



# HIGH SCHOOLS CHALLENGE

## 2013/14 Season

### GETTING STARTED GUIDE



WHERE TOMORROW'S  
**CHAMPIONS**  
ARE MADE



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## OTHER IMPORTANT DOCUMENTS TO READ

This document provides an overview of what is involved with participating in the F1 in Schools High Schools challenge and entering a team into the National Competition. All participating students and teachers need to also read carefully the Technical and Competition Regulations documents. These two separate documents which can be found in the resources area of the F1 in Schools UAE website. [www.f1inschools.ae](http://www.f1inschools.ae) and on the F1 in Schools Torque supportal

### **1. F1 in Schools UAE 2013/14 Season Technical Regulations**

This document details all of the F1 in Schools car design rules

### **2. F1 in Schools UAE 2013/14 Season Competitions Regulations**

This document details all of the other project requirements and judging information relevant to entering a team into one of the competition events.

**FIND THESE DOCUMENTS IN THE RESOURCES SECTION OF OUR WEBSITE AND READ THEM CAREFULLY**

## USEFUL WEBSITES

[www.f1inschools.ae](http://www.f1inschools.ae)

<http://f1-in-schools-torque.invisionzone.com/>

## INTRODUCTION

### What is F1 in Schools?

F1 in Schools is a global design and engineering competition open to all UAE students aged 11 to 19. Teams of 3 – 6 students set up their own mini Formula 1™ team and use CAD/CAM technologies to design, make, test, and then race miniature compressed air powered balsa wood F1 cars.

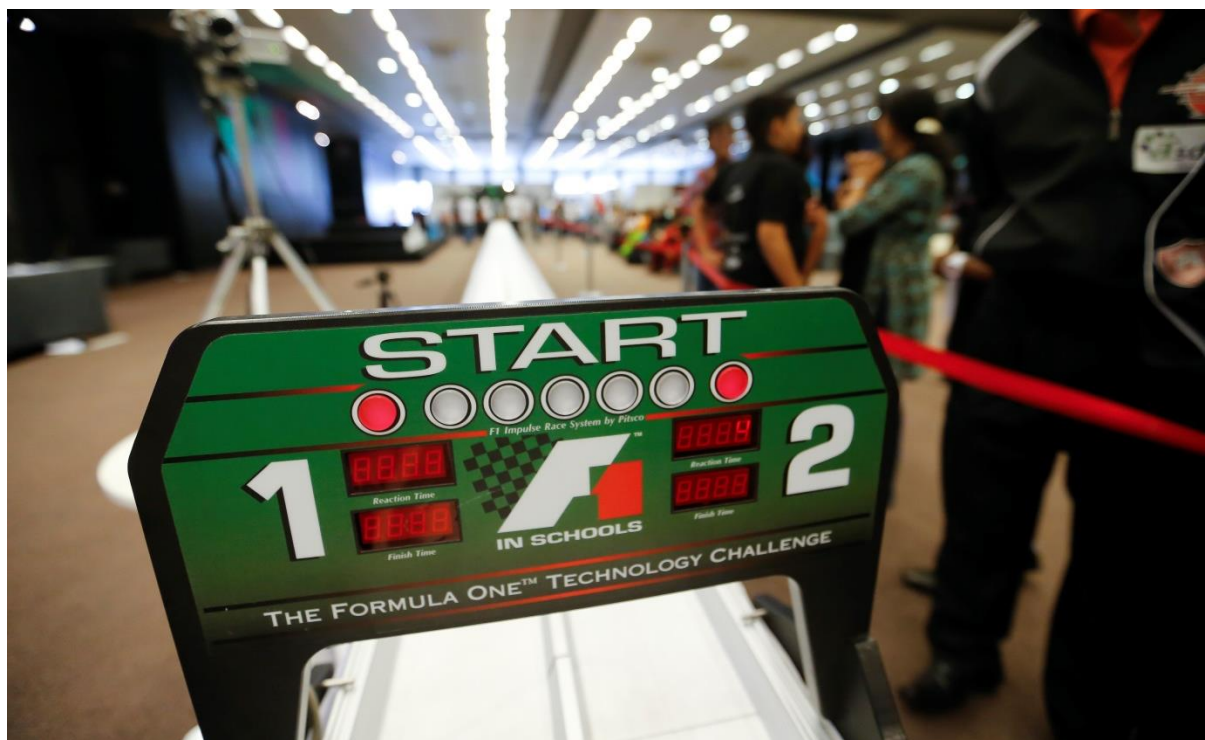
Teams are judged on car speed, as well as supporting design portfolio, verbal presentation and marketing display stand in “the pits”.

The best student teams compete in the UAE National Final with the champion teams in both the Professional and Rookie categories being invited to represent the UAE at the F1 in Schools World Finals!



2012/13 Champions – Adroit Infinitum  
The Indian School Dubai

### Now it's your turn!



## F1 in Schools – Presented by Yas Marina Circuit



At Abu Dhabi Motorsports Management, we define corporate social responsibility (CSR) as the way in which we operate to create a positive social impact within the community. Our business has a responsibility for enhancing the life of the community in which we work.

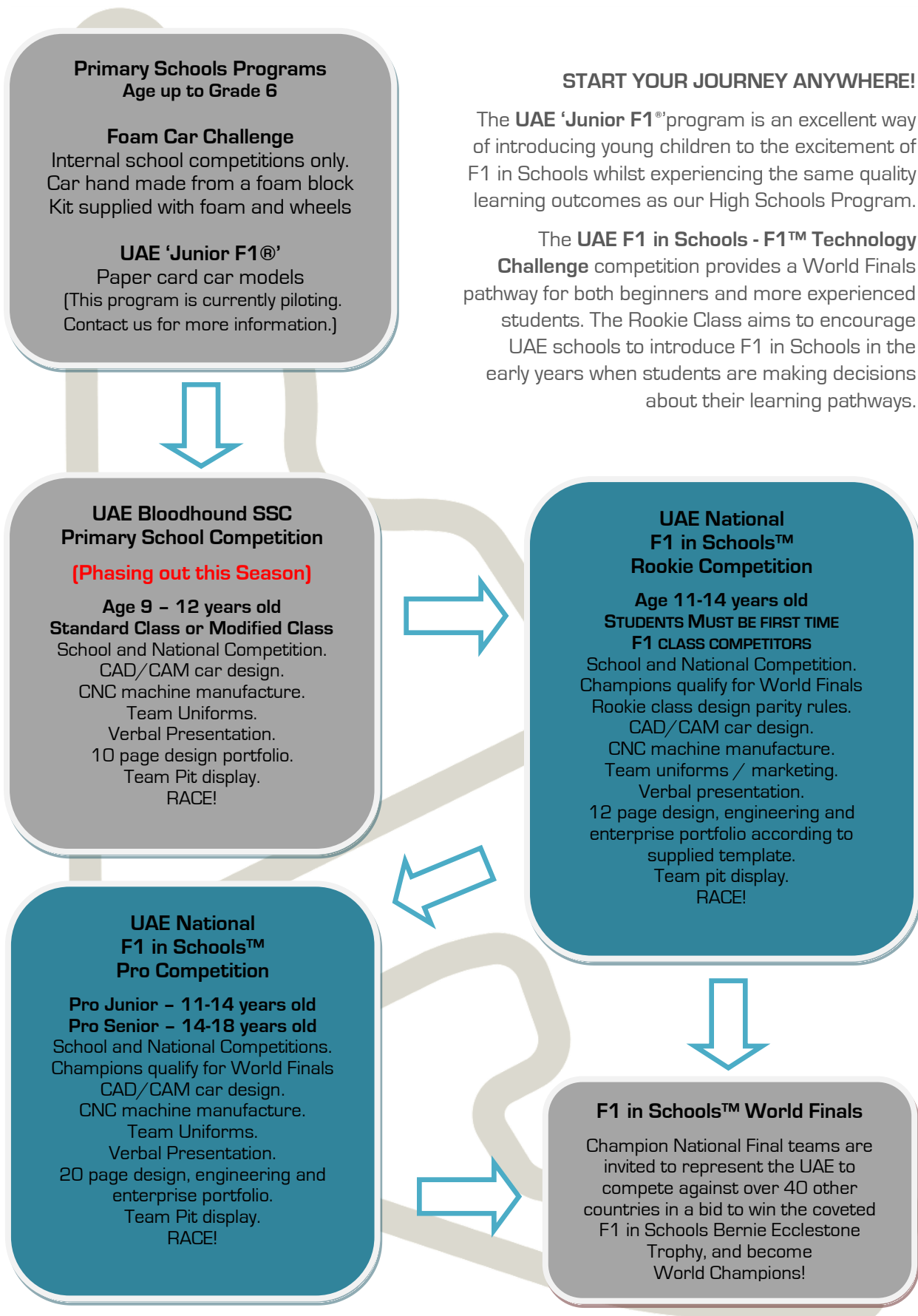
We already use our facilities to support the community in many ways, notably by making the Yas Marina Circuit available for “Training Nights Under Lights” every Tuesday. This focus is highlighted by activities such as the annual Diabetes Walkathon, the Ministry of Labour’s mini-marathon and a range of educational activities including the successful F1 in Schools programme.

**Yas Marina Circuit is the only Grand Prix circuit in the world to have a facility dedicated to all aspects of the F1 in Schools Challenge. It offers a fabulous resource for students and teachers.**

Schools involved in the F1 in Schools Challenge are encouraged to make use of the exceptional Centre of Excellence facilities. The Centre of Excellence features a fully equipped computer-aided design (CAD) software studio, wind-tunnel testing facilities, two 20m race tracks, a design and technology facility for students, a 30-person classroom setting and full audio-visual capabilities. The Centre is available for student and teacher training courses relating to all aspects of the project and its in-school delivery.



## Where Will F1 in Schools™ Take You?



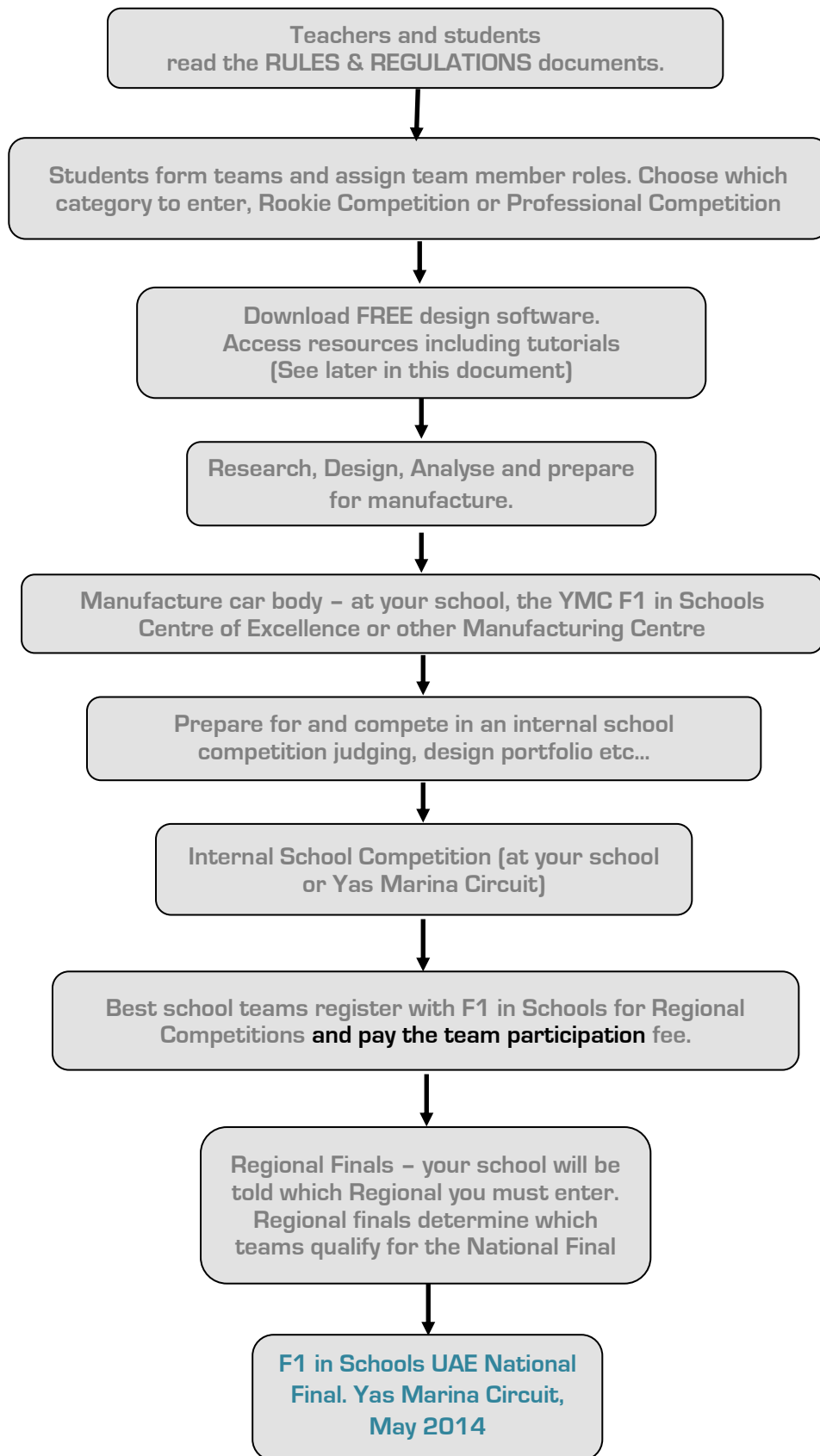
### START YOUR JOURNEY ANYWHERE!

The UAE 'Junior F1®' program is an excellent way of introducing young children to the excitement of F1 in Schools whilst experiencing the same quality learning outcomes as our High Schools Program.

The UAE F1 in Schools - F1™ Technology Challenge competition provides a World Finals pathway for both beginners and more experienced students. The Rookie Class aims to encourage UAE schools to introduce F1 in Schools in the early years when students are making decisions about their learning pathways.

## GETTING STARTED

### Program and Competition Stages



## F1 in Schools™ UAE High Schools Challenge Categories

There are two competition categories that teams can enter:

### 1. Rookie Class Competition

This class can only be entered by students who have NOT previously participated in the F1 in Schools High Schools challenge. **All team members must 14 years of age or less.** This category provides for closer competition along with a simpler project for beginners, requiring less time to complete. There are special 'design and competition parity' regulations for this category:

- a. Competition Regulations – Team Design Portfolio is limited to 12 pages and should be based on the Design Portfolio template provided by F1 in Schools UAE.
- b. Technical Regulations:
  - i. CNC machining – car body designs may only be manufactured using a maximum of two 3 axis machining processes. I.e. Car body machined once on each side OR one top machining process and one bottom machining process
  - ii. Wheel and axle systems – teams must use the standard F1 in Schools (Fusion style) wheels and axle system supplied by F1 in Schools UAE
  - iii. Rear wing – the rear wing must be manufactured and machined from the same balsa block as the car body

Strike Automobiles – School of Research Science.  
Rookie Category Car



### 2. Professional Class Competition

Primarily for the older students or students who have participated before. The Professional Class competition has two sub categories, Pro Junior (all team members 14 years of age or less), and Pro Senior (all team members 14-18 years of age). The rules and regulations for the Professional Class are based upon the international F1 in Schools World Finals regulations.



TACHYON – Dubai College.  
Typical Professional Category design

## The Design Brief

You are a Formula One™ Team commissioned to design, construct and race the fastest Formula One™ Car of the Future, driven by compact compressed air power plants. To succeed in the challenge you will need to work with modern design technologies like 3D CAD/CAM software. You will also need to read the rules and regulations carefully!

## Form your Team & Team Identity

In order to enter the Championship, you must allocate job roles to the members of your team. Your team can consist of a **maximum of six students**. Mixed boys and girl's teams are encouraged. Ideally, one role should be allocated to each person; however, you may have to double up on your roles, depending on the number of people you have available. The following job roles are just examples of what could be covered by the members of your team:

- **Team Manager.**

This person could be responsible for managing the team, ensuring that the primary and back-up cars are ready for the finals. The team manager works closely with all members of the team, offering assistance where necessary.

- **Resources Manager**

This person organises time, materials and equipment for design and making the cars. They could be responsible for developing ideas regarding team marketing and sponsorship. The resources manager will need to liaise with all members to check tasks are progressing on time and offer additional help, if needed.

- **Design Engineer**

This role could be responsible for the styling and aerodynamic performance of the car design using CAD software. Design engineers will need to liaise with the manufacturing engineers to ensure their ideas can be properly manufactured.

- **Graphic Designer**

This person could be responsible for producing the colour schemes applied to the vehicle, including any special sponsorship decals, together with the final graphic renderings and any additional team marketing materials. The graphic designer will need to liaise with the design engineer to ensure any schemes will fit the shape of the vehicle and the resources manager for additional marketing development.

- **Manufacturing Engineer**

This role is responsible for making the car and advising team members about the constraints of the machining process. Manufacturing engineers would normally be responsible for the car assembly and painting as well.



There are many tasks that must be mastered; in order to design, manufacture, prepare and finally enter a car for racing, teamwork will be vital to your success. A real F1 team succeeds because all the people learn to work together and support each other.

**Remember - no one person is more important than other members in the team.**



## Access Resources and Project Examples:

### F1 in Schools Torque – Online Supportal

Teachers - UAE & Middle East participating teachers should become members of our support website to enable download of classroom resources and stay up to date with program developments. F1 in Schools Torque includes advice and helpful information to help you through the various stages of the program. First up, you will benefit from downloading our “Introducing the F1 in Schools Challenge” presentation in the F1 in Schools Getting Started section of the supportal.

Students – can browse the support website as guests to review exemplar projects and links that will help with their own project development.

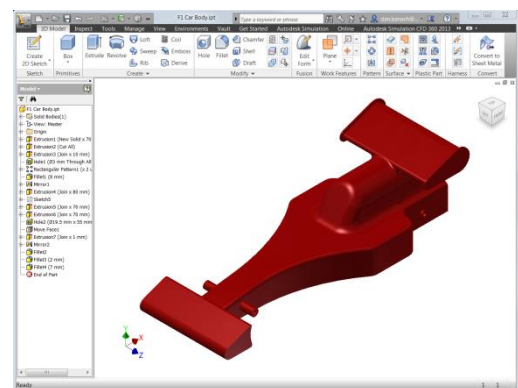
**Use your search engine to find ‘F1 in Schools Torque’ or go to the link in the resources section of our website.**

## Design Stage Considerations

### Get free CAD Software

All F1 in Schools cars must be designed using a 3D CAD program. Autodesk® is the global premiere software for F1 in Schools. All students and teachers can download their own FREE individual copies of all software required for F1 in Schools. There are also FREE school site licences available.

- To get your own INDIVIDUAL free software got to <http://students.autodesk.com/>
- For your free school site licence, contact F1 in Schools UAE



### Autodesk Programs you need:

There are three different Autodesk products you will use to design and analyse your F1 in Schools car:

1. **Autodesk® Inventor® Professional** - 3D CAD software. Easy-to-use set of tools for 3D design and modelling of F1 in Schools car.
2. **Autodesk® Showcase®** - For creating a brilliant photo realistic render of your car.
3. **Autodesk Project Falcon** – 'Virtual Wind Tunnel' software to analyse aerodynamics.

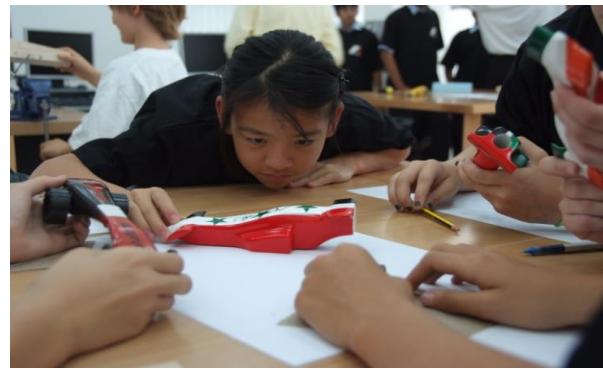
### Software Tutorials

We recommend that the Design Engineers complete the special F1 in Schools tutorials for Autodesk software before beginning to model their own car designs. There are a number of tutorials for the Autodesk software programs that can be downloaded in PDF format by teachers who are members of the F1 in Schools Torque supportal. There are also F1 in Schools tutorials available on YouTube and iBook's. Search for 'Autodesk F1 in Schools' and you should find these easily.

**READ THE TECHNICAL REGULATIONS CAREFULLY BEFORE YOU START DESIGNING YOUR OWN F1 IN SCHOOLS CAR!**

### Research

Investigate existing real F1™ car design characteristics and also previous F1 in Schools car design ideas. Concentrate your research on areas that could help your team, for example, aerodynamics and car body designs, and then try to apply the same principles to your own project. The F1 in Schools Torque supportal has many examples of car designs and other project elements.

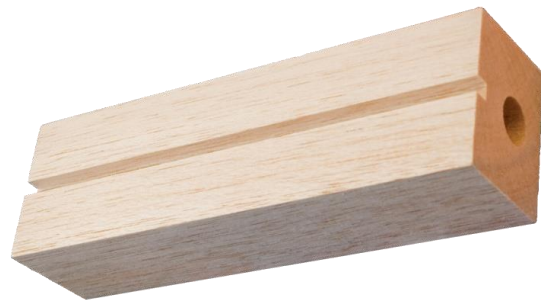


### Team Business & Project Plan

An important stage is to sit down as a team and plan out your project at the beginning. How much time do you have? What needs to be done when, and by whom? How much sponsorship do you need? Create a basic team budget and project timeline. A basic budget for a team of 6 would require approx. 1200 – 1500 Dhs and includes costs of manufacturing 2 x unpainted cars and basic team uniforms. If progressing beyond school level competition, then external competition registration cost is additional.

### Standard Car Components

All F1 in Schools car bodies are designed to be manufactured from a single official F1 in Schools balsa wood block. The picture here shows the bottom and back of the block which feature standard pre-manufactured tether line slot and Co2 cartridge hole. **It is crucial that teams understand the dimensions of the balsa block before commencing their car designs.** See the Technical Regulations document.



When teams have their car bodies manufactured by F1 in Schools, we supply the balsa wood blocks, plus a set of standard wheels and axles. The use of the standard wheels is mandatory for Rookie teams and optional for Professional teams. The manufacturing fee includes the supply of these materials.

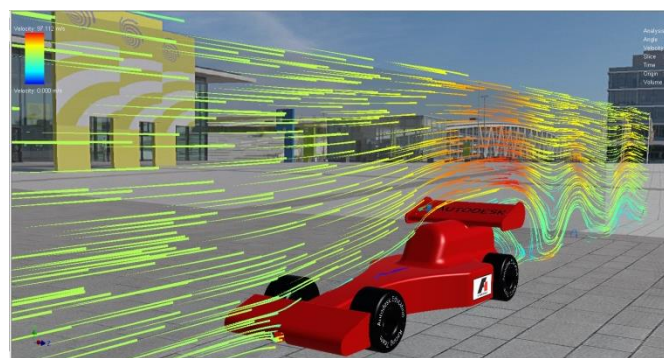


### Design Ideas and Development

Start by hand sketching your car design ideas. Evaluate these and then start to further develop your favourite ideas using Autodesk Inventor 3D design software. It's very important that you document and keep records of all of your ideas and developments; you will be required to present these in your Design Portfolio for judging.

### Analyse your 3D Model Design Ideas

The free Autodesk Software suite includes 'Project Falcon', a virtual wind tunnel testing program that will enable you to very quickly and easily analyse the aerodynamic qualities of your designs. The Autodesk F1 in Schools tutorials includes instructions for how to use Project Falcon.



Make design modifications based on these virtual wind tunnel test results. Don't forget to document all of this. The Judges will be looking to see that you have further developed your designs based on evidence collected in testing such as this.

Search for the 'Autodesk Labs' website and Project Falcon. Follow the instructions on the getting started. We recommend you select options to install as 'add in' for Autodesk Inventor Professional 2014.

### Manufacturing Considerations

All F1 in Schools™ car bodies must be manufactured using CAM (Computer Aided Manufacture) software and a CNC (Computer Numeric Control) machine.

Your body design must be at least 10mm shorter at the front end, compared to the actual balsa wood block (we have accounted for this in the Rules & Regulations, maximum car length). You will not be able to machine to the extreme end of the balsa wood block, as it is used for attaching it in the CNC machine.

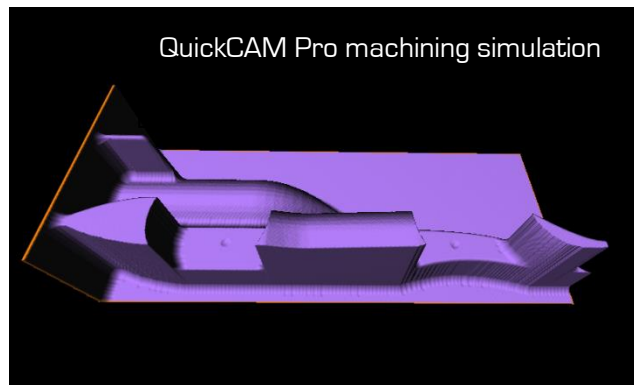
Team's final car body CAD models need to be converted to special CNC machine code using CAM software. We recommend and use DENFORD QuickCAM Pro for this. Schools can purchase this easy to use software from F1 in Schools so that students can generate their own machining plans, understand the process and get a better result. If your school doesn't have this software, we will complete this stage of the process for you.

There are special instructions and a tutorial available from the F1 in Schools Torque supportal to help teams prepare their car body CAD designs for manufacturing.

Once machined, you can smooth down the balsa wood design with sand paper, and finish with primer and paint. Note that only a limited amount of hand finishing to the body is allowed. You could also decorate the car body with any sponsorship stickers, advertising or colour schemes.

With your F1 in Schools car kit you will receive a balsa wood blank (used to make your car), a set of 4 wheels, 2 axles, axle guide and some washers for wheel spacing. These are the basics for car manufacture and assembly.

Schools can have their car designs manufactured at the Yas Centre of Excellence on our DENFORD CNC 3D routers either by visiting the centre or simply emailing us your car design; we then send the completed models back to you. **Be sure to check the season timeline on our website for manufacturing request deadlines.**



### Testing

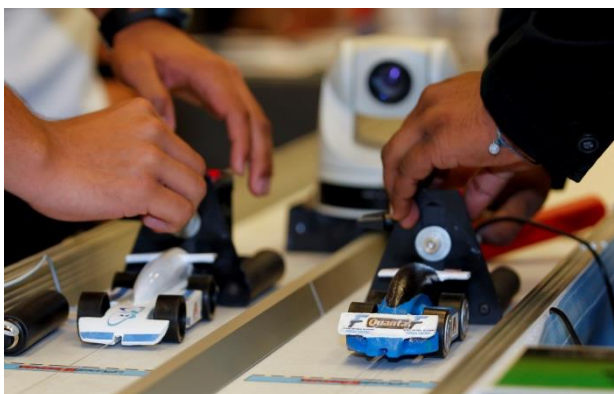
Teams may want to consider testing a variety of car designs, or car parts, in a 'real' wind and/or smoke tunnel to evaluate their aerodynamic performance. You can arrange a visit to the Yas Marina Circuit Centre of Excellence to use desktop size wind and smoke tunnels.



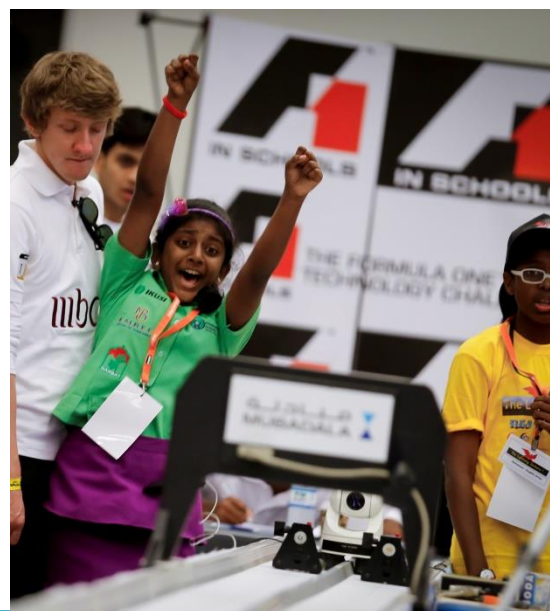
### Racing

THE EXCITING PART! – Race your F1 in Schools™ design, against other UAE teams, down the specially designed computerised 20 metre race track. Your car will be timed to 1/1000<sup>th</sup> of a second and your teams nominated drivers will need to have split second reaction times! Cars will be raced in 'auto mode' and driver 'reaction mode'.

Schools can contact us at F1 in Schools to book school race days, either at your school or the F1 in Schools Centre of Excellence at Yas Marina Circuit. If visiting Yas Marina Circuit you might also consider talking to us about booking a Race Circuit Tour to add to the excitement of the day.



F1 in Schools cars can travel up to 80 km/h over the 20 metre race distance, powered by a single 8 gram canister of compressed Co2 gas.



The current UAE record is – 1.144 seconds by Velox Racing, Indian High School. Dubai.

### Purchasing Equipment

Whilst we provide access to all necessary technologies, many schools choose to purchase their own. All of the F1 in Schools make, test and race technologies can be purchased for your own school through Yas Marina Circuit. Contact us for pricing details. Kit purchased through Yas Marina Circuit includes free expert training.

## COMPETITION TIME

### General Competition Requirements

You should find and download the F1 in Schools 2013/14 Season High Schools Challenge Competition Regulations. Following is a summary of the important points for teams to consider.

- Each team must consist of a **minimum of 3 students to a maximum of 6.**
- Rookie Category - Each team member must be 14 years of age or less and participating in the F1 in Schools secondary competition for their first time.
- Professional Category – Junior [11-14 years old]. Senior [14-18 years old].
- Each team must use CAD (Computer Aided Design) software to produce their ideas and model them in 3D.
- Each team must use a CNC (Computer Numeric Control) machine such as a Denford CNC Router, to produce the car body.
- Teams must read the Technical Regulations, (found later in this booklet), carefully to ensure that all aspects of their car design satisfy these regulations.
- The following must be included with your National Final entry:
  - 2 x identical F1 in Schools™ Cars
    - 1 main race car and a back-up car in case something goes wrong on the track.
    - Painted and decorated to a quality finish.
    - These will be checked and measured to the technical rules.
  - A3 size Design Portfolio
    - Rookie Class – 12 page maximum



Strike Automobiles – School of Research Science.  
2012/13 Rookie Champions



- Professional Class – 20 page maximum
- Present information about your team and how you worked together
- Show your design ideas, development and evaluation
- Document the steps for manufacturing your design
- Discuss aerodynamics and any other research you conducted
- A pit display and team uniforms
  - Show off your team image and promote your project
- An orthographic drawing and 3D render included in design portfolio
  - The orthographic drawing is a technical drawing showing dimensions and detail of your design
  - A realistic 3D render can be done using Autodesk® Showcase software following the F1 in Schools tutorial.
- 10 minute verbal presentation
  - Rehearse a team presentation to tell the judges about innovation within your project, how you have collaborated with other organisations and what you have learnt from participating in the F1 in Schools programme.



Safire Racing – German International School Dubai



**REMEMBER – CHECK THE COMPETITION REGULATIONS FOR MORE IMPORTANT  
DETAIL IN RELATION TO THESE REQUIREMENTS**

**Point Scoring**

Points will be awarded to each team across six (6) categories with maximum possible scores as shown below:

ELEMENT	Judging Categories	Points
Race Car & Backup Car	<b>1. Specifications</b>	<b>120</b>
	Technical Regulation Check	120 points
	<b>2. Engineering</b>	<b>120</b>
	Quality of Manufacture	60 points
Design Portfolio and Pit Display	CAD / CAM and Analysis	60 points
	<b>3. Design Portfolio and Pit Display</b>	<b>210</b>
	Portfolio	90 points
	Pit Display and Marketing	60 points
Verbal Presentation	<b>5. Verbal Presentation</b>	<b>180</b>
	Technique	60 points
	Composition	60 points
	Subject Matter	60 points
Race Car	<b>6. Racing</b>	<b>270</b>
	Time Trials	180 points
	Reaction Racing	90 points
<b>GRAND TOTAL</b>		<b>900</b>

**START YOUR ENGINES – See you at the National Final, May 2014, Yas Marina Circuit**

