and direct feedback from the car to the driver. This helps understand the car's behaviour and the influence of each single component on it, as well as decreasing the strain driving. We have modified certain key features, advancing straight line and cornering per-

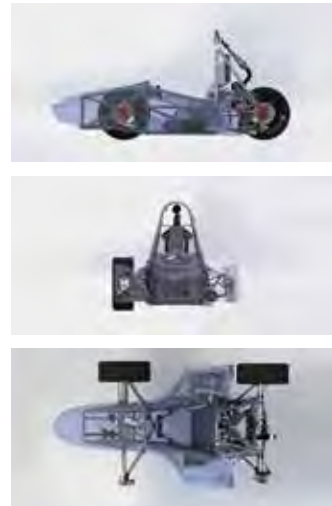
formance. Lowering the engine, shortening the wheelbase, improving intake and shifting system will enhance the car's physical capabilities. Revising steering kinematics and design, in combination with stiffened up seat paddings and pedals as well as raised shift paddle feedback, will keep the driver's concentration on the track, fully using the car's potential.

CAT-Racing thanks all sponsors, friends and families who made this project possible. We hope to meet and even exceed everyone's expectations. For more information, visit our website www.cat-racing.net

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase 2601mm/1158mm/1433mm/1526mm
Track 1210mm/1160mm
Car weight 195kg
Weight distribution 123kg/140kg
Suspension Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper
Tyres 20.0x7.5 - 13 R25B Hoosier
Wheels 7.0" wide, custom Al center, CFK rim base
Brakes Cast Iron, hub mounted, 238/212mm dia. Drilled, ISR 22-048/IS R22-049
Chassis tubular steel space frame
Engine 2005/Yamaha YZF-R6 four stroke in line four
Bore/stroke/cylinders/cc 65.5mm/44.5mm/4 cylinder/599cc
Fuel type 95 RON unleaded
Fuel system BOSCH multi point fuel injection
Max power/max torque 66kW @ 12000rpm/60Nm @ 10000rpm
Transmission 520 chain
Differential LSD torque sensing
Final drive 3.3:1



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# 71

## KTH ROYAL INSTITUTE OF TECHNOLOGY SWEDEN



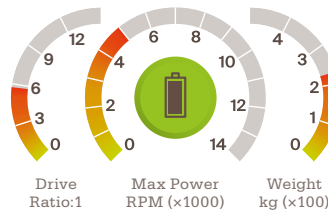
KTH Racing is the Formula Student team at KTH Royal Institute of Technology in Stockholm, Sweden. It is a fully student-governed team and no academic courses are associated with the project. Thus, most of the work in the team is voluntary and driven by sheer willpower and caffeine.

The R10e is the tenth generation of KTH Racing and is the team's third electric vehicle. In the history of KTH Racing, the development of electric vehicles has been so far experimental, third time's the charm.

The team's main goal for this third electric vehicle has been to guarantee participation in all the dynamic events. With the goal of having a running electric vehicle, with limited funds and time, the drivetrain from the previous electric car has been re-used, re-studied and optimised for the R10e. All other components on the vehicle, however, have been newly designed and manufactured. Additionally, a thorough study of ergonomics has resulted in a more compact chassis, a seat with excellent feedback for the driver, and better packaging of electronics.



### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 3105mm/1085mm/1380mm/1550mm

**Track** 1160mm/1140mm

**Car weight** 230kg

**Weight distribution** 134kg/164kg

**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented TTX-25 dampers

**Tyres** 205x55 R13 Hoosier R25B

**Wheels** 7x13" 3 pc Magnesium/Alu Rim

**Brakes** Floating, high carbon steel, hub mounted, 235mm outer diam, ISR aluminium monoblock calipers

**Chassis** Tubular steel space frame

**Engine** Siemens 1FE1082-6WP

**Bore/stroke/cylinders/cc** -/-/-/-

**Fuel type** Electric

**Fuel system** -

**Max power/max torque** 104kW/107Nm @ 4600rpm

**Transmission** Two stage spur gear box

**Differential** Torque vectoring using sensors for speed, steering angle, gyro and throttle

**Final drive** 5.76:1

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## UNIVERSITY OF ABERDEEN UK



TAU Racing are a team of over 50 Aberdeen University students from all disciplines. This broad range of members allows us to ensure the longterm life of TAU Racing, with a focus on knowledge transfer and effective training of all members.

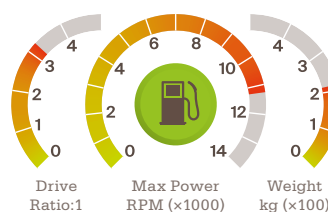
Building on our extremely successful entry to the 2012 competition, the team has entered the 2013 event with TAU-13. Designed as a direct evolution for the first time, we have focused on a well-designed, easy to maintain car, perfect for the weekend racer.

With the steel space-frame chassis alone 10kg lighter than last year, there has been a considerable amount of weight saved from previous cars. A custom ECU has also been developed for the first time, which is a huge step towards improving fuel efficiency and power, and expanded use of composites should see further weight loss.

We would like to extend a huge thanks to all of our sponsors old and new, as well as Aberdeen University for continuing to support TAU Racing.



### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2660mm/1220mm/1467mm/1573mm

**Track** 1276mm/147.16mm

**Car weight** 215kg

**Weight distribution** 135.84kg/164kg

**Suspension** Double unequal length wishbones. Pull (front)/Push (rear) rod actuated internal springs and dampers

**Tyres** Front: 6.2x20.0-13" Rear: 7.2x20.0-13" A45 Avon

**Wheels** 6x13"/7x13" three piece, aluminium rims with magnesium centres

**Brakes** Floating, hub mounted drilled steel. 200mm front with 4 pot aluminium ISR calipers, 220mm rear with 2 pot aluminium ISR calipers

**Chassis** One piece tubular steel spaceframe

**Engine** Suzuki GSX-R 600" line four, Life Racing ECU

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/600cc

**Fuel type** 99 RON unleaded

**Fuel system** Standard Suzuki injectors

**Max power/max torque** 55kW @ 11260rpm/54Nm @ 8000rpm

**Transmission** 6 speed sequential gearbox, 520 chain

**Differential** FSAE Drexler limited slip differential

**Final drive** 3.25:1

73

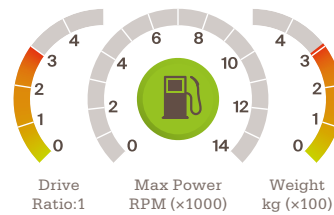
## THOMAS MORE MECHELEN-DE NAYER BELGIUM



Thomas More Innovation is the first Belgian team with an eco-friendly focus for the competition. We have built our vision around three pillars: electric drivetrain for higher tank-to-miles-efficiency, use of recyclable metals (eg alu for suspension, steel for frame and suspension) and use of

alternative materials. We try to search for more eco-friendly alternatives to commonly used materials in the automotive industry. For example: for the bodywork we use flax fibres instead of glass or carbon fibre, and our battery pack casing is made of basalt composite.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2575mm/1480mm/1300mm/1690mm  
**Track** 1275mm/1275mm  
**Car weight** 308kg  
**Weight distribution** 133kg/175kg  
**Suspension** Double wishbone, pullrod, with rocker and spring-damper unit in pullrod plane  
**Tyres** Rain: Continental 205/510 R13 34M; Dry: Continental 205/510 R13 34M  
**Wheels** Braid formrace lightweight alloy wheel  
**Brakes** Main cylinder: AP Racing CP 2623-88PRM115; Calipers: AP Racing CP4227-2S0  
**Chassis** One piece tubular spaceframe  
**Engine** 2x Enstroj Emrax permanent magnet motor  
**Bore/stroke/cylinders/cc** 86mm/-/-/  
**Fuel type** Electric  
**Fuel system** Electric accumulator: 396 Lipo pouch cells, 7.85kWh  
**Max power/max torque** 100kW/240Nm  
**Transmission** Planetary gear set  
**Differential** Electronic equivalent of conventional open differential  
**Final drive** 3:1



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## UNIVERSITY OF WEST BOHEMIA CZECH REPUBLIC

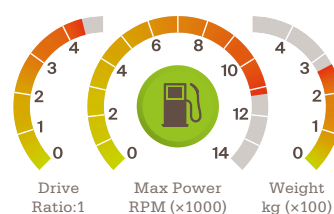


UWB Pilsen Racing Team is the student team of the University of West Bohemia in Pilsen. The University was founded in 1949 and it changed into its present form in 1991. Formula Student was founded at the University in 2009 and it was the first team in the Czech Republic. Our team is very small, at present we have eight members. Our target is to build a cheap, simple formula car with low maintenance requirements. The Honda CBR600RR engine is equipped with new camshafts, exhaust

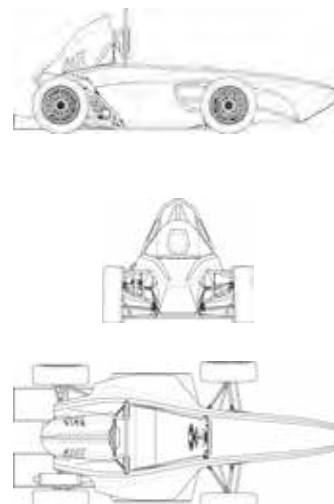
and intake. We have made a few adjustments on the engine such as reducing of cylinder head and polishing of intake channels. This engine provides our car with more than 100hp. Our best result was 36th place at the Formula SAE Italy 2012.

Our general sponsors include University of West Bohemia and its Faculty of Mechanical Engineering, AWAC, Praktik, RRR Power, Birell and many others. All our partners deserve great thanks.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2915mm/1172mm/1418mm/1590mm  
**Track** 1240mm/1180mm  
**Car weight** 270kg  
**Weight distribution** 150kg/188kg  
**Suspension** Double unequal length A-Arm. Pull rod/Double unequal length A-Arm. Push rod  
**Tyres** AVON 7.2/20.0-13  
**Wheels** 6" – Gloria, one pc Al Rim  
**Brakes** Wilwood Dynapro Single, Floating brake rotor 254mm diameter drilled  
**Chassis** One piece tubular spaceframe  
**Engine** 2006, Honda CBR600RR  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/600cc  
**Fuel type** RON 98  
**Fuel system** 4 Primary injectors, 4 Secondary injectors, Fuel Pressure 3.43bar/62.1Nm @ 10596rpm  
**Max power/max torque** 55kW @ 11260rpm/54Nm @ 8000rpm  
**Transmission** 6 speed gear box, Final drive Single 520 chain  
**Differential** Drexler FS2010  
**Final drive** 4.48:1



76

**LINKÖPING UNIVERSITY SWEDEN**



ELiTH Racing set their first footprint on the world of Formula Student in 2012 with a first year contribution above everyone's expectations. This of course has inspired the team to raise the bar and offer a genuine car that will catch much attention this year.

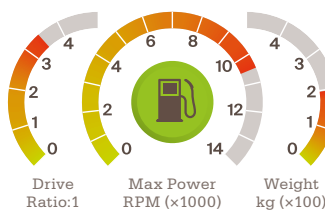
From the city of the jet fighter JAS Gripen, the new car from Linköping University this year exhibits a big and determined step towards the perfect engineered car. Combining the fine properties of composites

and high grade aluminum alloy, we have cut 100kg of weight from 2012. It's amazing look accentuates the effort that has been put into the development of the well-balanced suspension system together with the chase for maximum engine power and efficiency.

But we couldn't have done it without our sponsors who helped us in a variety of different areas!

For more information visit [www.ELiTHRacing.se](http://www.ELiTHRacing.se).

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2800mm/1211mm/1400mm/1600mm
- Track** 1200mm/1160mm
- Car weight** 198kg
- Weight distribution** 122kg/144kg
- Suspension** Double unequal length A-arms, push/pull-rod, vertically/horizontally oriented spring and damper
- Tyres** HOOSIER 20.0"x7.5"x13"
- Wheels** 7.5" wide BBS 2 pc. outer rim with custom wheel center
- Brakes** 210mm front/200mm back, water jet cut
- Chassis** One Piece Tubular CrMo spaceframe
- Engine** Honda CBR600RR
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** 99 RON unleaded
- Fuel system** Student built ECU system based on FreeEMS
- Max power/max torque** 67kW @ 10500rpm/60Nm @ 8000rpm
- Transmission** Single 520 Chain
- Differential** FSAE Drexler Limited Slip Differential
- Final drive** 3.46:1



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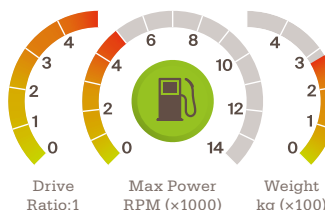
**INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE INDIA**



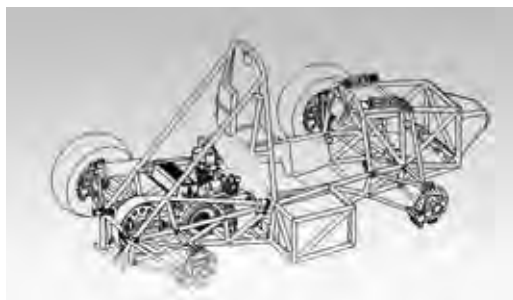
IIT Roorkee Motorsports is the second generation Formula Student team of the Indian Institute of Technology Roorkee. The team consists of more than 35 undergraduate students from mechanical and electrical engineering, organised in a very simple team structure consisting of Project Manager, Electrical Lead, Mechanical Lead and respective senior and junior engineers.

At FS UK 2013, the team has the sole electric-hybrid entry of the competition. Other notable features: air cooled, Smart BMS, Regenerative Braking, Servo controlled carburetor throttle  
Sponsors: IIT Roorkee, Vakrangee Softwares, Oxigen Services Ltd, SAAR, Munjal Showa, Bajaj Auto Ltd, Bender, Wilwood, Keizer, ANSYS.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2250mm/1212mm/1503mm/1550mm
- Track** 1325mm/1250mm
- Car weight** 280kg
- Weight distribution** 145kg/135kg
- Suspension** Front as well as rear: Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper
- Tyres** 20.5x7-13 R25B Hoosier
- Wheels** 13x6; 3 pc 6091 T9 Al Shell
- Brakes** Front: Steel, hub mounted, 230mm dia. Drilled. Rear: Steel, hub mounted, 220mm dia. Drilled
- Chassis** AISI 1020 TIG welded tubular spaceframe
- Engine** Bajaj Discover twin spark 125cc single cylinder/Motenergy ME0913 BLDC air cooled
- Bore/stroke/cylinders/cc** 21mm/22mm/1 cylinder/124.6cc
- Fuel type** 98 RON unleaded
- Fuel system** Carburetor throttle
- Max power/max torque** 5000RPM. Motor - 12kW cont; 30kW peak/Motor - 94Nm
- Transmission** Double stranded ANSI 402
- Differential** Quaife automatic torque biasing differential
- Final drive** 5:1



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**SHEFFIELD HALLAM UNIVERSITY**  
UK



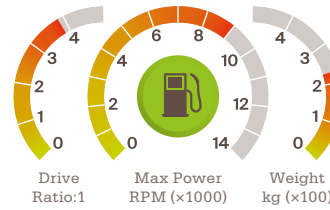
Now in its third competitive year, this generation of SHU Racing aims to overcome the difficulties of the past two years' engine troubles, which prevented competing in dynamic events, with the sole aim of delivering a foundation level and functional car. This is the starting block for a new 5+ year continuous iterative improvement drive to be a competitive team once again.

As part of this process the team expanded to 30 members consisting of mechanical, mechanical and automotive and aerospace engineering

students. The team also includes members studying marketing, business, accounting and English literature degrees, supporting the team's administrative and marketing side. This highlights Sheffield Hallam University's approach to the Formula Student project, being open to anyone who is a keen petrolhead or interested in engineering and wants to push and challenge themselves into a learning curve beyond what their academic course already offers, and reflecting the Institution's open door invitation to engineering involvement.



**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2400mm/1455mm/1600mm/1550mm
- Track** 1600mm/1600mm
- Car weight** 230kg
- Weight distribution** 134.1kg/163.9kg
- Suspension** Double unequal length A arm, pushrod actuated, inboard mounted spring and damper
- Tyres** 508x182-330 A45 Avon 13" Crossply Slicks (front) 6.2/20 0-13 (rear) 7.2/20 0-13
- Wheels** Braid Formrace 16 13"x7½ "
- Brakes** AP Racing 2 Piston Brake Callipers
- Chassis** One piece, tubular space frame, mig welded, cold drawn seamless mild steel
- Engine** 2013 KTM 500 EXC four stroke single cylinder
- Bore/stroke/cylinders/cc** 95mm/72mm/1 cylinder/510.4cc
- Fuel type** Unleaded RON 99/ Super-unleaded RON 95
- Fuel system** Keihin Single Point Injection
- Max power/max torque** 40kW @ 9000rpm/47Nm @ 7000rpm (unrestricted)
- Transmission** Single 520 Chain
- Differential** Quaife QDF7ZR ATB Helical LSD
- Final drive** 3.857:1

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**UNIVERSITY OF MARIBOR**  
SLOVENIA

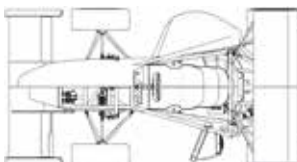
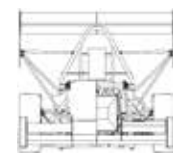
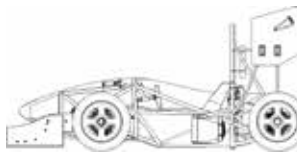
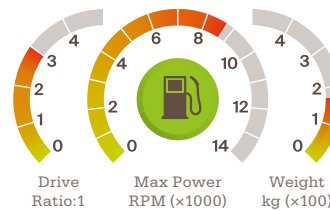


This is UNI Maribor Grand Prix Engineering's third car. We are entering FS UK, FSA and FSG. The highlight remains on the unique aluminium spaceframe. Composite materials were used on suspension arms, wheels, bodywork, seat, floor, intake steering wheel and throttle pedal to lower the car's mass.

A lot of work was done on the engine (changing from Honda CBR 600 to KTM 450

and using a big bore kit). The suspension aims to provide optimal camber curves and the ability to offer different heave and roll stiffness. Improved quick-shift system is made with a simple DC motor, changing gears in less than 100ms. By using a sophisticated data acquisition system, including all the important sensors, we were able to get the maximum out of the car.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2670mm/1115mm/1390mm/1550mm
- Track** 1200mm/1200mm
- Car weight** 170kg
- Weight distribution** 119kg/119kg
- Suspension** Double unequal A-arm, pull rod actuated front and rear
- Tyres** 20.5x7.0-13 R25B Hoosier
- Wheels** OZ Racing FSAE 13x7
- Brakes** Laser cut steel, 230mm (front & rear)
- Chassis** Aluminium tubular spaceframe
- Engine** 2007 KTM 450 SX-F
- Bore/stroke/cylinders/cc** 100mm/60.8mm/1 cylinder/477.5cc
- Fuel type** 99 RON unleaded
- Fuel system** Student built double point injection
- Max power/max torque** 39kW @ 8700rpm/50Nm @ 6800rpm
- Transmission** Single 520 chain
- Differential** Drexler limited slip differential
- Final drive** 3:1



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### LUND UNIVERSITY SWEDEN



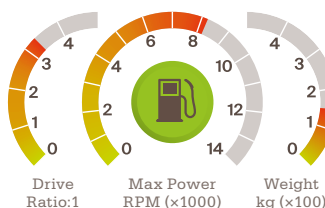
LURacing presents Lund University's sixth FS car. Our goal this year has been to design a lightweight, reliable car with good overall performance. By using a full carbonfibre monocoque, a single cylinder engine, lightweight materials and a simple but reliable electrical system, we have managed to reduce weight to 150kg, over 50kg less than our last car. The weight reduction and the well-tuned single cylinder engine will not only help us improve overall performance but also reduce fuel consumption.

Our team has 20 members, divided into four groups: administrative, chassis, engine and electronics. Since we are a small team everyone helps out where it is needed at the time. Our team is like our car - light, reliable and with a good overall performance! During the spring we started working on the FS14 car (LUR7) as a side project and that team have worked alongside the LUR6 team in the manufacturing process.

We would like to thank our main sponsors Composite Design and Seco Tools T/C for all their help and support throughout the project.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2538mm/1236mm/1408mm/1530mm

**Track** 1200mm/1150mm

**Car weight** 150kg

**Weight distribution** 98kg/120kg

**Suspension** Double unequal length A-Arm. Pull rod/push rod actuated spring/damper. Adj. Roll bars

**Tyres** 18.0x6.0-10" Hoosier LC0

**Wheels** 6.5" wide, 3 pc Al rim

**Brakes** ISR 2/2 piston calipers, floating steel discs, 189.4mm dia, hub mounted

**Chassis** Single Piece CFRP Monocoque

**Engine** Honda CRF450X

**Bore/stroke/cylinders/cc** 96mm/62mm/1 cylinder/449cc

**Fuel type** 99 RON unleaded

**Fuel system** LURacing fuel injection

**Max power/max torque** 36kW @ 8200rpm/40Nm @ 7500rpm

**Transmission** Single 520 chain

**Differential** Drexler LSD

**Final drive** 3.36:1

## 82

### LIVERPOOL JOHN MOORES UNIVERSITY UK



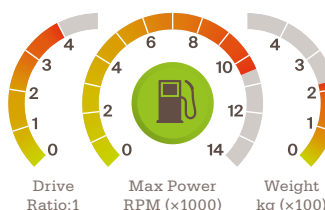
After LJMU Racing's first Class 1 car in 2010, the team has been steadily improving in its competition performances, resulting in its best competition result last year - 12th overall and 2nd UK team. The team aspires to continue its rise in the competition, aiming for its first top ten finish in 2013.

To make this possible, LJMU13 features a number of improvements over its predecessors, aimed at providing substantial weight savings along with improvements to the engine and drivetrain to ensure maximum performance. To achieve these goals, the team

has redesigned the space-frame chassis, along with a number of other components, and retuned and modified the engine to provide improved torque. One of the long-term goals of the team is to increase the number of components which are designed and manufactured in-house. This year LJMU13 features a custom hub design to further reduce weight and improve performance.

LJMU Racing team would like to thank all of its sponsors, especially Graham Engineering who made this year's entry possible and competitive.

#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2850mm/1015mm/1300mm/1525mm

**Track** 1200mm/1185mm

**Car weight** 220kg

**Weight distribution** 144kg/144kg

**Suspension** Double unequal length A-Arm. Push rod suspension with adjustable anti-roll bars, using Ohlins TTX25 Dampers

**Tyres** 508x182-330 A45 Avon

**Wheels** 13" Keizer Kosmo wheel, 6" wide. 3 pc aluminium rim with magnesium alloy centres

**Brakes** Hub mounted brakes. Using 10" diameter drilled brake disks, paired with ISR callipers

**Chassis** Tubular Space frame with removable members

**Engine** 2004 Honda CBR600RR, 4 stroke in line four featuring custom pistons & camshaft profiles

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** 99 RON Unleaded petrol

**Fuel system** Single Rail, Multi point fuel injection. Controlled by a DTA S80pro ECU

**Max power/max torque** 69kW @ 10500rpm/70Nm @ 8900rpm

**Transmission** single 520 chain

**Differential** Drexler FSAE limited slip differential

**Final drive** 4:1





P  
Petrol



E85  
85% Ethanol  
15% Gasoline



E  
Electric



A  
Alternative/  
other

83

## UNIVERSIDAD EUROPEA DE MADRID SPAIN



Formula UEM are the University of Madrid team participating in international Formula Student competition. The team began competing in 2008.

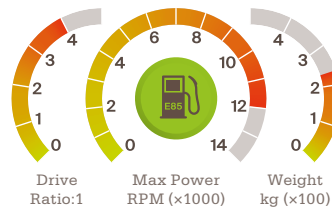
Formula UEM, with veterans and beginners students, is composed of members from different faculties. We form an enthusiastic and multidisciplinary group, and just as the other teams participating in this competition have, we have sacrificed our leisure time for love of technology.

This year the team arrives at the competition wanting to do a great role and consolidate itself as a great team.

“““

**JUST AS THE OTHER TEAMS PARTICIPATING IN THIS COMPETITION HAVE, WE HAVE SACRIFICED OUR LEISURE TIME FOR LOVE OF TECHNOLOGY.**

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2394mm/1110mm/1517mm/1628mm

**Track** 1283.9mm/1241.27mm

**Car weight** 235kg

**Weight distribution** 106kg/129kg

**Suspension** Double unequal length A-Arm Push rod actuated horizontally oriented spring and damper

**Tyres** 20x6.5-13" Hossier R25A

**Wheels** Braid alloy 10x7"+10mm offset/  
Braid alloy 10x7"+32mm offset

**Brakes** designed by students, cut by laser, hub mounted, 205mm dia/4.5mm thick. Drilled

**Chassis** Tubular chassis

**Engine** 2005/Honda CBR 600 RR four stroke in line four

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599cc

**Fuel type** Ethanol E-85

**Fuel system** Honda injection system adapted to the use of ethanol

**Max power/max torque** 82kw @ 12000rpm/131Nm @ 12000rpm

**Transmission** Single chain

**Differential** Differential adjusted torque 40/60

**Final drive** 4:1



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## 84

### UNIVERSITY OF CAGLIARI ITALY



UnicaR Team began in 2006. Currently operating with a staff of 20 people, the team is divided into functional areas, including: engine, chassis, suspension, dynamic, electronic and marketing.

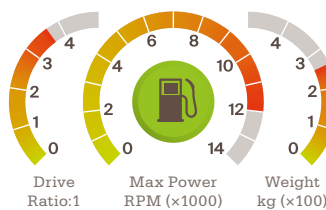
This year's car is the Ichnos.13, an evolution of Ichnos.12. Built around a tubular steel chrome molybdenum, in conjunction with a small castle in 6061. This solution provides better accessibility and greater speed in maintenance at the rear. Among the improvements made over the previous model, include the introduction of pneumatic change to enhance

the dynamic qualities of the car and the expansion of electronic equipment, such as the data acquisition system, telemetry and sensors.

Despite the functional divisions, the team follows a single overall objective: to create a high-performance car, economical, reliable and sustainable, with a focus on comfort and rider safety. Ichnos.13 is designed and implemented based on a series of assessments to 'make or buy' that improve the relationship between supplier-manufacturer-customer, facilitating a better strategic position in the market.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2850mm/1190mm/1550mm/1700mm

**Track** 1300mm/1250mm

**Car weight** 260kg

**Weight distribution** 147.6kg/180.4kg

**Suspension** Double unequal length A-Arm. Pull rod actuated. Vertical oriented spring and damper/Unequal length A-Arm. Push rod actuated Marzocchi Roco spring/damper units

**Tyres** 19.5x6.5-13 A 53 - avon front and rear

**Wheels** OZ 5.5x13"/OZ 7x13"

**Brakes** Student designed steel rotor, hub mounted, 230mm dia./Student designed single steel rotor, differential housing mounted, 240mm dia.

**Chassis** Steel tube space frame with bolted Al rear structure

**Engine** 2004 Yamaha FZ6-SS four stroke in line four

**Bore/stroke/cylinders/cc**  
65.5mm/44.5mm/4 cylinder/599cc

**Fuel type** Gasoline

**Fuel system** Yamaha motorbike stock fuel system

**Max power/max torque** 80hp @ 12000rpm/50Nm @ 10000rpm

**Transmission** Chain #520

**Differential** Quaife automatic torque biasing differential. 3:1 torque bias ratio

**Final drive** Adjustable: 3.35-3.67:1

## 85

### UNIVERSITY OF PADUA ITALY



The Race UP Team presented their first FSAE vehicle back in 2006. This year, with the new MG0813, they focused on improving the reliability of the car and improving its ergonomic qualities, without losing performance achieved over the past years, using a four cylinder Honda CBR600 RR engine.

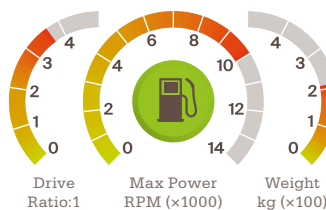
Given that the team can only work on Saturdays, they were forced to be really organ-

ised as well as efficient in order to achieve their ambitious goal, which is to complete a running vehicle that is not only reliable, but also performing.

The team is composed of five sub-groups: engine and powertrain, frame and body, suspension and wheels, electronics, marketing business and logistics. These groups are co-ordinated by a Team Manager and a Technical Lead.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2736mm/1027mm/1446mm/1600mm

**Track** 1260mm/1230mm

**Car weight** 210kg

**Weight distribution** 129kg/149kg

**Suspension** Double unequal length A-Arm pull rod actuated horizontally oriented spring and dampers

**Tyres** 20.5x6.0 - 13" Hoosier front and 20.5x7.0 - 13" Hoosier rear

**Wheels** 13" magnesium rim by OZ Racing

**Brakes** Aisi 420, hub mounted 235mm front 220mm rear diameters

**Chassis** 25CroMo4 tubular spaceframe

**Engine** Honda CBR 600 RR PC40

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599cc

**Fuel type** Petrol

**Fuel system** Indirect injection controlled by MoTeC M400 ECU

**Max power/max torque** 60.3kW @ 10000rpm/57Nm @ 8000rpm

**Transmission** Single 520 chain

**Differential** Drexler limited slip differential

**Final drive** 44:12



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COVENTRY UNIVERSITY UK



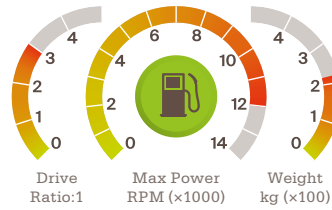
Phoenix Racing operates through a team of 15 final year students studying for a BEng in motorsport engineering. The team is divided into four sub-teams which deal with four separate areas of the car: chassis, engine, dynamics and unsprung mass.

Phoenix Racing have taken a realistic approach to produce a simple, yet lightweight and reliable car. Our main aim for this year is to be competitive at all the dynamic events and beat last year's result.



PHOENIX RACING HAVE TAKEN A REALISTIC APPROACH TO PRODUCE A SIMPLE, YET LIGHTWEIGHT AND RELIABLE CAR.

TECHNICAL SPECIFICATION



Length/height/width/wheelbase 3000mm/1130mm/1350mm/1640mm

Track 1100mm/1080mm

Car weight 220kg

Weight distribution 144kg/144kg

Suspension Double unequal length wishbones, pull rod damper activation

Tyres Hoosier R25B 19.5x7.5 - 10

Wheels Keizer 3 pc 10" Aluminium wheel, 7" wide

Brakes Cast iron, hub mounted drilled disks, 186mm dia.

Chassis T45 Steel Spaceframe

Engine 2002 Honda CBR600 inline four

Bore/stroke/cylinders/cc 67mm/45.2mm/4 cylinder/599cc

Fuel type 95 RON Unleaded

Fuel system Duel phase injection system controlled with a Emerald K3 ECU

Max power/max torque 70kW @ 12000rpm/50Nm @ 10000rpm

Transmission Single 520 Chain

Differential Drexler LSD Differential

Final drive 3:1

87

CARDIFF UNIVERSITY UK



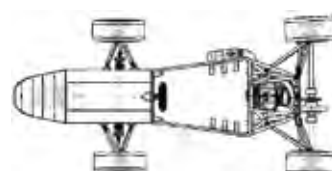
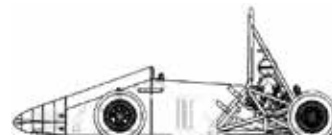
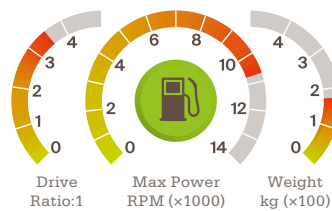
Cardiff Racing is a team of multi-disciplinary engineering students, including first year undergraduates up to final year masters and postgraduate students. We return to Silverstone this year with CR09 determined to give Cardiff its best ever result.

Due to the lack of dynamic testing time in previous years, the team was determined to ensure that CR09 was finished the earliest of all previous Cardiff Racing cars. The chassis continues to use the aluminium sandwich panel front monocoque that has been used by Cardiff Racing for many years, however,

larger radius curves have been used to bend the front panels, increasing the car's stiffness while also allowing for a shorter wheelbase. A rear steel space frame is also retained to allow for ease of maintenance.

Moving away from the spool drivetrain used in previous years, the team has developed a custom differential to improve cornering performance, while in-house dynamometer testing continues to improve upon the reliability and performance of the Aprilia SXV 550 engine, complete with newly designed and optimised exhaust and intake plenum.

TECHNICAL SPECIFICATION



Length/height/width/wheelbase 2749mm/1138mm/1341mm/1610mm

Track 1150mm/1120mm

Car weight 175kg

Weight distribution 119kg/124kg

Suspension Front and rear a-arms, push rod actuated. Vertically oriented front/inclined rear spring and damper

Tyres Hoosier C2000 R25B (18x6.0-10/18x7.5-10)

Wheels 3 pc centre lock wheels, Al rims 6"/7.5" wide, Keizer aluminium centres

Brakes Hub mounted custom steel discs

Chassis Front aluminium honeycomb sandwich panel front monocoque, steel roll hoops and rear spaceframe

Engine Aprilia SXV 550 V-twin

Bore/stroke/cylinders/cc 80mm/55mm/2 cylinder/553cc

Fuel type 99 Ron Unleaded

Fuel system Student designed fuel tank and cables, Bosch injectors

Max power/max torque 57bhp @ 10750rpm/50Nm @ 7960rpm

Transmission Single 520 chain

Differential Custom Torsen LSD Clutch Pack

Final drive 3.54:1



## 88

### UNIVERSITY OF PARMA ITALY



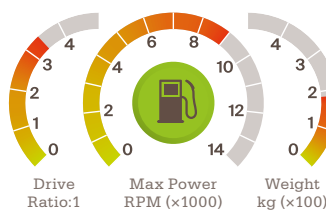
UniPR Racing Team was founded in 2007 from the passion of students and professors from Università degli Studi di Parma. The team is grounded on values such as the passion and dedication to the motorsport by members, and the continuous innovation at every point. The flagship of our vehicle is the CFRP spaceframe bonded with CFRP and aluminium joints using structural adhesive. This solution was adopted for the first time in 2011. UniPR Racing Team was the first team in the Formula SAE competition to choose it, and it has been

improved year after year. The guidelines of our design process are low weight and low centre of gravity, with the aim to achieve good and responsive vehicle dynamics. With these aims, we made some important design choices: we adopted Beta 520 RR single cylinder engine, the bodywork is made of thermo-retractile aeronautical cloth, and we made a massive use of CFRP.

We thank all our sponsors, and specially Bercella Carbon fibre, Henkel, Beta, Simpack, Springitalia, CFmotori, INAFAG.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2338mm/1404mm/1476mm/1540mm  
**Track** 1200mm/1180mm  
**Car weight** 185kg  
**Weight distribution** 131.5kg/125.5kg  
**Suspension** Double unequal length A-Arm. Push rod actuated transversally oriented spring and damper. Adjust. camber, wheel alignment, jounce and rebound dampings  
**Tyres** 18.0x6.0-10 LC0 Hoosier  
**Wheels** 6" wide, 3 pc Al Rim  
**Brakes** Front: Floating, Cast Iron, hub mounted, 184mm dia. Rear: Inboard, differential mounted, cast iron, 195mm dia.  
**Chassis** CFRP spaceframe bonded with aluminium joint using Hysol 9497 structural adhesive  
**Engine** Beta 520 RR  
**Bore/stroke/cylinders/cc** 100mm/63.4mm/1 cylinder/497.9cc  
**Fuel type** 98 RON unleaded  
**Fuel system** Student designed fuel injection  
**Max power/max torque** 31.6kW @ 9000rpm/35.5Nm @ 6000rpm  
**Transmission** Chain drive  
**Differential** clutch pack ltd slip, 100Nm preload, 1.4 bias ratio  
**Final drive** 3.42:1

## 89

### TYUMEN STATE OIL AND GAS UNIVERSITY RUSSIA

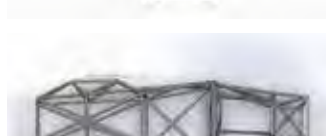
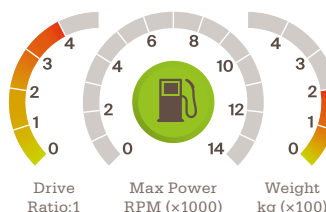


Formula Neftegaz team has 25 members, from Tyumen State Oil and Gas University and Tyumen State Academy of World Economics, Management and Law. This is the first student team in West Siberia, which take part in the international competition.

Team structure: the captain, the head of engineering, the head of PR and economics.

The engine team develops, designs, builds an inlet receiver engine restrictor and creates a unique the exhaust system. The chassis department designs, manufactures the suspension bolide. The department of economics conducts accounting and makes report documents. Our PR team is responsible for fundraising and organising team events.

#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2567mm/950mm/1485mm/1600mm  
**Track** 1230mm/1190mm  
**Car weight** 200kg  
**Weight distribution** 90kg/110kg  
**Suspension** Double unequal length A-arms, push rod actuated. 4-way adjustable, 4 dampers Ohlins TTX 25  
**Tyres** Hosier 20.5/7.0 - 13 - slick, Hosier 21.0/6.5-13 - rain  
**Wheels** OZ Rasing 13x7 model "superleggera C"  
**Brakes** Ø240mm/Ø220mm disks, thickness - 5mm  
**Chassis** One piece tubular spaceframe  
**Engine** Honda CBR 600 RR 2009 four stroke in line four  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 95  
**Fuel system** Honda multi point fuel injection  
**Max power/max torque** 62.52/49.57  
**Transmission** Single 520 chain  
**Differential** Drexsler  
**Final drive** 4:1



90

UNIVERSITY OF PORTSMOUTH UK

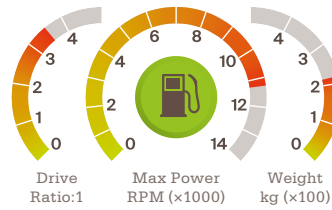


We are UPRacing and 2013 is our fourth consecutive Class 1 FS car. Our car's features this year include a custom designed differential housing with machined and sheet metal intertwined boomerangs to hold it all, kindly made and funded by Pall Europe. The car also includes: a paddleshift system, reducing gear shift time and increasing driver control; sheet metal uprights with camber adjustment, simplifying the set up procedure, welded by EMP tooling and machined by Innova; a single piece tubular spaceframe, welded by BAE Systems; a tuned air intake and

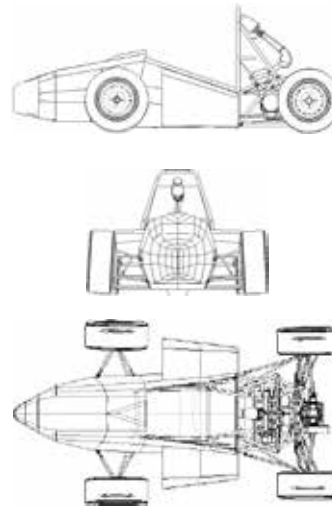
exhaust, with involvement from the university, BAE and Zirco-tec; custom-made connectors, provided by Fisher Connectors and unique handcrafted fibreglass bodywork.

We will also compete at Formula Student Spain. UPRacing are supporting Mission Motorsport over the 2013 season, a charity that provides respite, rehabilitation, recreational opportunities and training to previously injured and recovering military servicemen and women within the framework of motorsport. For more details visit [www.upracing.co.uk](http://www.upracing.co.uk).

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2770mm/1100mm/1500mm/1600mm
- Track** 1250mm/1200mm
- Car weight** 215kg
- Weight distribution** 127kg/156kg
- Suspension** Double Unequal A-Arm. Push rod (Front/Rear) actuated horizontally oriented spring and damper
- Tyres** 20x7x13 Hoosier
- Wheels** Braid 7" 31mm offset/ Braid 7" 18 Offset
- Brakes** Cast Iron, Custom 230 Dia. Hub mounted
- Chassis** One piece tubular spaceframe
- Engine** 205 Yamaha 5SL Four Stroke in-Line four
- Bore/stroke/cylinders/cc** 65.5mm/45.5mm/4 cylinder/599cc
- Fuel type** 99 RON unleaded
- Fuel system** Yamaha Multipoint Fuel Injection/Sytec Motorsport Fuel Injection Pump
- Max power/max torque** 70bhp @ 11300rpm/28ft-ibs @ 9000rpm
- Transmission** 428 O-Ring Chain
- Differential** Torsen University Special Differential
- Final drive** 3.538:1



91

UNIVERSITY OF BIRMINGHAM UK



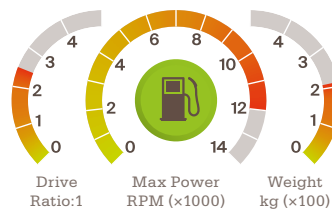
This year UBRacing will enter its 16th car into competition. Our 19 person team, formed mainly of third and second year students, have targeted an increase in drivability and reliability.

This year's evolutionary approach has led to a redesign of the majority of the car's components. Areas of development include a new air intake system designed to increase torque at low engine speeds, a revised outboard assembly design and an improved telemetry system.

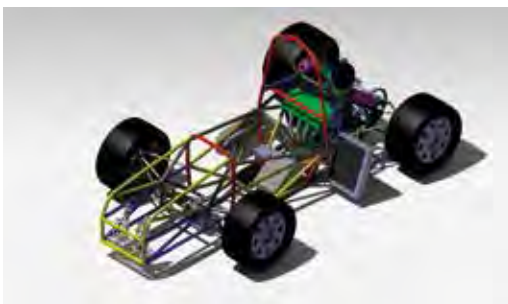
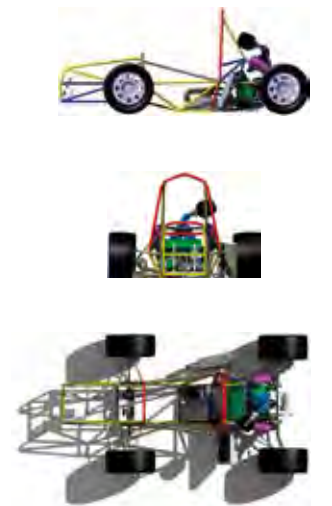
Other improvements include a redesigned clutch and gear shift system, as well as a complete overhaul of the car's electronics system.

The team has had continued support from our long running sponsors Mazak, Perkins and ISCAR, as well as this year seeing an increase in support from Delcam and Aston Martin. Without their support and the support from our numerous other sponsors, we would not be able to take part in this amazing competition.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2570mm/1037mm/1408mm/1570mm
- Track** 1220mm/1160mm
- Car weight** 210kg
- Weight distribution** 139kg/139kg
- Suspension** Front: Double unequal length wishbone, pull rod actuated with in plane horizontally orientated dampers. Rear: Double unequal length wishbone, push rod actuated with out of plane dampers, vertically orientated
- Tyres** 20.5x7.0-13 Hoosier front, 20x7.5-13 Hoosier rear
- Wheels** Split rim Braid Formrace, 7x13 front, 8x13 rear
- Brakes** Cast iron, hub mounted, 220mm dia. Drilled
- Chassis** One piece tubular spaceframe
- Engine** 2005 Yamaha YZF-R6 four stroke in line four
- Bore/stroke/cylinders/cc** 65.5mm/44.5mm/4 cylinder/599cc
- Fuel type** 99 RON
- Fuel system** Sequential fuel injection, McLaren TAG400 ECU
- Max power/max torque** 43KW @ 12000rpm/62Nm @ 8500rpm
- Transmission** Single 520 chain
- Differential** Drexler Motorsport, Formula Student Limited Slip Differential (2010)
- Final drive** 2.4375:1



## 92

### ESTACA FRANCE



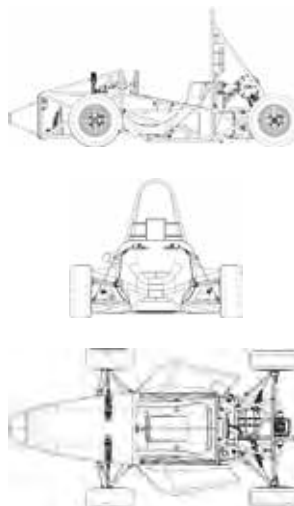
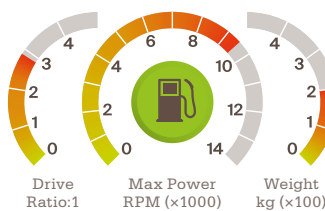
EC-01 is the first Formula Student car from ESTACA, the French transport engineering university. The car was created and manufactured with help from Aixam Mega, Facom, and three technical high schools (AFORP, GARAC and Lycée Le Corbusier).

EC-01 began in September 2011, with the aim to design and manufacture the most reliable car possible for an expected weight of 200kg. We created simulations to show handling and power requirements for autocross, selecting a 450cc single cylinder engine,

which offers weight reduction and ease of use. This provides a gain of 30kg, a consumption reduction (30%) and simplicity compared to 600cc 4 cylinders. Our car is small, with 10" rims, which brings lightness while reducing rotating masses. The double wishbone suspension is fully adjustable with 4 channels adjustable shock absorbers, to provide maximum performance through the settings. The chassis is a tubular space frame, chosen for its simplicity and low cost. Overall, we used simple solutions, not costly complex technology.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2700mm/1100mm/1430mm/1552mm  
**Track** 1300mm/1270mm  
**Car weight** 200kg  
**Weight distribution** 126kg/142kg  
**Suspension** Double unequal length A-Arm, push rod actuated Ohlins TTX 25 dampers  
**Tyres** 10in Hoosier LC0, 6in wide  
**Wheels** 6in wide Al rim  
**Brakes** 2 pistons calipers Front and rear, Self designed discs  
**Chassis** One piece tubular spaceframe, TU37 steel  
**Engine** BMW G450X  
**Bore/stroke/cylinders/cc** 98mm/59.6mm/1 cylinder/449cc  
**Fuel type** 98 RON unleaded  
**Fuel system** Monopoint injection, Performance electronics ECU, Lambda sensor.  
**Max power/max torque** 36.8kW @ 9500rpm/45Nm @ 6500rpm  
**Transmission** Single 520 chain  
**Differential** Drexler LSD  
**Final drive** 43:15

## 93

### UNIVERSITY OF SURREY UK



Stag'13 is Team Surtes' fifth Class 1 entry. It was developed as an evolutionary car, building on previous cars' strengths. The primary design aim for Stag'13 is to improve vehicle performance by advancements in functionality, reliability and lightness.

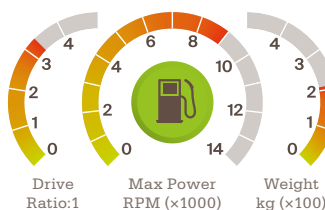
A newly shaped hybrid chassis, consisting of a carbon fibre monocoque that protects the driver and a high strength steel frame which houses our Honda CBR600RR engine, is the backbone for these improvements. Amongst this year's developments, we have designed a pull rod suspension system which lowered the centre of

gravity without compromising kinematic characteristics or adjustability. We have also optimised our bespoke cooling system through the removal of unnecessary components and a new oil tank design.

Despite being a small team, we are big on ambition. We would like to thank all of our longstanding supporters, in particular the University of Surrey, for their generous contributions and help in making Team Surtes possible. We are pleased to have sealed a sponsorship deal with Caltest Instruments Ltd, an international power and instrumentations specialist company.



#### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2750mm/1050mm/1370mm/1590mm  
**Track** 1200mm/1120mm  
**Car weight** 210kg  
**Weight distribution** 125kg/153kg  
**Suspension** Double unequal length. Front and rear pull rods  
**Tyres** Hoosier 20.5x7x13" R25B  
**Wheels** 13x6" Keizer manufactured  
**Brakes** Front outboard 220mm/ Rear inboard 190mm. ISR dual piston 25mm diameter calipers  
**Chassis** Rear space-frame, front carbon fibre monocoque  
**Engine** 2009 Honda CBR600RR, 4 stroke in line 4  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 99 RON unleaded  
**Fuel system** Custom multi-point fuel injection  
**Max power/max torque** 66kW @ 9000rpm/60Nm @ 8500rpm  
**Transmission** Single 520 DID chain  
**Differential** Modified Honda Suretrac  
**Final drive** 3.2:1

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96

**UAS ZWICKAU  
GERMANY**

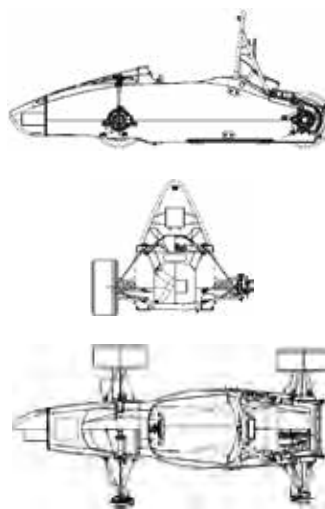
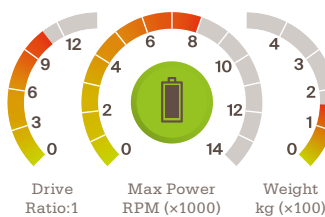


Innovation meets tradition. If you look at Zwickau's automotive history, you can easily find out why we picked out this slogan for our team. Zwickau is the birth place of Horch and Audi, and furthermore in the 1930s, it was the location of the Auto Union race cars which dominated Europe's racetracks. Almost 70 years later our WHZ

Racing Team was founded. Now in 2013, we bring our fourth full electric car to the tracks. The FP713e is a further development of last year's successful cars, concentrating on lightweight, packaging and reliability. We created a fast and dynamic car with two independent motors and self-developed electronic components.



**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 2656mm/1123mm/1390mm/1530mm  
**Track** 1200mm//1140mm  
**Car weight** 160kg  
**Weight distribution** 114kg/114kg  
**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper  
**Tyres** 18.0x6.0-10 R25B Hoosier  
**Wheels** 6.5" wide, 3pc Alu Rim  
**Brakes** Steel, hub mounted. Front: 200mm dia. Rear: 170mm dia.  
**Chassis** CFRP monocoque  
**Engine** 2 PMSM motors close to the wheels on the rear axle  
**Bore/stroke/cylinders/cc** -/-/-/  
**Fuel type** Energy storage: 144 lithium polymer cells  
**Fuel system** 600V lithium polymer accumulator  
**Max power/max torque** 45Nm @ 8000RPM. 80kW/300Nm  
**Transmission** spur gear  
**Differential** self developed vehicle dynamic drive control (VDDC) with torque vectoring  
**Final drive** 10.8:1

97

**WROCLAW UNIVERSITY OF TECHNOLOGY  
POLAND**

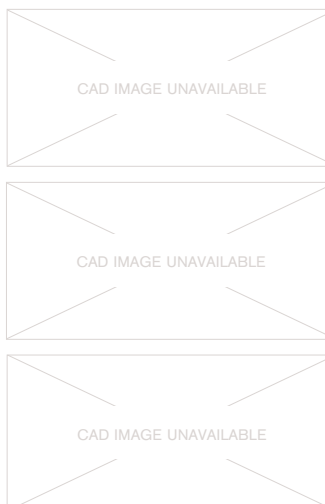
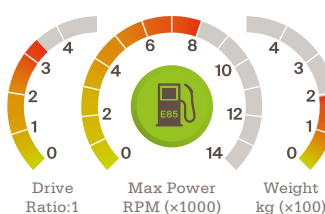


PWR Racing Team is proud to present RT03 – the team's third car. This build was a great breakthrough for the team. Our main area of interest was weight reduction and new materials. For the first time, a steel frame was replaced with monocoque and the Honda CBR600RR engine was dropped in favor of KTM 450SX, which is half as heavy. All of that together with E85 fuel, provided competitive amount of torque and power. Further weight optimisation was done on all elements. These new technologies were challenging but helped to reduce vehicle weight

below 200kg and provide it with satisfactory reliability.

The team consists of 30 students from several faculties at Wroclaw University of Technology and support from University of Wroclaw and Wroclaw University of Economics. Divided into technical and marketing/financial teams, PWR Racing Team members have worked hard to design and build a competitive racecar. Our group of curious and open-minded people from different backgrounds have proven that competitive race cars can be built in even an immature track-racing environment such as Poland.

**TECHNICAL SPECIFICATION**



**Length/height/width/wheelbase** 2750mm/1140mm/1470mm/1610mm  
**Track** 1230mm/1130mm  
**Car weight** 195kg  
**Weight distribution** 113kg/150kg  
**Suspension** Double unequal length A-Arm front and rear. Front: push rod actuated spring and damper. Rear: direct acting spring and damper  
**Tyres** Hoosier 20.5x6.5x3R25B  
**Wheels** 184mm wide, 3 pc Al Rim  
**Brakes** Slotted cast iron discs, hub mounted, 203.2mm dia.  
**Chassis** Tubular steel spaceframe  
**Engine** 2004 Yamaha YZF-R6 four stroke in line four  
**Bore/stroke/cylinders/cc** 65.5mm/44.5mm/4 cylinder/599cc  
**Fuel type** 99 RON unleaded  
**Fuel system** City Racing multi point fuel injection  
**Max power/max torque** 56kW @ 8000rpm/51.8Nm @ 9000rpm  
**Transmission** Single 520 chain  
**Differential** Quaife Automatic torque Biasing Differential  
**Final drive** 3.23:1



99

CITY UNIVERSITY LONDON UK



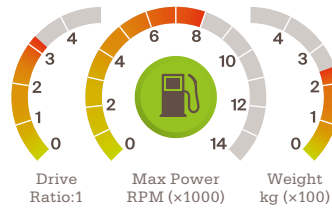
Now in its second year under new structure and branding, City Racing is proud to present the CR13. Having gained valuable experience and knowledge in 2012, the team has designed a car to be competitive and move City Racing to the top positions.

The team is primarily made up of third and fourth-year MEng students with some first and second-year students joining to allow them to learn and continue our progress in the coming years.

The team have invested heavily into a new and improved, easy to adjust suspension system, which when combined with the Yamaha R6 engine, provides a powertrain and suspension system capable of realising the team's potential. In addition, an improved electrical system and custom in-house manufactured exhaust and air intake give the team all the required tools to make the step forward. City Racing have though, still maintained the objectives for the competition, and that is to produce an affordable car for the amateur weekend racer.



TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2188mm/1172mm/1064mm/1600mm
- Track** 1200mm/1150mm
- Car weight** 240kg
- Weight distribution** 96kg/144kg
- Suspension** Double unequal length A-Arm front and rear. Front: push rod actuated spring and damper. Rear: Direct acting spring and damper
- Tyres** 184mm wide, 3 pc Al Rim
- Wheels** 13x6, 3 pc Al Keizer Rim
- Brakes** Slotted cast iron discs, hub mounted, 203.2mm dia.
- Chassis** Tubular steel spaceframe
- Engine** 2004 Yamaha YZF-R6 four stroke in line four
- Bore/stroke/cylinders/cc** 65.5mm/44.5mm/4 cylinder/599cc
- Fuel type** 99 RON unleaded
- Fuel system** City Racing multi point fuel injection
- Max power/max torque** 56Kw @ 8000rpm/51.8Nm @ 9000rpm
- Transmission** Single 520 chain
- Differential** Quaife Automatic torque Biasing Differential
- Final drive** 3.23:1



100

UNIVERSITY OF CENTRAL LANCASHIRE UK



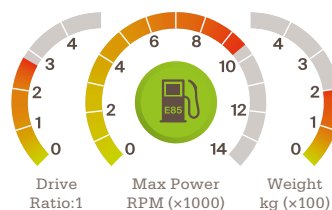
UCLan Race Engineering is made up of dedicated and enthusiastic third-year undergraduates and MEng students at the University of Central Lancashire. Looking to improve on previous entries, the team opted for a very aggressive design, starting with a blank sheet in all respects, and incorporating design ideas never attempted before by the university.

The aim of the car is to be lightweight with high performance and all aspects of the design have been driven by this, with a lot of the design phase being spent finetuning designs using CFD and FEA

simulation software. The team are the first to build a carbon fibre monocoque and use a full aerodynamic package, including front and rear wings, and a diffuser. An Aprilia 550cc v-twin engine transmits power to the Avon slicks, running on Keizer magnesium rims, through an X-trac set up differential.

We would like to thank our numerous sponsors, without whom the project would not have been possible. These include DTBS, JBL Audio, Jones Restoration Services, Emkay Plastics Ltd and Seward Precision Laser Ltd.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 3080mm/1350mm/1385mm/1555mm
- Track** 1210mm/1090mm
- Car weight** 200kg
- Weight distribution** 107kg/161kg
- Suspension** Double wishbone, pushrod front, pullrod rear, inboard dampers
- Tyres** Avon Slicks
- Wheels** 2 piece mag 5.5j rim
- Brakes** Cast iron, hub mounted 220mm dia., drilled and grooved
- Chassis** Carbon-fibre monocoque, with tubular spaceframe power module
- Engine** Aprilia 550cc V-twin
- Bore/stroke/cylinders/cc** 80mm/55mm/2 cylinder/550cc
- Fuel type** E85
- Fuel system** Aprilia multi point injection
- Max power/max torque** 62bhp @ 9600rpm/53Nm @ 7400rpm
- Transmission** 520 chain, single
- Differential** Custom quaife limited slip differential
- Final drive** 13:36



101

DUBLIN INSTITUTE OF TECHNOLOGY IRELAND



FormulaDIT's 2013 car (FS-DIT13) is designed and built by final year mechanical and manufacturing students. Team members are excited about competing in the event and meeting the Formula Student community face to face.

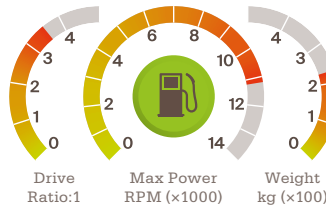
The car is based around a Suzuki K6 engine and a tubular steel space frame. Detailed ergonomics analysis has been carried out in the cockpit area to ensure driver comfort. A full data acquisition and wireless telemetry system is used to evaluate car performance. The dry sump is an original design and electrical system innova-

tions have resulted in replacement of the traditional relay and junction box type loom with a programmable power distribution module. Using a carbon composite impact attenuator as an integral part of the bodywork has resulted in substantial weight losses.

Sponsorship from National Instruments, Kelvin and DIT Foundation have enabled FormulaDIT's development. The team also maintains strong links with Track day performance, Mondello Park race track TRL, OC Suspension Centre and Galway Carbon.



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2625mm/1170mm/1407mm/1652mm

**Track** 1225mm/1175mm

**Car weight** 230kg

**Weight distribution** 118kg/180kg

**Suspension** Double unequal length A-Arm, push rod actuated with custom tuned Fox Shox spring dampers

**Tyres** Avon 508x7.2/20

**Wheels** Keizer, 13" 3-piece Rim

**Brakes** AP racing 4 pot front callipers and 2 pot rear with 220mm dia. steel alloy discs

**Chassis** One piece tubular steel spaceframe

**Engine** 2006 Suzuki GSXR-600-K6 four stroke inline four.

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** 99 RON unleaded

**Fuel system** Suzuki multi point fuel injection, external fuel pump with adjustable fuel pressure and custom aluminium fuel tank

**Max power/max torque** 60.3kW @ 11200rpm/55Nm @ 8700rpm

**Transmission** Single 520 chain

**Differential** Drexler LSD differential

**Final drive** 3.57:1

102

WARSAW UNIVERSITY OF TECHNOLOGY POLAND



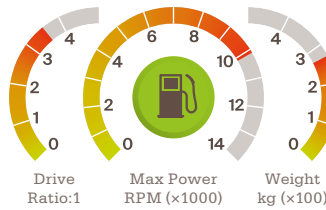
WUT Racing project is located at the Warsaw University of Technology. We are usually well-organised, and the atmosphere is not very stressful. Sometimes we must do something at the last gasp, but the team always remains calm and happy. About 25 students with different experience and knowledge backgrounds are at the same time a bunch of friends. We never say 'no' to anybody. To become a member you don't have to be a genius, we are just students learning from each other and really enjoying it.

When it comes to our car, as most of us study at the Faculty of Aeronautical Engineering – the vehicle has sophisticated aerodynamics that we are proud of. We have used powerful, supercharged Honda CBR F4i so a bit of down force seems to be very helpful.

We receive a lot of support from the Warsaw University of Technology, but without help of our sponsors we wouldn't be where we are now. We would like to thank Techniko, Bosch, LeasePlan, Racing Center Warsaw, Joffe Group and to all the others who helped us!



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 3053mm/1095mm (1578mm with aero)/1400(+20)mm/1550mm

**Track** 1200(+20;-40)mm/1200(+20;-40)mm

**Car weight** 269kg

**Weight distribution** 152kg/185kg

**Suspension** Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper/Double unequal length A-Arm. Pull rod actuated horizontally oriented spring and damper

**Tyres** 20.5x7.0-13 R25B Hoosier/20.5x7.0-13 R25B Hoosier

**Wheels** 6" wide, Forged Aluminum Rim/6" wide, Forged Aluminum Rim

**Brakes** Floating, steel, hub mounted, 240mm dia./Floating, steel, hub mounted, 220mm dia.

**Chassis** Front and rear Tubular space frame

**Engine** Honda CBR 600 F4i, 4 cylinders in-line

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** Gasoline

**Fuel system** Student des/built, fuel injection, sequential

**Max power/max torque** 68kW @ 10150rpm/42Nm @ 8000rpm

**Transmission** 5/8" 520 type, X-ring

**Differential** Torsen; Quaife QDF7ZR

**Final drive** 3.53:1



108

UNIVERSITY OF SHEFFIELD UK



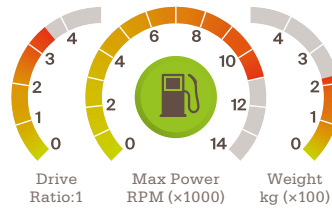
Sheffield Formula Racing is proud to present the SFR-004, our fourth car. SFR consists of 32 enthusiastic engineers at various stages of their degree. Our strong team structure and fluid team dynamic guarantees a flow of knowledge throughout the years, ensuring continual development and innovation within the team. We believe that these factors benefit the students and team greatly, allowing Sheffield Formula Racing to become more competitive year on year.

In 2013, we have focused on achieving our earliest completion time, whilst still incorporating a range of innovative upgrades that utilise Sheffield's new 3D printing technology. We aim to maintain our strong performance in all static events whilst finishing every dynamic event for the first time.

We would like to thank the University of Sheffield and our sponsors for their support, with special thanks to Stauff, the AMRC, National Instruments, Bosch and Agemspark, as without their input none of this would have been possible.



TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2750mm/1150mm/1310mm/1525mm  
**Track** 1150mm/1150mm  
**Car weight** 220kg  
**Weight distribution** 108/112kg  
**Suspension** Double unequal length A-arm. Pull rod actuated horizontally oriented spring and damper/ Double unequal length trailing-arm. Push rod actuated horizontally oriented spring and damper  
**Tyres** A45 Avon 7.2/20.0-13  
**Wheels** 13" Compomotive, one-piece aluminium rim  
**Brakes** Stainless steel, hub mounted, 220mm diameter, laser cut discs  
**Chassis** One piece tubular spaceframe  
**Engine** Suzuki GSX-R 600 K7 four stroke inline four  
**Bore/stroke/cylinders/cc** 67mm/42.4mm/4 cylinder/599cc  
**Fuel type** 99 RON unleaded  
**Fuel system** Suzuki multi point port fuel injection  
**Max power/max torque** 67kW @ 11000rpm/63Nm @ 9000rpm  
**Transmission** Single 520 chain  
**Differential** Drexler limited-slip clutch differential  
**Final drive** 3.54:1

111

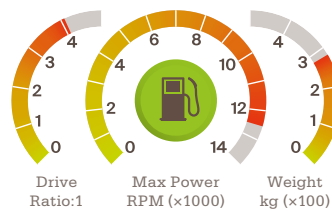
TRANSILVANIA UNIVERSITY OF BRASOV ROMANIA



BlueStreamline is the first Romanian team to compete in a Formula Student event. Every year since 2009, we have improved our skills and engineering techniques. This season we will compete in UK and Spain, targeting top positions.

“””  
**EVERY YEAR SINCE 2009, WE HAVE IMPROVED OUR SKILLS AND ENGINEERING TECHNIQUES.**

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2790mm/1093mm/1432mm/1600mm  
**Track** 1250mm/1200mm  
**Car weight** 280kg  
**Weight distribution** 121.8/226.2kg  
**Suspension** Double unequal A-Arm, push rod actuated horizontally/vertically damper  
**Tyres** Continental 20.5x7 R13  
**Wheels** 13"x7" Oz Racing casted Al Rims  
**Brakes** APRacing Braking System, 2 pistons Aluminium calipers, semi-floating 220 dia. disks  
**Chassis** One piece tubular spaceframe (25CrMo4)  
**Engine** 2006 Honda CBR600RR  
**Bore/stroke/cylinders/cc** 42.5mm/67mm/4 cylinder/599cc  
**Fuel type** 98 RON  
**Fuel system** Honda injection system managed by AEM Racing ECU  
**Max power/max torque** 55kW @ 12500rpm/50Nm @ 9000rpm  
**Transmission** Single 520 chain  
**Differential** Drexler Limited Slip Differential  
**Final drive** 4.09:1



# 113

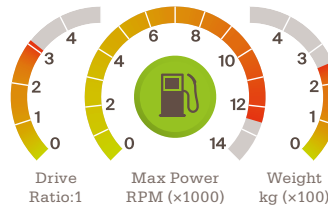
## AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY POLAND



Our goal, as a team taking off for the first time, is to gain experience and verification of knowledge in practice. By participating in the competition, we can continuously develop, checking in real life what works and what does not. The basic parameter for the first year of the competition is the reliability of the vehicle. We wanted to build a bit heavier vehicle,

based on a tubular frame that meets all regulations. The core of the team consists of fourth and fifth year students, but since we want this project to be continuous, we also have students of all years in the team. We plan in the future to switch to a monocoque construction, new fuels and innovative suspension with variable geometry.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2982mm/1286mm/1438mm/1620mm  
**Track** 1240mm/1140mm  
**Car weight** 260kg  
**Weight distribution** 138kg/190kg  
**Suspension** Unequal, double wishbone suspension, pushrod actuated. Manitou swinger x3 dampers, with custom made springs. Anti-roll bar on front and rear axle  
**Tyres** 7.2/20.0-13 A45 Avon and 8.2/20.0-13 A45 Avon  
**Wheels** 7.5x13 and 8x13, A1, 4 screws  
**Brakes** 190mm dia. Drilled, One piston calipers, hub mounted  
**Chassis** One piece tubular spaceframe  
**Engine** 2008/Honda CBR 600 RR four stroke in line  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 98 unleaded  
**Fuel system** Custom, multi point fuel injection  
**Max power/max torque** 3110kM @ 12500rpm/64Nm @ 9500rpm  
**Transmission** single 525 chain  
**Differential** Spool/Drexler V3 LSD differential  
**Final drive** 3.06:1



# 118

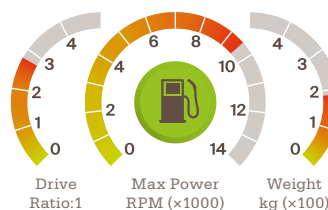
## UNIVERSITY OF GLASGOW UK



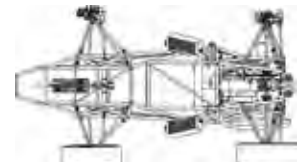
After a difficult start to the year, our team's focus for FS 2013 was simplicity and reliability. Every effort has been directed towards this goal. Our new single cylinder engine has increased fuel economy and reduced the total mass significantly. UGRacing have also improved the bodywork design of UGR-13 through work with our sponsor, Formech, creating a lightweight vacuum-formed piece. Heavy emphasis has been placed on manufacturing processes and quality control to make sure UGR-13 is our most reliable car, with project management objectives helping

to condense build time. 2013 has seen an increase in partners at UGRacing thanks to our new dedicated sponsorship team. We welcome NGK Sparkplugs, intouchCRM, Mishimoto and SPAL Automotive alongside Duright Engineering, Baileigh Industrial and ISR. UGRacing was one of four teams to win the £2,500 Formula Student Award, increasing economic stability. UGRacing is also the only team to enter female main and reserve drivers in the FS Bosch Diesel Eco Driving Challenge, highlighting our approach to promoting equal opportunities.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2521mm/1214mm/1331mm/1530mm  
**Track** 1240mm/1200mm  
**Car weight** 190kg  
**Weight distribution** 120kg/138kg  
**Suspension** Front and Rear - Double unequal length A-Arms with pushrod actuated springs and dampers  
**Tyres** 7.2x20.0-13 Avons  
**Wheels** Braid 13" Formrace 16, single piece  
**Brakes** Fully Floating Discs 250mm/190mm. Callipers ISR front, AP racing rear  
**Chassis** One piece tubular space frame  
**Engine** KTM 450 SX-F 450cc single cylinder 4-stroke, upgraded to fuel injection and electronic ignition using  
**Bore/stroke/cylinders/cc** 95mm/63.4mm/1 cylinder/449.3cc  
**Fuel type** 99 RON unleaded  
**Fuel system** Student built fuel rail and injector housing with Bosch injector  
**Max power/max torque** 35kW @ 9500rpm/39Nm @ 7000rpm  
**Transmission** Single 520 Chain  
**Differential** Honda ATV Clutch-style LSD (Custom Housing)  
**Final drive** 2.79:1



P  
PetrolE85  
85% Ethanol  
15% GasolineE  
ElectricA  
Alternative/  
other

CLASS 1

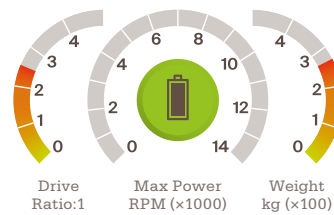
123

**HAMBURG UNIVERSITY OF TECHNOLOGY  
GERMANY**

E-ignition Hamburg's 2013 car, the egn13, is an evolution of the egn12. The technical spotlight was set on a reliable race-car. A modular electronic information management system was developed, mainly used for torque vectoring and telematics. With an easily removable accumulator container and new ergonomics we not only help our drivers during the race, but the crew in the box as well. To reduce the racecar's weight, we increased the use of fibre composites.

The egn13 is powered by two Emrax motors with a peak power of 60kW each. They are

powered by Bamocar controllers in our self-developed, weight-optimised housing. To further reduce weight, we are air-cooling all components. To enhance on-track agility we advanced our torque vectoring software, alongside new suspension, so that the car feels handles in a very controlled way. The crew is able to read telemetric data in real-time during the race, and due to new server technologies we are also able to allow our supporters and fans to take a real time look at the car's performance data from home.

**TECHNICAL SPECIFICATION**

**Length/height/width/wheelbase** 2852mm/1164mm/1430mm/1626mm  
**Track** 1244mm/1200mm  
**Car weight** 275kg  
**Weight distribution** 164kg/179kg  
**Suspension** Double unequal length A-Arm. Push rod/push rod actuated horizontally oriented spring and damper  
**Tyres** 522x155-330 PACEJKA '96 model Avon  
**Wheels** 178mm wide, 2 pc Al Rim  
**Brakes** High Alloyed Steel, hub mounted, 218mm dia. Drilled  
**Chassis** One piece tubular spaceframe  
**Engine** Two Custom Enstroj Emrax air-cooled permanent magnet synchronous machine  
**Bore/stroke/cylinders/cc** -/-/-/  
**Fuel type** Electricity  
**Fuel system** 7.128kWh stored in 108 "A123 AMP20M1HD-A"-cells, type LiFePo4, 20Ah each  
**Max power/max torque** 120kW/440Nm  
**Transmission** 2 straight geared transmissions  
**Differential** Electronic Torque Vectoring Differential  
**Final drive** 2.5:1

**BOSCH**  
Invented for life**Formula Student Sponsorship 2013**

**Are you looking for a sponsor who will take your team to the next level?**

**Then become one of the Bosch sponsored teams!**

Tell us more about your team and let us know why your team is most suitable to join our sponsorship programme by sending a 1-2 page proposal to [formula.student@uk.bosch.com](mailto:formula.student@uk.bosch.com) by **September, 15<sup>th</sup> 2013.**

(Combustion Engine UK Teams only)

**+++ APPLY NOW FOR 2014 SPONSORSHIP +++**

# 140

## GROUP T INTERNATIONAL UNIVERSITY COLLEGE BELGIUM



Formula Group T consists of 20 Masters students in engineering, studying at Group T – International University College Leuven near Brussels, Belgium. Eve will be their second electric Formula Student race car. The main mission is to provide an academic platform for companies to test and demonstrate innovative and durable solutions for the future of the automotive industry. To do this the car has been built around three pillars: the Innovation Highlights:

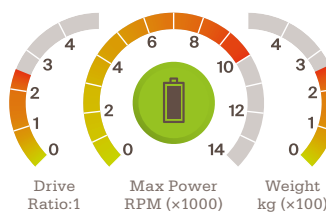
- the self developed electric drivetrain with self-assembled and lightweight controller,

a custom made compact gearbox and an accumulator designed for mass production.

- the extensive use of 3D-printing for the uprights, air ducts for cooling the brakes and the motor and controller system.
- the improved vehicle dynamics, with a weight reduction of 80kg from the previous car which brings Eve to 260kgm, as well as a full simulation model of the car to optimise the setting for each dynamic event

2013 events: FSUK, FSCzech and FSAustria.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2710mm/1221mm/1448mm/1650mm  
**Track** 1300mm/1260mm  
**Car weight** 260kg  
**Weight distribution** 95kg/165kg  
**Suspension** Double unequal length A-arm/ Pull rod actuated vertical oriented spring and damper  
**Tyres** 508x190.5 – 330.2 Hoosier  
**Wheels** 202mm wide, 3 pc Al/My Rim  
**Brakes** Outside diameter: 240mm/stainless steel (AISI 420) HUB mounted/fixed discs  
**Chassis** One piece tubular space frame  
**Engine** Enstroj Emrax LC  
**Bore/stroke/cylinders/cc** -/-/-/  
**Fuel type** -  
**Fuel system** 85kW/1200Nm  
**Max power/max torque** 85kW @ 10000rpm/180Nm  
**Transmission** Custom made gearbox with internal gear  
**Differential** -  
**Final drive** 2.5:1



# 146

## POLITECNICO DI TORINO ITALY



SquadraCorse of Politecnico di Torino was founded in 2004 and until 2011 has manufactured internal combustion engine prototypes. After a short but successful experience in 2010 with a hybrid vehicle, in 2012 the team switched from internal combustion to full electric propulsion.

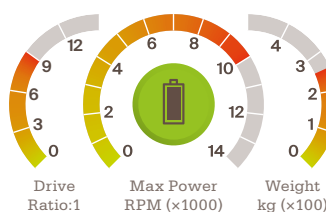
When last year the SC12e came to life it was the first electric prototype ever produced by an Italian Formula SAE team and after the successful season the team carried on the electric project with the SCR.

The 2013 team is interdisciplinary as always and includes people from ten different

countries. The team has been reorganised after the change to an electric vehicle, giving more importance to the electrical and electronic division.

Several improvements have been adopted for the new vehicle to increase the performance and the efficiency; the most important one is certainly the transition from a steel tubular spaceframe chassis to a composite monocoque. The new SCR has two independent motors on the rear axle such as the previous car but the transmission has been substantially modified to increase efficiency and to cope with a different position of the motors.

### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 3045mm/1462mm/1400mm/1620mm  
**Track** 1210mm/1210mm  
**Car weight** 255kg  
**Weight distribution** 152kg/171kg  
**Suspension** Double unequal length A-Arm. Push rod actuated spring/damper. Adj. Roll bar./Double unequal length A-Arm. Push rod actuated spring/damper. Adj. Roll bar  
**Tyres** 180/530-13 Pirelli Tyres, custom compound/180/530-13 Pirelli Tyres, custom compound  
**Wheels** Magnesium rim, 13"x7" with locknut/magnesium rim, 13"x7" with locknut  
**Brakes** Floating, Steel, hub mounted, 218mm dia./Steel, inboard mounted, 218mm dia.  
**Chassis** One piece composite monocoque  
**Engine** 2xMagneti Marelli TMG Low Motors 30kW  
**Bore/stroke/cylinders/cc** -/-/-/  
**Fuel type** Electric  
**Fuel system** 400V Battery Accumulator with 96 Lithium-ion Polymer Cells  
**Max power/max torque** 85kW @ 10000rpm/180Nm  
**Transmission** Custom Gearbox  
**Differential** Electronic Torque vectoring  
**Final drive** 9:1



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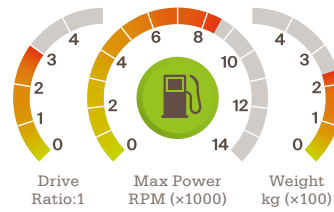
UNIVERSITY OF SOUTHAMPTON UK



Southampton University Formula Student Team (SUFST) is a brand new team which began its work in October 2012. The University of Southampton has not entered a car in Formula Student for over seven years. It was clear that we needed a new approach to the challenge. We set ourselves a very ambitious goal of rebuilding the infrastructure available to the team as

well as designing and building the car in just less than nine months. However, as we did not have any previous experience to base our work on, the car is a complete clean-sheet design. We aim to build a car which is capable of finishing all events during the competition weekend in order to gain experience for future years.

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2435mm/1050mm/1210mm/1575mm

**Track** 1190mm/1200mm

**Car weight** 230kg

**Weight distribution** 130kg/170kg

**Suspension** Double wishbone front and rear. Pushrod actuated horizontally orientated springs and dampers

**Tyres** 6.2x20.0-13/8.2x20.0-13 Avon

**Wheels** 13x6/13x8 Billet 3 piece

**Brakes** Wilwood Powerlite radial mount caliper. Wilwood UL-32 10.25"x0.81" Rotor (plain face, iron)

**Chassis** One piece tubular spaceframe

**Engine** 2003/Honda CBR600RR four stroke in line four

**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc

**Fuel type** 99 RON unleaded

**Fuel system** DTA S60 Multipoint Injection

**Max power/max torque** 65kW @ 8500rpm/80Nm @ 8500rpm

**Transmission** Chain drive with 525 chain

**Differential** Quaife ATB differential

**Final drive** 3:1



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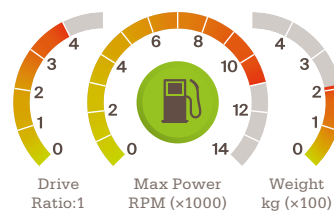
UNIVERSITY OF BURGUNDY: ISAT FRANCE



ISAT Formula Student team was created in 2003, and is composed of 23 students in their first year. The whole team is renewed each year and team members work on this project in parallel with attending their mechanical engineering courses. The integration of this project in our school curriculum makes the data and knowledge transmission difficult, so we have tried to give the most clear

and complete data and reports possible at the end of our year. The main purpose of this project is to enable students to discover how to design and build an entire car and how to work in an autonomous way. This year we tried to work hard on weight reduction, improving little details and reliability. We thank all of our sponsors and will be doing our best to embrace the best results we can this summer.

TECHNICAL SPECIFICATION



**Length/height/width/wheelbase** 2600mm/1408mm/1200mm/1550mm

**Track** 1200mm/1150mm

**Car weight** 210kg

**Weight distribution** 139kg/139kg

**Suspension** Double unequal length A-arm, pull rod actuated, vertically oriented spring and damper

**Tyres** Hoosier R25B 20.0x7.13

**Wheels** 178mm wide 3 pc Braid rims

**Brakes** Beringer Cast Iron, hub mounted, 200mm dia. Drilled

**Chassis** One piece tubular spaceframe

**Engine** Yamaha XJ6 four stroke in line four

**Bore/stroke/cylinders/cc** 66.5mm/44.5mm/4 cylinder/599cc

**Fuel type** 99 RON

**Fuel system** Yamaha multipoint fuel injection

**Max power/max torque** 65kW @ 11000rpm/62Nm @ 9000rpm

**Transmission** Double 520 OS

**Differential** Drexler Motorsport limited slip differential

**Final drive** 4:1



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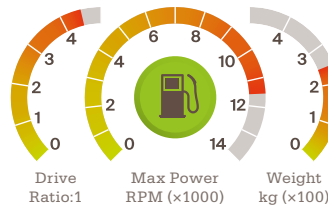
**MANCHESTER METROPOLITAN UNIVERSITY  
UK**



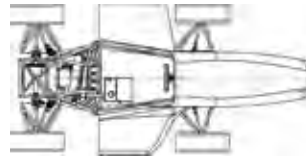
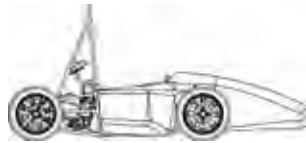
MMU Racing is a team of passionate and ambitious university students who choose to represent Manchester Metropolitan University in designing, building and ultimately racing our Formula Student car. From our base at the Manchester Metropolitan University School of Engineering, a team of over 60 undergraduate and postgraduate students will be working on this year's car for the UK event.

**“”**  
**MMU RACING IS A TEAM OF PASSIONATE AND AMBITIOUS UNIVERSITY STUDENTS WHO CHOOSE TO REPRESENT MANCHESTER METROPOLITAN UNIVERSITY.**

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2435mm/1050mm/1210mm/1575mm
- Track** 1210mm/1180mm
- Car weight** 245kg
- Weight distribution** 153kg/160kg
- Suspension** Double wishbone push actuated spring/damper
- Tyres** 20/13 Avon P96
- Wheels** Compomotive CXR 1365
- Brakes** Ap Racing 4 pot front/2 pot rear callipers, custom plate steel disks
- Chassis** One piece tubular spaceframe
- Engine** Yamaha YZF-R6 2CZ
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** 99 Ron Unleaded
- Fuel system** DTA s80 powered Electronic Fuel Injection (EFI)
- Max power/max torque** 64kW @ 11500/53Nm @ 9000
- Transmission** constant mesh 6 speed chain
- Differential** Torsen
- Final drive** 4.5:1



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**KAREL DE GROTE UNIVERSITY COLLEGE  
BELGIUM**

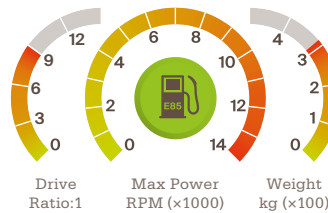


fastrada, the racing team of the Karel de Grote-University College in Antwerp, Belgium, is competing in Formula Student for the third time. fastrada focuses on sexy, fast and durable cars where technology and environment go hand in hand.

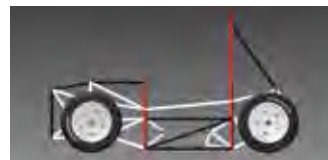
Our team mixes the automotive education department with business management and cross-media management students at the KdG-University College. This way, we aim at turning this practice-based-study into an attractive interdisciplinary education programme.

Due to the technical problems we experienced in 2012, we had to start developing the 2013 car from scratch. We assembled all possible insights on our earlier failures, focused on the knowledge we actually missed and started building our car based on our main design principles from the past. We opted to install the engine on the right side of the car and gave a lot of time to the suspension. These choices result in a far much better handling and accurate driving control.

**TECHNICAL SPECIFICATION**



- Length/height/width/wheelbase** 2178mm/1296mm/842mm/1543.5mm
- Track** 1264mm/1166mm
- Car weight** 315kg
- Weight distribution** 172kg/210kg
- Suspension** Double unequal length A-Arm. Direct acting spring and damper (front and rear)
- Tyres** 16/53-13 Michelin S6B
- Wheels** 13", 7" wide, 4x100, ET 13 (Replica Alpine-rims)
- Brakes** Hub mounted, 220mm dia. vented (front and rear)
- Chassis** Complete steel tubular frame
- Engine** Aprilia RXV550 four stroke
- Bore/stroke/cylinders/cc** 80mm/55mm/2 cylinder/550cc
- Fuel type** E85
- Fuel system** Bosch, sequential fuel injection
- Max power/max torque** -/-
- Transmission** Compressed air
- Differential** Standard Formula student drexler differential
- Final drive** 8.93:1



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UNIVERSITY OF DUNDEE UK



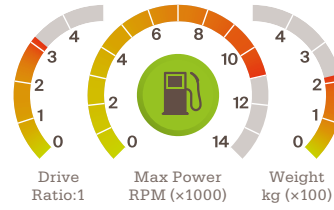
The University of Dundee team, Drive, have been operating since 2008. In 2009 the team entered its first car into Class 1, and since then the team and the cars have developed rapidly, going from 363kg in 2009 down to 220kg in 2012. In 2011 the team finished seventh in the sprint, and were the top ranking Scottish entry to FS UK.

This year there are 14 team members from a range of disciplines including mechanical and civil engineering, product design and business. All work

is carried out in the students' free time with minimal involvement from the university. Team members join in their first year and work their way up through the ranks year after year, once in fourth year they can put themselves forward for a vote to be team captain. Our core objective is to produce a reliable, lightweight, efficient car through simplification and intelligent packaging. With this we have built a worldwide reputation for speed and ruthlessly focused design.



TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2715mm/970mm/1395.5mm/1670mm
- Track** 1243mm/1086mm
- Car weight** 215kg
- Weight distribution** 138kg/145kg
- Suspension** Double unequal a-arm, direct acting and push rod actuated, adjustable anti-roll bars
- Tyres** 16/53-13 Michelin
- Wheels** 152.4mm wide, single piece steel rim
- Brakes** steel, hub mounted floating, 220mm dia., drilled
- Chassis** One piece tubular steel spaceframe
- Engine** 2008/Honda CBR 600 RR four stroke in line four
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** 99 RON unleaded
- Fuel system** micro-squirt multi point fuel injection
- Max power/max torque** 50kW @ 11000rpm/55Nm @ 10500rpm
- Transmission** single 520 chain
- Differential** Gripper Differential, clutch plate actuated
- Final drive** 3.16:1

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UNIVERSITY OF HULL UK

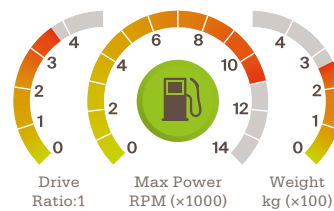


2013 is the second time Hull University has competed at Formula Student. Our first car, the Challenger, was the result of an immense effort to understand and apply the knowledge required to complete a competitive FS car, without any prior experience of the challenges involved. We were all delighted to make it to Silverstone last year and were proud of our first car's performance at the competition.

With the enthusiasm generated in 2012, we try to learn from our experiences and improve upon them. Although our new car, the Challenger II, shares a name and similar

aesthetics, underneath we have an entirely new car with considerably more effort placed on efficient design, handling performance and weight reduction. Aside from working hard on improving design, we have changed the team structure, creating well-defined roles and responsibilities, management structure, meeting formats and documentation procedures, as well as generating workshop handbooks, good practice guides and charters of rules. We hope that these developments in documentation and practices will ensure that our young team develops in future years.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase** 2830mm/1285mm/1410mm/1545mm
- Track** 1220mm/1100mm
- Car weight** 250kg
- Weight distribution** 128kg/190kg
- Suspension** Double unequal length A-Arm. Front: Pull rod actuated vertically orientated spring and damper. Rear: Push rod actuated horizontally orientated spring and damper
- Tyres** 7.2/20.0-13 A45 Avon
- Wheels** 7.0x13 ProRace1.2 billet Al machined rims
- Brakes** Cast Iron, hub mounted, 248mm dia. grooved & Drilled/Cast Iron, diff. mounted, 232mm dia. drilled
- Chassis** One piece tubular steel spaceframe
- Engine** Honda CBR 600 F4i
- Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc
- Fuel type** 99 RON unleaded
- Fuel system** Programmed sequential fuel injection, APS high pressure in-line fuel pump with regulator
- Max power/max torque** 11000rpm/8000rpm
- Transmission** Single 520 chain
- Differential** Modified Honda Civic Type R LSD Differential in custom Al casing, Taylor Race lightweight CV joints, boots and shafts, diff mounted brakes and incorporated chain tensioning
- Final drive** 3.7:1



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## CALEDONIAN COLLEGE OF ENGINEERING OMAN



Caledonian Team Oryx (CTO), a group of undergraduates from Caledonian College of Engineering, is proud to be the first team to represent Oman and the Gulf Region (GCC) in this competition. As there are no automobile courses in Oman, the team structure has been specifically designed to be cross-disciplinary, with students drawn from a range of engineering programmes to cover all the areas needed to develop the car.

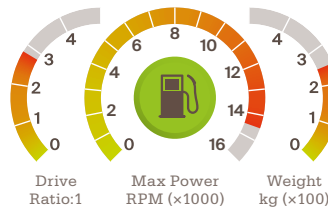
As this is the team's first attempt at vehicle design, the safety of the driver has been a top priority. We feel it

is possible to combine safety features with mechanical performance and still make the car look attractive. A Yamaha YZF-R6 engine forms the heart of our car, Luban, which means frankincense.

We are grateful to all our partners and sponsors for believing in our determination to create Luban, the first Formula SAE car from the Gulf region. Partners: Industrial Innovation Centre, Caledonian College of Engineering and Al-Madina Logistics. Sponsors: Nur Majan, Tebodin, Golden Torches Trading, ZYNOVA, Nuhas Oman.



### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2840mm/1017.6mm/1420mm/1620mm

**Track** 1157mm/1157mm

**Car weight** 262kg

**Weight distribution** 165kg

**Suspension** Double Unequal A Arms, double wishbone, push rod setup, placement of dampers on both front and rear of the car, adjustable camber and toe

**Tyres** 21.0x6.5-13 hoosier

**Wheels** Front: 13.0"x7", front tire: 20.0"x7.5"x13.0". Rear: 13.0"x7.5", rear tire: 20.0"x7.75"

**Brakes** Double piston AP Racing Calipers, Single disc 248mm dia., AP Racing Aluminium Lug Mount - CP3696-6E0, AP Racing master cylinders CP2623, AP Racing Break pad CP2195D38

**Chassis** TIG welded 1020 Steel space frame

**Engine** 2007/Yamaha YZF-R6 four stroke in line four

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599.4cc

**Fuel type** Petrol

**Fuel system** Mikuni fuel injection system

**Max power/max torque** 97.8kW @ 14500rpm/55.99Nm @ 11500rpm

**Transmission** Single 525 chain

**Differential** Supply Drexler Motorsport, Formula SAE Limited Slip Differential Version 2

**Final drive** 2.8125:1

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## SLOVAK UNIVERSITY OF TECHNOLOGY SLOVAKIA



STUBA Green Team was founded in 2009 at the Slovak University of Technology in Bratislava. In that year, the team successfully designed and built the first Slovak electric formula car ever. With our first car, SGT-FE10, we won the cost event at FS Germany 2010.

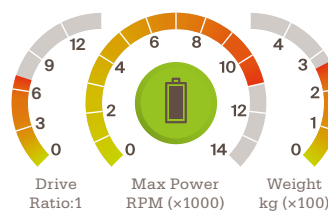
Our fourth season is focused on improvement, exploring better solutions and search of perfection. Our main goal is to improve on last year's SGT-FE12, which proved a successful car with fourth place in FS Spain's Autocross Event. We are focusing mostly on the

tractive system, building a new battery-box and improving our suspension.

Currently we have around 30 active team members, who work in three main sections: electric systems, mechanical systems and PR and marketing. This project, which originally came out of the Slovak University of Technology in Bratislava, has partially spread also to other universities; today it connects students from 3 universities and different faculties, who share the same passion, goals and desire for growth.



### TECHNICAL SPECIFICATION



**Length/height/width/wheelbase**  
2750mm/1135mm/1435mm/1590mm

**Track** 1230mm/1180mm

**Car weight** 269kg

**Weight distribution** 158kg/179kg

**Suspension** Double unequal length A-Arm. Pull rod actuated spring

**Tyres** 205x44 R13, Continental/205x44 R13, Continental

**Wheels** Braid 7x13, 18mm offset, 4 pc Aluminium Rim

**Brakes** Front: Dual circuit calipers, aluminium alloy body and 4 pistons, 25.4mm dia. Rear: Lug Mount, 2pc aluminium body, 25.4mm dia.

**Chassis** One piece tubular space frame - Steel S355J2G3 - TIG/MIG welded

**Engine** Brusa - Hybrid Synchronous Motor HSM1-6.17.12 - C01

**Bore/stroke/cylinders/cc** -/-/-

**Fuel type** -

**Fuel system** -

**Max power/max torque** 80kW @ 11000rpm/220Nm

**Transmission** Double-chain DID Gold X-Ring

**Differential** Drexler Formula Student 2010 limited slip differential, Bias ratio 2.6:1

**Final drive** 7:1



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DALHOUSIE UNIVERSITY CANADA



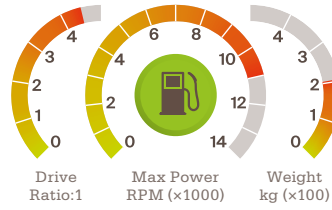
Dalhousie Formula SAE is competing for the fourth year.

This year's design was focused on improving each system from 2012, rather than redesigning any major components. The goals were to reduce the weight of every component, and to improve the reliability of systems which had been problematic in

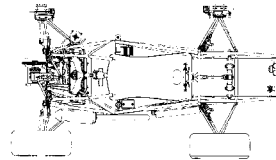
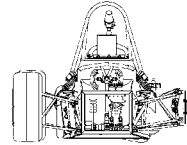
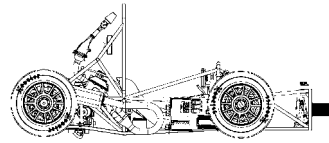
the past. One key improvement this year is the implementation of electro-mechanical paddle shifting, allowing our drivers to keep both hands on the steering wheel at all times.

Dalhousie Formula SAE would like to thank all of our sponsors who make it possible to do what we do.

TECHNICAL SPECIFICATION



- Length/height/width/wheelbase 2679mm/1067mm/1430mm/1545mm
Track 1200mm/1155mm
Car weight 205kg
Weight distribution 96kg/109kg
Suspension Double unequal length A-arms, pushrod activated
Tyres Hoosier 20x7 - 13 R25B
Wheels 202mm single piece Al rim
Brakes Floating steel rotors, 4 piston calipers
Chassis 4130 Chromoly Space Frame
Engine Honda CBR 600 RR
Bore/stroke/cylinders/cc 67mm/42.5mm/4 cylinder/599cc
Fuel type 93 Octane
Fuel system Fuel injection
Max power/max torque 56kW @ 11000rpm/61Nm @ 8000rpm
Transmission Single 520 Chain
Differential Drexler LSD
Final drive 4.5:1



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## CAIRO UNIVERSITY EGYPT



The Cairo University team is participating in Formula Student for the second time in 2013. In 2012, our team successfully managed to manufacture our first car and compete at Silverstone. In 2013, we focused on studying the disadvantages of our 2012 car to take them into considerations for our new car. For example, the high weight and mechanical shifter were our two main disadvantages in 2012, as well as a few other points. Our team is sponsored by the National Bank of Egypt, LINKDSL and Hyundai Ghabour.

### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase** 3169mm/1250mm/1466.75mm/1618mm  
**Track** 1200mm/1100mm  
**Car weight** 243kg  
**Weight distribution** 140kg/171kg  
**Suspension** Double unequal length A-Arm. Front: Pullrod actuated horizontally oriented spring and damper. Rear: pushrod actuated generally oriented spring and damper  
**Tyres** 20x6.5-13 R25A Hoosier /20x8-13 R25A Hoosier  
**Wheels** 8" wide, 3 pc Al Rim, 1 pc carbon  
**Brakes** Manufactured, fixed mount to live spindle, Annealed Stainless steel 201, 228.6mm  
**Chassis** Front and rear Tubular space frame, steel A106 grade B round tubing  
**Engine** Honda CBR 600RR 2008  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** RON 99-98  
**Fuel system** PGM-FI (programmed fuel injection)  
**Max power/max torque** 67.113kW/10000rpm  
**Transmission** Chain drive stock Honda CBR600RR gearbox  
**Differential** Torsen 012000 University Special, LSD  
**Final drive** 3.28:1



## HELWAN UNIVERSITY EGYPT



For the fourth time since 2010, we participate at FS, but this year in Class 2. We aspire to finish in a higher position than before. We have learnt from our past experiences; building a team, designing, manufacturing and testing in one year sounds impossible. We have done it before but our position did not meet our ambition.

A wide-range volunteer programme, a well-built team structure and a realistic design philosophy has been plotted. ANUBIS is the project name, expressing our pride in ancient Egypt and our aspirations to resurrect the automotive industry in Egypt.

### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase** 3220mm/1140mm/1530mm/1600mm  
**Track** 1350mm/1250mm  
**Car weight** 250kg  
**Weight distribution** 144kg/176kg  
**Suspension** Double un-parallel un-equal length A-Arms, front/rear push-rod and bell crank actuated spring and damper, adjustable ARB  
**Tyres** (20.5x6-13/20x7.5-13) Hoosier R25B  
**Wheels** Front 6"/rear 8" wide kosmo Magnesium series keizer 13" wheels  
**Brakes** 4-Outboard Disc system, aluminum self developed rotors hub mounted, adjustable brake balance with balance bar, AP racing calipers and master cylinders  
**Chassis** Chromoly Steel tubular space frame chassis  
**Engine** 2009 Honda CBR 600 RR  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** 95 RON unleaded  
**Fuel system** Sequential injection DTA fast ECU engine management  
**Max power/max torque** 75HP @ 12000rpm/65Nm @ 9000rpm  
**Transmission** Standard Honda GearBox  
**Differential** Torque Senestive Limited Slip Drexler  
**Final drive** 4.5:1



## MENOUFYIA UNIVERSITY EGYPT



We are a group of Egyptian students aiming to build the Egyptian automotive industry through driving acquired knowledge into industry. It's our first time in the FS competition. Our decision to apply for Class 2 with a full running car originated from our desire to get feedback in order to enhance our design for next year competition.

MFS is classified into five main sub-teams (engine, chassis, aerodynamics, suspension and organising), working in harmony to reach our goals.

Our main sponsors: AXON, Solidwork, Promech.

MFS Menoufyia University team... a small team beginning with a great dream: to be the perfect team.

### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase** 2600mm/1100mm/1300mm/1670mm  
**Track** 1200mm/1300mm  
**Car weight** 250kg  
**Weight distribution** -/-  
**Suspension** Front: double unequal length A-Arm suspension. Rear: double equal A-Arm suspension in rear, pushrod actuated  
**Tyres** Tyre size 175/530R13-diameter 532mm - section 197mm/tread 179mm AVON  
**Wheels** 152mm wide, Rim  
**Brakes** Floating, Gray cast iron, hub mounted, 220mm dia., vented  
**Chassis** Carbonfibre front monocoque and steel space frame  
**Engine** 2010/Honda CBR600RR - four stroke in line  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** E85  
**Fuel system** Sequential multi port fuel injection - Honda multi point Dual Stage Fuel Injection (DSFI) system programmed  
**Max power/max torque** 88.1kW @ 13500rpm/66Nm @ 11250rpm  
**Transmission** Constant mesh 6-speeds (Honda Stock)  
**Differential** limited slip Differential  
**Final drive** 2.75:1



## TANTA UNIVERSITY EGYPT



The team consists of seven student engineers:

- Hani Fakhry Hassan: vehicle dynamics (suspension, steering and braking designing), structural and stress analysis and design
- Mahmoud Hisham: weld design
- Ahmed Alaa El-den: engine tuning and intake
- Hassan Khaled: drivetrain system
- Mohamed Al-Hashmie: aerodynamics modelling and design
- Omar Hamada: composite design and analysis
- Mohamed Kamal: team organiser for sponsorship and funding

We are very interested in dynamic analysis and seek to spread the total vehicle concept design for our community.

### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase** 2800mm/1250mm/1300mm/1888mm  
**Track** 1300mm/1200mm  
**Car weight** 200kg  
**Weight distribution** 100kg/100kg  
**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper/Double unequal length A-Arm. Push rod actuated vertical oriented spring and damper  
**Tyres** Hoosier 20.0x7.5-13 7rim  
**Wheels** 236mm wide  
**Brakes** Aluminium, 254mm dia. Drilled  
**Chassis** Tubular spaceframe  
**Engine** 2003/honda cbr 600 f3  
**Bore/stroke/cylinders/cc** 67mm/42.5mm/4 cylinder/599cc  
**Fuel type** Gasoline  
**Fuel system** Programmed Fuel Injection  
**Max power/max torque** 30kW @ 11500rpm/75Nm @ 11500rpm  
**Transmission** Constant mesh, 6-speeds  
**Differential** Drexler Limited Slip Differential Formula Student  
**Final drive** 4.1:1



## SKEMA BUSINESS SCHOOL FRANCE



SKEMA Racing Team began in 2012 with a small team with a wide range of skills and talent. Our concept included the full design, engineering analysis and conception of the prototype, using PTC Creo 2 as the CAD base. Developing the project has been an amazing learning experience for the team as we have designed an innovative car concept. This assists with the local fight against climate change and supports our town's environmentally friendly policies. A big thank you goes to our sponsors Renault Sport and SKEMA Bachelors for helping the team to achieve our goal of competing at FS.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2950mm/1200mm/1414mm/1825mm

**Track** 1219mm/1100mm

**Car weight** Est: 320kg

**Weight distribution** 174.6kg/213.4kg

**Suspension** Double Unequal Length A-Arm. Pull rod actuated System with horizontally oriented spring dampers (Ohlins DBB 2.25/600)

**Tyres** Hoosier 520.7x152.4 - 13 C2500 Composant R25B

**Wheels** 175mm wide - Alloy Rim

**Brakes** Front and Rear Disc braking system. 220mm Dia. Drilled

**Chassis** One Piece Tubular Frame (Aircraft grade Aluminium ANSI 4130)

**Engine** Renault MB L7e (Renault M75)

**Bore/stroke/cylinders/cc** -/-/-

**Fuel type** Battery 28V (Lithium Ion Renault Twizy Battery)

**Fuel system** -

**Max power/max torque** 13kW @ 2100rpm/57Nm @ 2100rpm

**Transmission** Direct Transmission

**Differential** -

**Final drive** 9.23:1

## UNIVERSITY OF ICELAND ICELAND



2013 is the University of Iceland's third year participating in the Formula Student competition. The experience gained at Silverstone 2011 and Silverstone 2012 has been of great benefit for the team. The team decided to compete in Class 2 this summer instead of Class 1 due to major changes in the team's core. The goal this year was to enhance last year's design and therefore try to limit expenses. Like last year, the 2013 focus has been on incorporating sustainable materials into the design with special attention on basalt fibres. Our goal for this year's competition is to have a good design and do better than last year in all of the Class 2 categories.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2501mm/1215mm/1380mm/1568mm

**Track** 1244mm/1170mm

**Car weight** 330kg

**Weight distribution** 190kg/198kg

**Suspension** Double unequal length A-Arm. Push rod actuated spring and damper

**Tyres** 20.5x6.0 - 13 R25 Hoosier

**Wheels** 13x6in 3pc Al rim

**Brakes** Ø218mm disks, 4 piston front/2 piston rear calipers, 2 master cylinders

**Chassis** Steel tube spaceframe

**Engine** 2x Agni 95-R DC electric motors

**Bore/stroke/cylinders/cc** -/-/-

**Fuel type** Electricity

**Fuel system** -

**Max power/max torque** 54kW @ 5000rpm/104Nm @ 0rpm

**Transmission** Two-stage gearbox, fixed ratio

**Differential** Electronically controlled via steering wheel sensor input by motor controllers

**Final drive** 6:1

## UNIVERSITY OF FLORENCE ITALY



Firenze Race Team is the official FS team of the University of Florence. In 2013 we have introduced a new organisational approach for the team, dividing ourselves into eight groups, with each one having a supervisor who reports to the Team Leader. This new approach allowed the development of a design, using a new lighter and stiffer carbonfibre monocoque frame, and an innovative electronically controlled semiactive differential. To reduce the overall weight of the car, we have used a Beta monocylinder engine which gives a high torque at low revs. Thank you to the team, supporters and our sponsors.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2650mm/1107mm/1386mm/1600mm

**Track** 1200mm/1100mm

**Car weight** 175kg

**Weight distribution** 97kg/78kg

**Suspension** Front: unequal length A-Arm. Push rod actuated Cane Creek Double Barrel spring/damper units. Rear: unequal length A-Arm. Push rod actuated Cane Creek Double Barrel spring/damper units

**Tyres** 20.5x6.0x13 R25B C2500 Hoosier

**Wheels** 6.0"/Aluminium

**Brakes** Floating, AISI 1040, hub mounted, 226mm dia. Magura, monoblock caliper, 4 opposing pistons, fixed mtg on upright

**Chassis** Carbon fiber monocoque

**Engine** 2011, BETA 520, Monocylinder

**Bore/stroke/cylinders/cc**  
100mm/63.4mm/1 cylinder/497.9cc

**Fuel type** 99 RON unleaded

**Fuel system** Student designed/built, fuel injection, sequential

**Max power/max torque** 33kW @ 10000rpm/38Nm @ 8000rpm

**Transmission** single 520 chain

**Differential** electronically controlled semiactive differential

**Final drive** 2.75:1

## ANAMBRA STATE UNIVERSITY NIGERIA



Anambra State University, Nuta\_Bolts Team aims at presenting Nigeria's concept of rebranded engineering to the world. The car Nicknamed Eagle (UGO) represents the symbol of our great country and it is the first of its kind in Nigeria.

We tried developing a lightweight, cost-effective, easy to maintain and reliable car with our local technology. The Nuta\_Bolts Team is out to challenge the younger generations in Nigeria and the world at large. We can't wait to race our car (UGO) at Silverstone this summer!



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2805mm/1315.5mm/1023mm/1682mm

**Track** 1148mm/1064mm

**Car weight** 230kg

**Weight distribution** 125.16kg/166.88kg

**Suspension** Double unequal length A-Arm/Pull rod actuated spring and damper

**Tyres** D2704 20x7.0 - 13 R110 Goodyear

**Wheels** 330mm wide, 3 pc Al Rim

**Brakes** 1080 Steel hub mounted, 190mm dia./1080 Steel differential mounted single rotor, 203mm dia.

**Chassis** Steel Tubular spaceframe

**Engine** 2006/Honda CBR 600RR

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599cc

**Fuel type** Gas - Normal 98 octane unleaded petrol

**Fuel system** PGM - DSFI electronic fuel injection

**Max power/max torque** 86KW @ 13000min - 1 (95/1/EC)/86Nm @ 11000min - 1 (95/1/EC)

**Transmission** Single 520 Chain

**Differential** Torsen Differential FSAE Special

**Final drive** 6.1:1

**POLITECHNIC INSTITUTE OF LEIRIA PORTUGAL**



The FS Team from the Centre for Rapid and Sustainable Product Development, Leiria Polytechnic Institute, Portugal, is participating for the second time. Our new car, FIPL02, is created by engineering and design students working together, to optimise design and materials and build a novel Formula Student car. One of the major project goals is to obtain the leanest sustainable design using compressed natural gas as an alternative fuel. The FIPL02 body is also incorporating a non-conventional composite material comprising natural cork, to enhance the properties of the car. The FIPL02 performance will then be significantly improved and its sustainability greatly enhanced.

**TECHNICAL SPECIFICATION**

- Length/height/width/wheelbase** 2810mm/1115mm/1365mm/1600mm
- Track** 1198mm/1147mm
- Car weight** 253kg
- Weight distribution** 152kg/169kg
- Suspension** Double unequal A-arms. Push rod actuated horizontal spring and damper with anti-roll bars
- Tyres** -
- Wheels** -
- Brakes** -
- Chassis** Tubular steel spaceframe
- Engine** 2002/Honda CBR 600F4i four stroke in line four
- Bore/stroke/cylinders/cc** -/-/-
- Fuel type** Compressed Natural Gas
- Fuel system** Multi point fuel injection system
- Max power/max torque** -/-
- Transmission** -
- Differential** Drexler LSD
- Final drive** -



**KARLSTAD UNIVERSITY SWEDEN**



At Karlstad University, the Formula Student team Clear River Racing (CRR) is a stand-alone course that students participate in outside the curriculum. So far CRR has only built petrol vehicles, but since EVs are the future and we want to keep up with the times, we also compete in Class 2 with an EV. And since this is our EV debut, the keyword is simplicity. Therefore, we only use one engine, a YASA 750, which is mounted on the driveshaft. The battery box is our own design and it contains 392 5Ah battery cells which are cooled by air.

**TECHNICAL SPECIFICATION**

- Length/height/width/wheelbase** 2940mm/1150mm/1396mm/1550mm
- Track** 1180mm/1140mm
- Car weight** 250kg
- Weight distribution** 180kg/138kg
- Suspension** Double unparallel unequal length a-arm. Push/pull actuated spring and damper
- Tyres** 20.5"x6" - 13" Hoosier R25B Slicks
- Wheels** 7" wide, 2 pc centerless Aluminum Rim
- Brakes** Steel, hub mounted, fully floating. 200mm diameter. Drilled wavediscs
- Chassis** ASteel tubular spaceframe
- Engine** YASA 750 100kW
- Bore/stroke/cylinders/cc** -/-/-
- Fuel type** Electricity
- Fuel system** 392 5Ah lithium ion battery cells from Dow Kokam
- Max power/max torque** 85kW/750Nm
- Transmission** Engine mounted around driveshaft
- Differential** Drexler LSD
- Final drive** 1:1



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**ASTON UNIVERSITY UK**



Aston University is now in its 13th year at Formula Student. The team is made up of keen and enthusiastic engineering and design students. The 2012 concept that was developed gave the current team a great springboard to work from in terms of research and design. We have decided to continue with the electric drive concept for 2013. After a very successful 2012 competition, finishing sixth overall in the Class 2 category, it was important for the team to ensure we built on this and set our goals to be both high and realistic.

**TECHNICAL SPECIFICATION**

- Length/height/width/wheelbase** 2000mm/1000mm/1350mm/1650mm
- Track** 1200mm
- Car weight** 190kg
- Weight distribution** -
- Suspension** Lancaster Links front and rear with directly actuated spring/dampers
- Tyres** 6.0"/18.0"-10" Hoosier LC0
- Wheels** 6" wide, Keizer 10I Al rim, 4 lug
- Brakes** -
- Chassis** One piece Carbon Fibre monocoque
- Engine** 2xAgni 119-R PMDC
- Bore/stroke/cylinders/cc** -/-/-
- Fuel type** LIFEPO4 cells
- Fuel system** DC Electric
- Max power/max torque** 80nM @ 2000rpm/-
- Transmission** Single epicyclic reduction gear
- Differential** Torque Vectoring
- Final drive** 3.4:1



## BRUNEL UNIVERSITY UK



For the ninth time since its inception, Brunel University brings together young graduates from 11 nationalities, infusing the team with varied knowledge, skills and resources. This team takes on the challenge of designing a tamer version of a single seat racing car. In their quest for engineering excellence the team will battle against competing universities, coming from the farthest corners of the world, at the Formula Student event in July 2013 at Silverstone, UK.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2863mm/1193mm/1196mm/1600mm

**Track** 1200/1175mm

**Car weight** 261kg

**Weight distribution** 104kg/157kg

**Suspension** Double unequal length A-Arms / Push rod actuation / Horizontally oriented spring and damper / Front and rear anti-roll bars actuated via rockers

**Tyres** 20.5x7-13" Hoosiers

**Wheels** 7" wide (177.8mm) / 4 spoke / 3 piece / 13" diameter Aluminium rims

**Brakes** Cast Iron / Solid drilled discs / Hub mounted

**Chassis** One piece tubular spaceframe

**Engine** 2007 Yamaha YZF R6 engine

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinder/599cc

**Fuel type** 99 RON

**Fuel system** Single point port fuel injection

**Max power/max torque** 59kW @ 11,000rpm/63.5Nm @ 7,500rpm

**Transmission** 520 chain driven

**Differential** Quaife automatic torque biasing differential (LSD), model number - QBF1U

**Final drive** 3.5:1

## DURHAM UNIVERSITY UK



DUFS is a new team aiming to enter Class 1 for the first time in 2014. The team has a special interest in vehicle dynamics and chassis construction, particularly in regards to weight reduction, having reduced the design's weight notably since last year's Class 2 entry. In addition, the team has a strong focus on environmentalism and sustainability, not just by being an electric car but through a partnership with Durham's Solar Car. An emphasis on business through the university's business society has greatly helped the team's understanding in business also.

The team is sponsored by ARM and Matchtech.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2300mm/1050mm/753mm/1600mm

**Track** 1200mm

**Car weight** 150kg

**Weight distribution** 87.2kg/130.8kg

**Suspension** Push rod and anti roll front and rear. Unequal length wishbones. Roll centre 70/90mm front/rear

**Tyres** 20.0"x7.5-13, 20.6" OD, Thread Width 8.0", Section Width 9.4", Recommended Rim 7.0-9.0

**Wheels** Composite Autosport Rims 13" diameter front & rear

**Brakes** Racing Callipers, 220mm diameter discs. Drilled lightweight steel

**Chassis** Tubular steel spaceframe

**Engine** YASA 750 Motor, peak efficiency 95%, total volume 7litres, total weight 25kg, continuous torque 40

**Bore/stroke/cylinders/cc** -/-/-

**Fuel type** Electric

**Fuel system** 216V 15Ah Lithium Ion Batteries

**Max power/max torque** 750Nm @ 1200rpm/450Nm @ 2000rpm

**Transmission** Single chain direct drive

**Differential** Limited Slip Automatic Torque Biasing Differential

**Final drive** 1.65:1

## IMPERIAL COLLEGE LONDON UK



We are Imperial College London's alternative fuel racing team, Imperial Racing Green. The team specifically develops more sustainable racing alternatives to the conventional petrol IC powertrain. In 2013, we deliver EV2, a vehicle concept based upon a simplified electrical design, including some innovative features. We aimed to deliver a high voltage battery pack (340V max) to be packaged aggressively within the car for better dynamic performance. Various mechanical changes have been made to accommodate this pack, such as the 'underslug' pedal box. We intend to deliver a simple and robust vehicle combining high performance with low manufacturing complexity and costs.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2390mm/1238mm/1525mm/1525mm

**Track** 1290mm/1340mm

**Car weight** 230kg

**Weight distribution** 153kg/145kg

**Suspension** Unequal length A-Arms. Pull rod actuated Ohlins TTX25 spring/damper units front and rear

**Tyres** Avon 6.2/20.0-13 front and rear

**Wheels** 152.4mm wide, 2 pc Al custom design

**Brakes** 1040 steel laser cut, hub mounted front/inboard rear, 220mm/180mm dia.

**Chassis** One piece tubular steel spaceframe with bonded carbon shear panels

**Engine** 1x Liquid cooled AC motor, 40kW nom, 80kW/220Nm peak, 3000rpm @ 315 V DC

**Bore/stroke/cylinders/cc** -/-/-

**Fuel type** Lithium polymer pouch cells

**Fuel system** 6.0kWh single series battery pack, 82 cells, 300 V nom

**Max power/max torque** 80kW @ 3000rpm/220 Nm peak

**Transmission** Parallel axis chain drive (520 chain)

**Differential** Limited-slip differential

**Final drive** 3.083:1

## SWANSEA UNIVERSITY UK



Swansea University Race Engineering team comprises a mix of first and second year students from a variety of engineering disciplines. The combination of a Yamaha Genesis snow mobile engine with a CVT and turbo provides a unique concept within the competition. Mounted in the signature aluminium honeycomb and tubular steel subframe combination, SURE evolves from previous years.

The team would like to thank the new partners we have developed this year for all the help they have provided.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2705mm/1055mm/1345mm/1025mm

**Track** 1200mm/1100mm

**Car weight** 190kg

**Weight distribution** 129kg/129kg

**Suspension** Double unequal length A-Arm. Pull rod/ Push rod actuated double barrel dampers

**Tyres** 6.2/20.0-13 A45 Avon

**Wheels** 13" spun Aluminium rims, Cast magnesium centres

**Brakes** Stainless Steel rotors, hub mounted, 220mm 4 piston/200mm 2 piston

**Chassis** Aluminium honeycomb with steel subframe rear

**Engine** Yamaha Genesis 80fi Phazer MTX, Garrett Turbocharger

**Bore/stroke/cylinders/cc**  
77mm/53.6mm/2 cylinder/499cc

**Fuel type** 99 RON unleaded

**Fuel system** DTAfast controlled, fully sequential

**Max power/max torque** 85bhp @ 8500rpm/80Nm @ 8000rpm

**Transmission** CVT and Single 428 chain

**Differential** Drexler automatic torque biasing differential

**Final drive** 4:1 (Variable)

**UNIVERSITY OF BATH  
UK**



'Elegant. Efficient. Proven.' TBR14 are implementing this philosophy to produce a lightweight, elegant full length composite monocoque chassis, weighing 10kg less than a steel space frame. Powered by a tuned Aprilia 550cc engine, the mass and power output is tailored to suit Formula Student tracks. Our focus on efficient design drives components to bring performance to the car whilst balancing mass and cost – such as the aerodynamic package producing 750N at 60kph. 'Proven' emphasises our aim to build the car early, extensively track test it to ensure reliability, and optimise TBR14's setup before entering the dynamic events in 2014.

**TECHNICAL SPECIFICATION**

- Length/height/width/wheelbase** 2780mm/1140mm/1360mm/1530mm
- Track** 1150mm/1100mm
- Car weight** 160kg
- Weight distribution** 109kg/119kg
- Suspension** Double Wishbone. Pull rod Front. Push rod Rear
- Tyres** 18x6-10 LC0 Hoosier
- Wheels** 6" wide, carbon outer with aluminium centre
- Brakes** Floating Disks. Hub mounted front 175mm, Inboard mounted rear 160mm. 2-pot calipers
- Chassis** Full Carbon Monocoque
- Engine** Aprilia RXV550cc V-Twin
- Bore/stroke/cylinders/cc** 80mm/55mm/2 cylinder/552cc
- Fuel type** 99 RON Unleaded
- Fuel system** Aprilia Fuel Injection System
- Max power/max torque** 45kW @ 9500rpm/58Nm @ 5750-7500rpm
- Transmission** Chain Drive
- Differential** Drexler Limited Slip Differential
- Final drive** 2.53:1



**UNIVERSITY OF  
CAMBRIDGE UK**



Full Blue Racing's (FBR) 5th entry to FS consists of 40 students from various faculties. Building on last year's success, FBR will run a two year cycle; developing the design and manufacturing over the first year, followed by assembly and testing the next. Our focus is to design a highly reliable and low-weight solution, with the car manufactured well in advance of the competition to allow for extensive testing. With this new arrangement, we hope that FBR will reach its potential and move up the competition rankings.

We thank all of our sponsors who make this event possible for us.

**TECHNICAL SPECIFICATION**

- Length/height/width/wheelbase** 2535mm/1080mm/1200mm/1560mm
- Track** 1200mm/1200mm
- Car weight** 195kg
- Weight distribution** 118kg/145kg
- Suspension** Front: Push-rod with ARB. Rear: Push-rod with ARB
- Tyres** Front and Rear-7.2/20.0-13 Avon Slicks
- Wheels** Front and Rear-13x6" Braid Formrace spin-forged wheels with +18mm offset
- Brakes** Mild steel, Floating on 6 bobbins, Dia 200mm, 5mm thick, No drilling
- Chassis** Steel tubular spaceframe
- Engine** Yamaha R6
- Bore/stroke/cylinders/cc** 65.5mm/44.5mm/4 cylinder/600cc
- Fuel type** RON 98 Petrol
- Fuel system** Fuel injected high pressure
- Max power/max torque** 67kW @ 11500rpm/65Nm @ 8000rpm
- Transmission** Single 520 chain
- Differential** Torsen LSD
- Final drive** 3.55:1



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**UNIVERSITY OF DERBY  
UK**



This is the University of Derby's first Formula Student campaign. As a team of four, we've designed all of the vehicle's main components. This year we will be showcasing a variety of components that we have manufactured in-house, and it is the intention that out-sourcing will be used sparingly.

We've secured sponsorship with Triumph Motorcycles with a 2012 specification Street Triple 675cc engine, which will be sleeved to meet the competition requirements and will run TDi. This project has been a learning curve that the university hope to build on in the coming years with a running vehicle.

**TECHNICAL SPECIFICATION**

- Length/height/width/wheelbase** 2700mm/1210mm/1450mm/1600mm
- Track** 1250mm/1200mm
- Car weight** 250kg
- Weight distribution** 127.2kg/190.8kg
- Suspension** Double unequal length A-Arm, pushrod actuated horizontally oriented spring and damper/Double unequal length A-Arm, pushrod actuated horizontally oriented spring and damper
- Tyres** 508x208-300 A45 Avon/508x208-300 A45 Avon
- Wheels** 203mm wide, 2 pc Al Rim, Compomotive/203mm wide, 2 pc Al Rim, Compomotive
- Brakes** Cast Iron, hub mounted, 228mm dia./Cast Iron, diff mounted, 180mm dia. Drilled
- Chassis** One piece tubular T45 Steel spaceframe
- Engine** 2012/Triumph Street Triple four-stroke in-line three
- Bore/stroke/cylinders/cc** 70mm/52.3mm/3 cylinder/604cc
- Fuel type** Diesel
- Fuel system** Direct injection
- Max power/max torque** -/-
- Transmission** Single 520 chain
- Differential** Torsen type, limited slip
- Final drive** 3.13:1



## UNIVERSITY OF GLASGOW UK



The UGRacing 2 team started out as an apprenticeship for the University of Glasgow Formula Student team. All team members are starting out for the first time, but made it their goal to design a full car to enter the competition. The team's design philosophy focused on a simplistic, reliable platform to develop in the future. The car features a simplified aero package, beam axle suspension, 10" wheels, a chain and sprocket, and a variable length engine intake. The overall goal of the team was to gain valuable experience by designing a car that will be the basis for next year's entry.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2830mm/1199mm/1451mm/1525mm

**Track** 1190mm/1170mm

**Car weight** 187kg

**Weight distribution** 120kg/135kg

**Suspension** Beam axle/beam axle with watts linkage

**Tyres** 7.2/20.0-13 A45 from Avon

**Wheels** 10" Braid Tenrace Monoblock

**Brakes** 2xISR 22-048 180mm discs/Single rear inboard brake, ISR22-049 200mm disc

**Chassis** Tubular space frame

**Engine** 2007/KTM 450 SX-F four stroke

**Bore/stroke/cylinders/cc**  
97mm/60.8mm/1 cylinder/449.3cc

**Fuel type** Unleaded premium fuel RON95

**Fuel system** Breakerless DC-CDI ignition system, digital ignition timing- KOKUSAN

**Max power/max torque** 39.2 kW @ 9600rpm/45.9Nm @ 7400rpm

**Transmission** Single 520 chain

**Differential** Spool

**Final drive** 2.25:1

## UNIVERSITY OF HERTFORDSHIRE UK



As the most successful UK Formula Student team, finishing second last year, our Class 2 entry needed to pick up where they left off. In this year's car, we aim to achieve an inexpensive and reliable race car, which is easy to maintain and lightweight through simplistic designs and structural analysis. We are improving our car by adding an innovative new aerodynamic upgrade, producing down force and adding grip in the corners.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2657mm/1060mm/1479mm/1550mm

**Track** 1250mm/1200mm

**Car weight** 183kg

**Weight distribution** 100.4kg/150.6kg

**Suspension** Front: Push-rod with ARB. Rear: Push-rod with ARB

**Tyres** Front and Rear - 7.2/20.0-13 Avon Slicks

**Wheels** 254mm diameter, 177.8mm wide, 3pc Magnesium Alloy. Same front and rear.

**Brakes** Laser cut, stainless steel, OD 191mmx4mm thick. Drilled

**Chassis** Cold drawn carbon steel (CDS) space frame. MIG welded.

**Engine** Yamaha R6 2009 four stroke in-line four.

**Bore/stroke/cylinders/cc**  
67mm/42.5mm/4 cylinders/599cc

**Fuel type** 99 RON unleaded

**Fuel system** Multi point fuel injection

**Max power/max torque** 64kW @ 12500rpm/57Nm @ 8500rpm

**Transmission** Standard R6 transmission

**Differential** Gripper clutch pack with student made housing

**Final drive** 3.45:1

## UNIVERSITY OF MANCHESTER UK



The team consists of a small group of voluntary members from various disciplines. This year the University of Manchester has opted for a Class 2 entry, as our focus has been on moving workshop and constructing and engine dynamometer.

Our sponsor Essar has supported us through this process with financial aid. Essar also provides assistance with our business presentation. The aim of the 2013 car is to reduce the mass by 10%. The method of achieving this is through conservative use of materials and utilising more composites in heavy components. For 2014, we have secured funding to attend both the British and Spanish Formula Student competitions.



### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2200mm/1100mm/1100mm/1337mm

**Track** 1222mm/1168mm

**Car weight** 199kg

**Weight distribution** 99kg/100kg

**Suspension** Unequal, unparallel double A-Arm wishbones. Push-rod actuated acute angle orientated spring and damper. Front and Rear anti-roll bars. Toe link at rear

**Tyres** 18.0x6.0-10[C2000] R25B Hoosier

**Wheels** 254mm wide, 3 pc Al Rim

**Brakes** Laser cut steel, 20mm dia. Slotted

**Chassis** One piece tubular steel spaceframe

**Engine** 2005/Yamaha YZF-R6 four stroke in line four

**Bore/stroke/cylinders/cc**  
65.5mm/44.5mm/4 cylinder/599cc

**Fuel type** 99 RON unleaded

**Fuel system** Bosch port fuel injection

**Max power/max torque** 41/8000rpm

**Transmission** Single 520 chain

**Differential** Torsen internals within CNC machined aluminium housing

**Final drive** 4:1

## UNIVERSITY OF NEWCASTLE UK



Newcastle Racing 9 is Newcastle University's ninth entry in Formula Student. The team comprises 19 students, eight of whom are Stage 4 MEng students and 11 of whom are stage 3 MEng students studying mechanical engineering. NR9 was an attempt to improve upon NR8, the team's first electric car. NR9 will boast its own custom-built a123 battery packs, built by Mavizen.

Our team sponsors include Santander Universities, Dyer Engineering of Stanley and Lamplas Polymer Engineering of County Durham.



Newcastle Racing

### TECHNICAL SPECIFICATION

**Length/height/width/wheelbase**  
2500mm/800mm/550mm/1600mm

**Track** 1300mm/1200mm

**Car weight** 331kg

**Weight distribution** 118kg/213kg

**Suspension** Double unequal length A-Arm. Direct acting spring and damper

**Tyres** 20.5"x6" - 13" Hoosier R25B Slicks  
Al & Mg 80mm negative offset

**Brakes** Steel, hub mounted, 220mm dia. 4mm thick (2x2pot AP racing callipers/1x2pot AP racing calliper)

**Chassis** Aluminium sandwich panel monocoque construction

**Engine** 3 phase AC Brushless Synchronous Motor

**Bore/stroke/cylinders/cc**  
280mm/280mm/-/300cc

**Fuel type** Mavizen custom built Lithium Ion Battery Packs

**Fuel system** 108 a123 pouch cells

**Max power/max torque** 70kW @ 3000rpm/250Nm @ 3000rpm

**Transmission** Carbon fibre reinforced belt and aluminium pulleys

**Differential** Quaife ATB Limited Slip Differential

**Final drive** 4:1

**UNIVERSITY OF NORTHAMPTON UK**



Entering the Formula Student competition allows the University of Northampton to provide its students with the best possible industry experience. Our Class 2 racing car is at the stage of concept design with a virtual prototype being currently developed, reducing the costs and the development time. We used ADAMS/COMSOL modeling and simulation tools to build and test functional virtual prototypes of the complete vehicle and its subsystems such as chassis and suspension. With thanks to our current sponsors: Santander Bank, MSC Software Corporation, National Instruments, COMSOL Multiphysics, Caterham F1, NVision 3D Immersion Technology.

**TECHNICAL SPECIFICATION**

**Length/height/width/wheelbase**  
2282mm/1048mm/1365mm/1500mm

**Track** 1200mm/1150mm

**Car weight** 312kg

**Weight distribution** 150kg/230kg

**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented spring and damper

**Tyres** 205x70 R13, Hoosier R25B/200x75 R13, Hoosier R25B

**Wheels** Aluminum rim star and CFRP-rim

**Brakes** CP2195D38-M1144, Mintex organic, AVE FRICTION 0.32, THICKNESS 10.5mm CALIPER TYPE CP2696

**Chassis** Tubular space frame chassis

**Engine** 2x rear right, Rear Left/50kW, 50kWX EMRAX Air Cooled

**Bore/stroke/cylinders/cc** -/-/-

**Fuel type** Li YUAN Super Capacitor Battery

**Fuel system** -

**Max power/max torque** 50kW @ 3000rpm/120Nm @ 4000rpm

**Transmission** 2.5:1

**Differential** Two EMRAX motors which connect to a Drexler Motorsport differential by a chain and sprocket system

**Final drive** Sprocket and chain



**UNIVERSITY OF WARWICK UK**



This year's Warwick University Class 2 team comprises 30 committed undergraduate engineers, separated into three sub-groups: powertrain, chassis and business development. The 2013 innovative design is the first to come from Warwick that features a sustainable composite monocoque, and is powered by a brand new Honda engine. Working with KS-Composites, the tub design is cutting-edge, using a highly sustainable bamboo composite to provide strength and rigidity with low environmental impact. This new concept is the core of a robust business concept aiming to fill the gap between karts and the highly contested Formula Renault and Ford race series.

**TECHNICAL SPECIFICATION**

**Length/height/width/wheelbase**  
2855mm/1079mm/1560mm/1892mm

**Track** 1335mm/1250mm

**Car weight** 231kg

**Weight distribution** 92.4kg/138.6kg

**Suspension** Double wishbone, aluminium uprights, Ohlins shock absorbers actuated by push-rods and rockers

**Tyres** Wide tyres to improve handling, 50% profile height. Exact make still to be decided on

**Wheels** 10" diameter, 5" wide

**Brakes** Carbon fiber ventilated disc brakes at the front and possibly drum brakes at the rear. Yet to be finalized

**Chassis** 2 main parts, bamboo fibre monocoque including aerodynamic floor produced using a wet layup

**Engine** Honda VFR 400 NC30

**Bore/stroke/cylinders/cc**  
55mm/42mm/4 cylinder/399cc

**Fuel type** Unleaded petrol 95 RON

**Fuel system** Electronic Fuel Injection using OMEC ECU with Bosch Injectors

**Max power/max torque** 37.3kW @ 7500rpm / 45Nm @ 6000rpm

**Transmission** Single Chain

**Differential** Front limited slip differential taken from Honda quad bike

**Final drive** 12.8:1



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**UNIVERSITY OF THE WEST OF ENGLAND UK**



Returning to Class 2 in 2013, UWE Racing are back with a new design and ambition to place well within the Class 2 top ten. Our team includes students from across all engineering disciplines as well as from the business school. This year has seen the team overcome challenges to build on the success of the 2012 competition and leave a solid foundation for a Class 1 entry in 2014. As a team funded largely through sponsors and donations, UWE Racing would like to thank ProTech Shocks, RELAYS Southwest, H Engineering Motorsport and Studwelders for their support in 2013. [www.uweracing.com](http://www.uweracing.com)

**TECHNICAL SPECIFICATION**

**Length/height/width/wheelbase**  
2720mm/1020mm/1390mm/1675mm

**Track** 1240mm/1200mm

**Car weight** 195kg

**Weight distribution** 125kg/138kg

**Suspension** Double unequal length A-Arm. Push rod actuated horizontally oriented Protech spring and dampers

**Tyres** 6.2/20.0-13 Avon

**Wheels** 13"x6" Compomotive CXR 1362 1-piece aluminium

**Brakes** Billet alloy calipers, hub-mounted 240mm/225mm (front/rear) solid discs. Drilled

**Chassis** One piece tubular steel spaceframe

**Engine** 1999 Yamaha YZF-R6 four stroke in line four

**Bore/stroke/cylinders/cc**  
65.5mm/44.5mm/4 cylinder/599cc

**Fuel type** 99 RON unleaded

**Fuel system** Student designed fuel injection system

**Max power/max torque** 60 kW @ 9000rpm/45 Nm @ 9000rpm

**Transmission** Single 530 chain

**Differential** Quaife ATB sprocket Differential

**Final drive** 3.5:1



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# EVENT SCHEDULE

## WEDNESDAY 3 JULY: INSTALLATION

09:00–12:00	Partners Installations set-up	Event Control/ Paddock
12:30–13:00	Partner and Sponsor orientation	Race Control
14:00–20:00	<b>Site and Garages Open (for teams to set up their pits only)</b>	Event Control
14:00–19:00	<b>Event Control Open</b>	Event Control
17:30–18:30	Opening Ceremony (All Team Members must attend)	The Pavilion

## THURSDAY 4 JULY: SCRUTINEERING AND JUDGING

07:30–23:00	<b>Site and Garages Open</b>	Paddock
07:30–19:00	<b>Event Control Open</b>	Event Control
08:00–18:00	<b>Registration for all Teams</b>	Event Control
08:00–10:30	<b>Sign-on for Judges and Volunteers</b>	Paddock Lounge
08:30–18:00	<b>Scrutineering</b>	Scrutineering Bay
09:00–09:15	Partner and Sponsor brief	Paddock Lounge
09:30–17:30	<b>Business Presentation Judging</b>	Paddock Suites
10:00–17:00	PTC and Concurrent Engineering raffle, winner announced at 17:00	Event Control
10:00–17:30	<b>Class 1 Design Judging</b>	Team Garages
10:00–17:30	<b>Class 2 Design Judging</b>	The Pavilion
10:00–17:30	<b>Class 1 Cost and Sustainability Judging</b>	Team Garages
10:00–17:30	<b>Class 2 Cost and Sustainability Judging</b>	The Pavilion
14:00–18:00	<b>Shell Fuel Open</b>	Support Paddock 1
14:00–18:00	<b>Tilt Table</b>	Support Paddock 1
14:30–18:00	<b>Noise Test</b>	Scrutineering Bay
15:00–18:00	<b>Brake Test</b>	Support Paddock 2
15:00–17:00	<b>Practice Area Open</b>	Support Paddock 2
18:15–18:45	Team Photograph	National Pit Straight

## FRIDAY 5 JULY: SCRUTINEERING, JUDGING AND SCHOOLS ACADEMY

07:30–23:00	<b>Site and Garages Open</b>	Paddock
07:30–16:30	<b>Welcome Centre Open</b>	Welcome Centre
07:30–19:00	<b>Event Control Open</b>	Event Control
07:30–19:00	Paddock Lounge Open	Paddock Lounge
07:30–09:00	<b>Sign-on for Judges and Volunteers</b>	Paddock Lounge
08:00–18:00	<b>Shell Fuel Open</b>	Support Paddock 1
08:00–18:00	<b>Scrutineering</b>	Scrutineering Bay
08:15–08:45	<b>Driver Briefing (All Drivers and Team Leaders)</b>	The Pavilion
08:30–18:00	<b>Tilt Table</b>	Support Paddock 1
08:45–09:00	Formula Student Bosch Diesel Eco Driving Challenge Awards	Pavilion
09:00–09:15	Partner and Sponsor brief	Paddock Lounge
09:00–09:30	Formula Student Bosch Diesel Eco Driving Challenge Passenger Rides for Winners	Pit Lane
09:00–11:50	<b>Practice Area Open</b>	Brooklands Corner
09:00–11:50	<b>Brake Test</b>	Wellington Straight
09:00–18:00	<b>Noise Test</b>	Scrutineering Bay
09:00–18:30	<b>Class 1 Design Judging</b>	Team Garages
09:00–18:30	<b>Class 1 Cost, Manufacture and Sustainability Judging</b>	Team Garages
09:00–17:30	<b>Business Presentation Judging</b>	Paddock Suites
09:30–11:50	Practice and brake test area open	
10:00–16:00	Formula Student Schools Academy	The Pavilion
10:00–17:00	PTC and Concurrent Engineering raffle, winner announced at 17:00	Event Control
12:00–12:30	FS Parade Lap	National Circuit
12:30–18:00	<b>Practice Area Open</b>	Brooklands Corner

Scrutineering (including brake, noise and tilt) will be available on Sunday by request only (ask at Event Control).

## Key

Competition events

Non-competition events

13:00–13:30	Learn and Compete book signing with Suzanne and Michael Royce and fellow judges	Race Tech Stand, Paddock
13:30–18:00	<b>Brake Test</b>	Wellington Straight
17:00–18:00	Jaguar Land Rover Lecture – Sound Quality Development	Jaguar Land Rover Marquee
18:00–19:00	Jaguar Land Rover Lecture – How to Achieve a 5 Star EuroNCAP Rating for a Large SUV	Jaguar Land Rover Marquee
18:00–20:00	Faculty Advisors Reception and Alumni Reunion	Paddock Lounge

## SATURDAY 6 JULY: DYNAMIC EVENTS

07:30–23:00	<b>Site and Garages Open</b>	Paddock
07:30–16:30	<b>Welcome Centre Open</b>	Welcome Centre
07:30–19:00	<b>Event Control Open</b>	Event Control
07:55–08:30	<b>Driver Briefing and walk of Sprint Course (All Drivers and Team Leaders)</b>	The Pavilion
08:00–18:00	<b>Shell Fuel Open</b>	Support Paddock 1
08:30–18:00	<b>Tilt Table</b>	Support Paddock 1
08:30–18:00	<b>Scrutineering</b>	Scrutineering Bay
09:00–09:15	Partner and Sponsor brief	Paddock Lounge
09:00–12:30	<b>Acceleration Event</b>	National Pit Straight
09:00–12:30	<b>Skid Pad Event</b>	Support Paddock 2
09:00–18:00	<b>Practice Area Open</b>	Brooklands Corner
09:00–18:00	<b>Noise Test</b>	Scrutineering Bay
09:00–18:00	<b>Brake Test</b>	Wellington Straight
07:30–19:00	Paddock Lounge Open	Paddock Lounge
12:30–12:45	<b>Acceleration Event: Top 6 Run-off</b>	National Pit Straight
13:00–13:30	Learn and Compete book signing with Suzanne and Michael Royce and fellow judges	Race Tech Stand, Paddock
13:30–18:00	<b>Sprint Event</b>	Copse Corner
17:00–18:00	Jaguar Land Rover Lecture – The Ultimate Destination – JLR Graduate Programme	Jaguar Land Rover Marquee
18:00–19:00	Jaguar Land Rover Lecture – Unsteady Aerodynamics CFD Simulation at JLR	Jaguar Land Rover Marquee
18:00–19:00	<b>Cost Final</b>	Race Control Garage
19:00–20:00	<b>Design Final</b>	Garage 1
19:00–20:00	Business Presentation Demonstration (Class Winners)	The Pavilion
20:00–21:00	Awards Ceremony (Part 1)	The Pavilion

## SUNDAY 7 JULY: ENDURANCE EVENT

07:30–19:30	<b>Site and Garages Open</b>	Paddock
07:30–16:30	<b>Welcome Centre Open</b>	Welcome Centre
07:30–19:00	<b>Event Control Open</b>	Event Control
07:30–19:00	Paddock Lounge Open	Paddock Lounge
07:45–08:30	<b>Driver Briefing and Walk of Course (All Drivers and Team Leaders)</b>	The Pavilion
08:00–18:00	<b>Shell Fuel Open</b>	Support Paddock 1
09:00–09:15	Partner and Sponsor brief	Paddock Lounge
09:00–15:30	<b>Practice Area Open</b>	Brooklands Corner
09:00–17:30	<b>Endurance Event</b>	Copse Corner
10:00–12:00	<b>Judges Corner</b>	Event Control
10:50–11:10	<b>Church Break for Endurance</b>	
13:00–14:00	Jaguar Land Rover Lecture – Engineering the Team Sky Sportbrake – Tour de France	Jaguar Land Rover Marquee
14:00–16:00	Judges Corner	Event Control
19:30	<b>Garages Locked (All teams must clear their pit, inc. cars)</b>	
19:30–20:15	Final Awards Ceremony	The Pavilion
20:15–23:00	Official after party with DJ sets	The Pavilion

# WHAT NOT TO MISS

1



## FORMULA STUDENT SCHOOLS ACADEMY

Friday 5 July, The Pavilion

School students will be taking over Formula Student, meeting the people behind F1 in Schools, Bloodhound and the Motor Sports Association and taking part in practical engineering workshops. Plus, testing their reaction times with a fastest finger first competition on the F1 in Schools track.

Invited schools only.

2



## F1 CAR DISPLAY

The Paddock

Come and see the current MERCEDES AMG PETRONAS F1 showcar in the paddock.

3



## SHELL: READY TO RACE TRACK

Event Control

Ready for a challenge? Using different parts and engine components you can design, build and then test drive your mini car at the Shell stand – as well as take part in our fun aerodynamic challenge!

3



## INSTITUTION OF MECHANICAL ENGINEERS Event Control

Find out the benefits of professional registration and how it can enhance your career opportunities. Learn more about the 1000mph Bloodhound SSC project and check out the model car on display throughout the weekend.

3



## PTC AND CONCURRENT ENGINEERING RAFFLE

Thursday 4–Friday 5 July, Event Control

Win an Xbox 360!

4



## JAGUAR LAND ROVER TERRA POD

Fri 5–Sun 7 July,

Jaguar Land Rover Marquee

Your chance to drive the Jaguar Land Rover Terra Pod obstacle course: learn how you cope with off road!

4



## 4x4 IN SCHOOLS

Friday 5–Sunday 7 July,

Jaguar Land Rover Marquee

Come and see radio controlled 4-wheeldrive (4x4) vehicles designed and created by students negotiate a specially designed test track that will emulate that of real life and what a full scale 4x4 vehicle can do.

5



## BOSCH DIESEL ECO DRIVING CHALLENGE CAR DISPLAY

Friday 5–Sunday 7 July,

The Paddock

Drivers from 47 UK universities competed across England, Scotland and Wales to be crowned Britain's most economical driver. The car will be on display in The Paddock.

5



## BOSCH HONDA YUASA BTCC DISPLAY

Saturday 6 July, The Paddock

Bosch Motorsport UK, part of Bosch Engineering GmbH will be exhibiting a variety of motorsport components. Honda Yuasa Racing's BTCC show car will be showcased, fitted with the latest motorsport dash display, the DDU7. Bosch engineers will be present throughout the event.

6



## THE SILVERSTONE RUN: CAR DISPLAY

Sat 6 July, Bakersville

Vintage and classic car display, meet local members of the Institution of Mechanical Engineers and see the cars parade on the National Circuit.

7



## RADICAL SR8 SUPERCAR

Freshly back from conquering the 16,000 mile Pan American Highway, take a look at the 120mph, fully electric, custom Radical SR8 Supercar – built by Formula Student graduates from Imperial College London. Plus, talk to NI engineers about their measurement and control systems.

8



## ALUMNI CAR DISPLAY

Check out Formula Student cars from the previous years of the competition and see how they compare to the 2013 cars!

CAMPSITE  
ENTRANCE

TUNNEL (ROUTE  
TO PADDOCK)

Sprint  
Start / Finish

NATIONAL PIT  
STRAIGHT

DYNAMIC  
ENTRANCE

WOODCOTE  
CORNER

GARAGES  
1-6

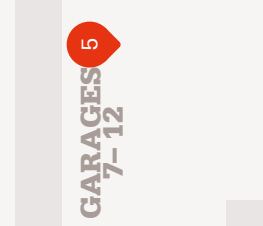
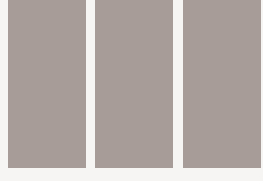
GARAGES  
7-12

GARAGE 0  
MEDIA CENTRE

EVENT  
CONTROL

EVENT  
ENTRANCE

BROOKLANDS  
CORNER



1

8

2

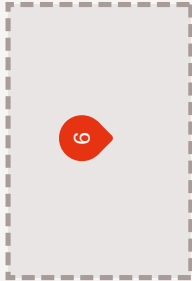
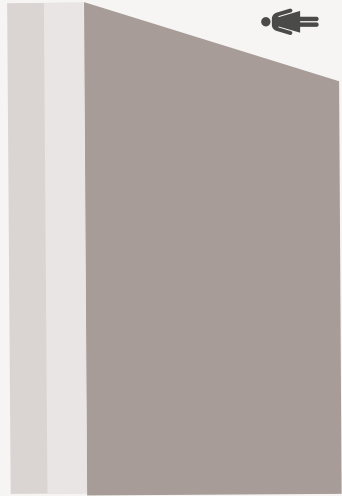
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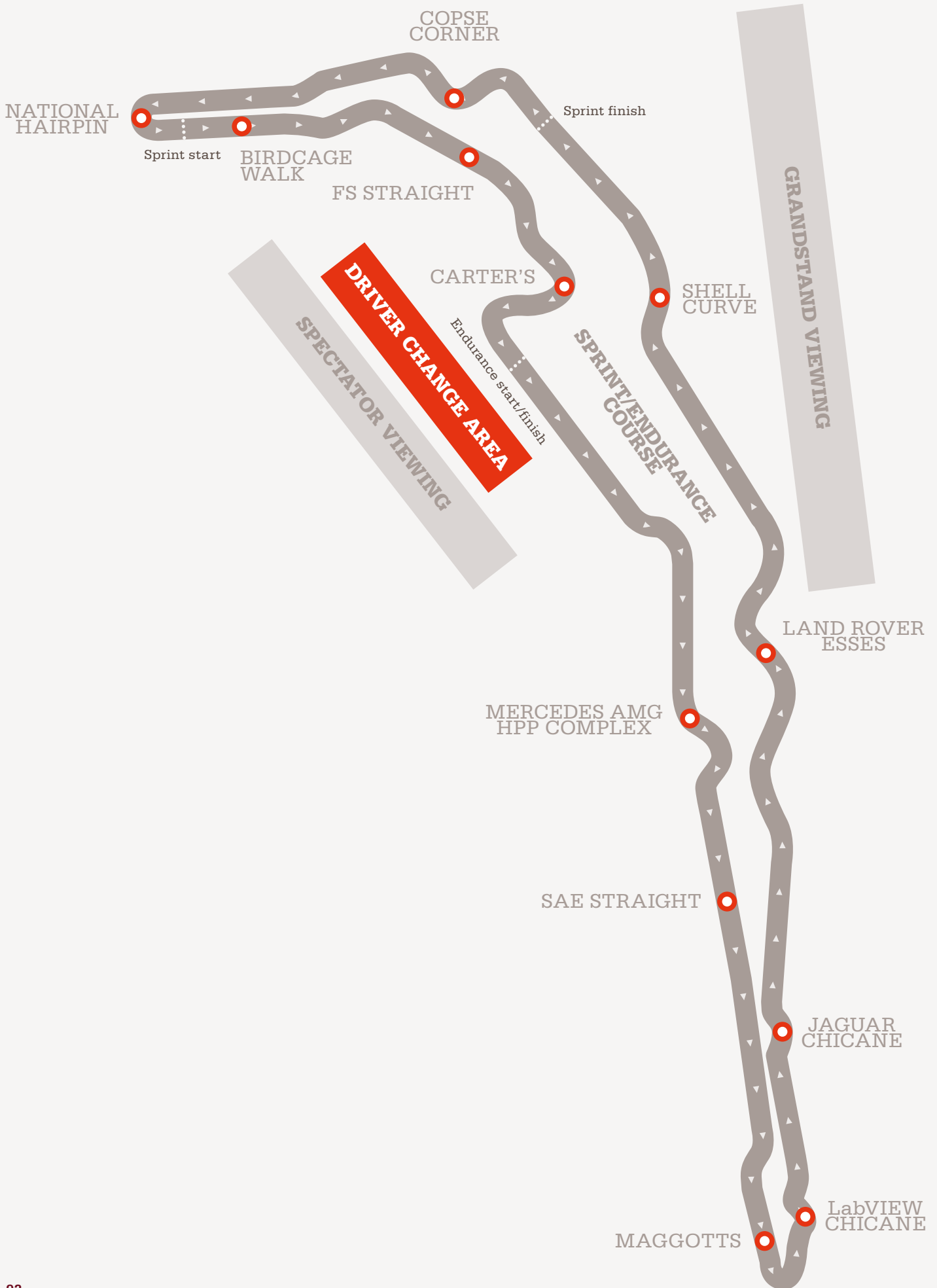
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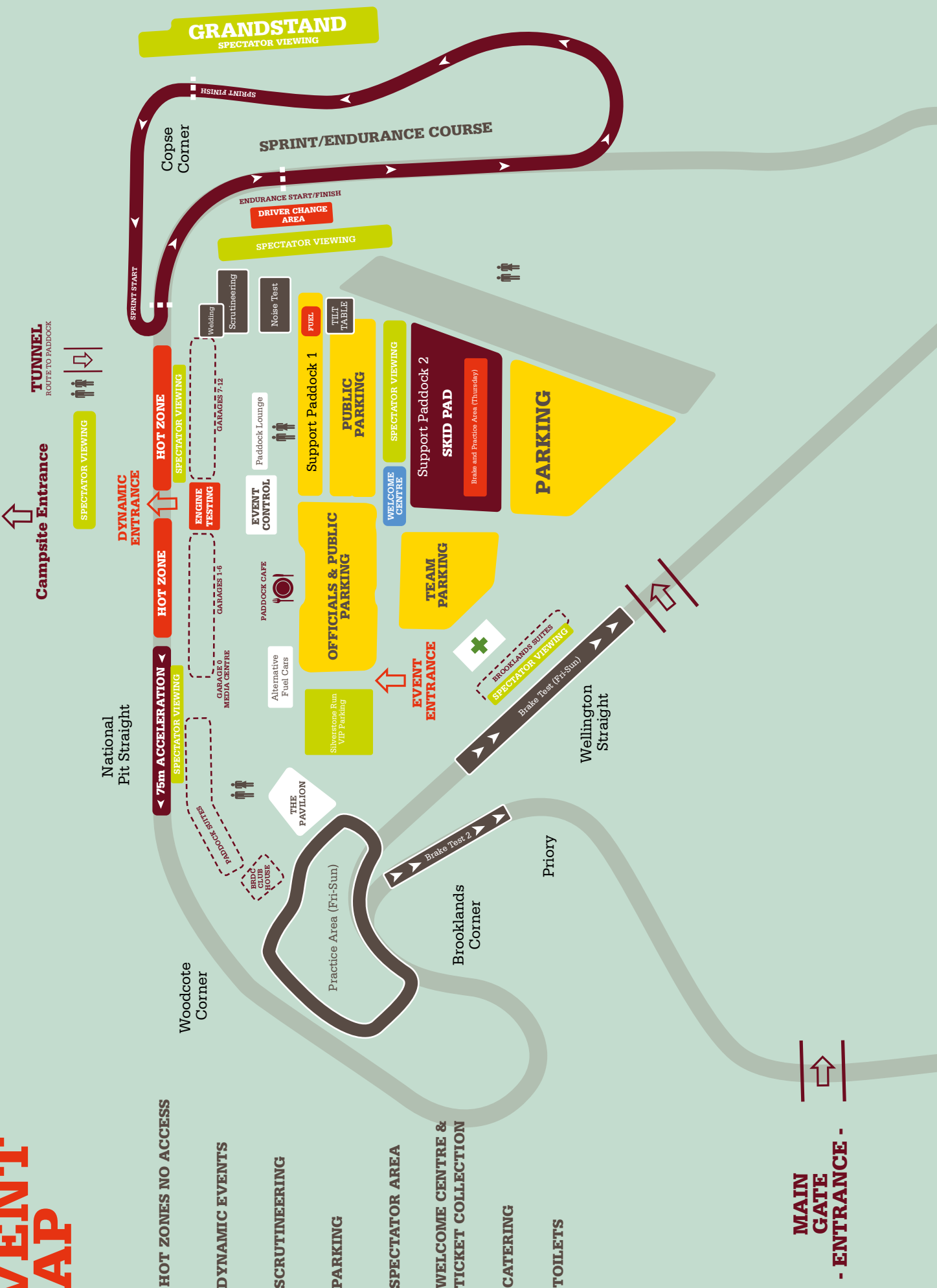


# CORNERS MAP



# EVENT MAP

- HOT ZONES NO ACCESS
- DYNAMIC EVENTS
- SCRUTINEERING
- PARKING
- SPECTATOR AREA
- WELCOME CENTRE & TICKET COLLECTION
- CATERING
- TOILETS



**MAIN GATE ENTRANCE -**

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