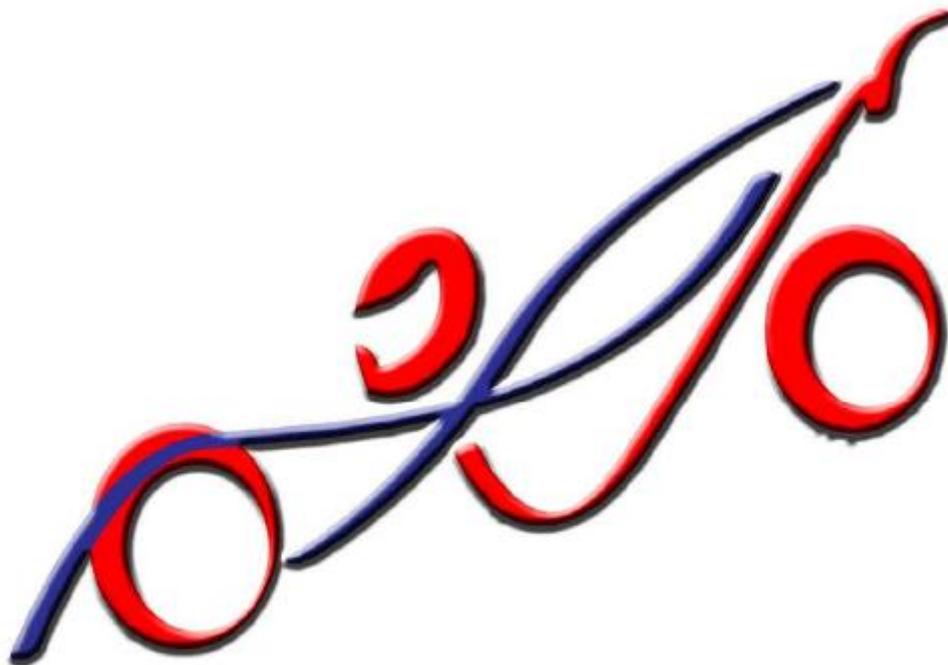


UTeM Formula Varsity 2012 Vehicle Technical Specifications



UTeM Formula Varsity 2012

Rules intended to give freedom to modify or replace some parts in the interest of safety, research, and development. The rule also intended to provide fair competitions and maintain parity.

1.0 Definition

Small-scale open wheel single-seater car, design and build by students from Institute of Higher Learning.

The engine used must be derived from mass-produced homologated moped bikes, modified by the kit.

2.0 Engine Homologation

Engine must be originated from motorcycle manufactured and assembled in Malaysia.

3.0 Number of Seats

The car must have only 1 seat, located at the centre at the width of the car.

4.0 Material

Any kind of materials considered exotic such as titanium or carbon fibre, are strictly prohibited from the car design.

The use of fire-resistant composite based on fibreglass, are allowed.

5.0 Dimensions and Bodywork

5.1 Wheel Centre Line

The centre line of any wheel shall be deemed to be halfway between two straight edges, perpendicular to the surface, placed against the opposite sides of the complete wheel at the centre of the tyre tread.

5.2 Height Measurements

All height measurement will be taken with the car in normal race trim with driver aboard seated normally.

5.3 Overall Height

Except for the rollover structure, no part of the car can be higher than 900mm from the ground. However, any part of the rollover structures more than 900mm from ground must not be shaped to have significant aerodynamic influence on the performance of the car.

5.4 Overall Width

The overall width of the car including complete wheels shall not exceed 1500mm, with the steered wheels in straight position.

5.5 Wheelbase

The car should have a minimum wheelbase of 1600mm.

5.6 Ground Clearance

The car should have a minimum ground clearance of 150mm, with driver onboard.

5.7 Bodywork

5.7.1 Bodywork around the front wheels

In plan view, there must be no bodywork in the area formed by two longitudinal lines parallel to/and 200mm and 350mm from the car centre line and two transversal lines, one 50mm forward the front edge and one 150mm behind the rear edge of the complete front wheel.

5.7.2 Width ahead of the rear edge of the front wheels

The bodywork ahead of the rear edge of the complete front wheels is limited to a maximum width of 1100mm.

Except for fixation, the lateral extremities of any bodywork forward of the front wheels must be flat and, in order to prevent tyre damage to other cars, at least 10mm thick within a radius of 5mm on all edges.

5.7.3 Width between the rear edge of the front wheels and rear wheel centre line

The maximum width of the bodywork behind the rear edge of the complete front wheels and in front of the centre line of the rear wheels is 1100mm.

5.7.4 Width behind the rear wheel centre line

Bodywork behind the centre line of the rear wheels must not exceed 900mm in width.

Except for fixation, the lateral extremities of any bodywork behind the rear wheel centre line must be flat.

5.7.5 Overhangs

No part of the car shall be more than 300mm behind the centre line of the rear wheels or more than 600mm in front of the centre line of the front wheels.

5.7.6 Aerodynamic influence

Any specific part of the car influencing its aerodynamic performance:

- Must comply with the rules relating to the bodywork
- Must be rigidly secured to the entirely sprung part of the car (rigidly secure means not having any degree of freedom)
- Must remain immobile in relation to the sprung part of the car.

6.0 Weight

6.1 Minimum Weight

The half dry weight of the car plus driver without fuel is 200kg.

Car weight without fuel	140kg
Driver's weight	60kg

Please note that if the driver's minimum weight is less than 60kg, penalty of **up to a maximum of 10kg must be added** onto the car to equal 150kg, however no additional weight will be added should the total weight still be less than 150kg after the penalty is imposed.

All ballast added to the car must be securely fitted. Sprockets will not be allowed to be use as weight ballast unless permanently welded on to the car. Fuel in the fuel tank can be used as ballast.

In case of the team wants to alternate their drivers between races on the same event, only the weight of the lightest driver nominated will be taken into account to form the minimum weight.

- **Half Dry Weight: Car ready to race without fuel. In case of separate lubricant oil, it is regarded as fuel.**

7.0 Engine

7.1 Permitted Engine

All engines must be four-strokes, with the maximum cylinder of ONE.

7.2 Maximum Capacity

The based-engine used must not exceed **135 cc**. Modifications on bore dimension are allowed.

7.3 Forced Induction / Power Boost System

Any kind of forced induction system such as turbocharger or supercharger, are not allowed.

In addition, any type of power boost system that enriches fuel/air mixture such as Nitrous Oxide is not allowed.

7.4 Engine Modification

The following engine components may not be altered from the homologated machine except as noted.

The homologated engine design concept cannot be changed.

Homologated materials and castings for crankcase, cylinder, cylinder head, and gearbox housing must be used.

Material for crankcase, cylinder, cylinder head, and gearbox housing may only be added by welding or removed by machining unless stated.

Method of valve retention must remain as the homologated engine.

All moving internal engine, gearbox, and clutch parts may be altered or replaced including materials from those fitted on the homologated engine (unless not allowed in the individual section covering parts in question).

Polishing and lightening of engine parts is permitted, except for carburetion instruments (unless not allowed in the individual section covering parts in question).

7.4.1 Cylinder Head

The homologated cylinder head can be modified as follows:

Homologated materials and castings for the cylinder heads must be used.

Material for these parts may only be added by welding or removed by machining.

The induction and exhaust system including the number of valves and/or ports (intake and exhaust) must be as homologated.

Porting and polishing of the cylinder head normally associated with individual tuning such as gas flowing of the cylinder head, including the combustion chamber is allowed.

The compression ratio is free.

The combustion chamber may be modified.

The valves may be altered or replaced from those fitted to the homologated engine.

The valve seats may be altered or replaced from those fitted to the homologated engine.

The valve guide may be altered or replaced from those fitted to the homologated engine.

Valve springs may be altered or replaced from those fitted to the homologated engine.

The valve retainers may be altered or replaced from those fitted to the homologated engine.

7.4.2 Camshaft

Camshaft may be altered or replaced from those fitted to the homologated engine.

The cam chain or cam belt tensioning device(s) are free.

7.4.3 Cam Drive

Cam drive may be altered or replaced to allow the degreeding of the camshaft.

The method of cam drive must remain as homologated.

The location of cam drive must remain as homologated.

7.4.4 Crankshaft

Crankshaft may be altered from those fitted to the homologated engine.

Attachment of aftermarket ignition components or sensors is permitted.

Balance shaft may be removed.

Crankshaft stroke must remain as homologated.

Flywheel can be altered or replaced from those fitted to homologated engine.

7.4.5 Oil Pumps and Oil Lines

Oil pump may be altered or replaced from those fitted to the homologated engine.

Oil lines may be modified or replaced. Oil lines containing positive pressure, if replaced, must be of metal reinforced construction with swaged or treaded connectors.

7.4.6 Connecting Rods

Connecting rods may be altered or replaced from those fitted to the homologated engine. Carbon composite or carbon fibre materials are not allowed.

7.4.7 Piston

Piston may be altered or replaced from those fitted to homologated engine.

7.4.8 Piston Rings

Piston rings may be altered or replaced from those fitted to homologated engine.

7.4.9 Piston Pins and Clips

Piston pins and clips may be altered or replaced from those fitted to homologated engine.

7.4.10 Cylinder Block

Cylinder block can be altered or replaced from those fitted to homologated engine.

The material for the cylinder block may only be added by welding and/or removed by machining. The sleeves or liner material may be changed and the surface finish is free.

7.4.11 Crankcase and all other Engine Cases (i.e. ignition case, clutch case)

Crankcases must remain as homologated. No modifications are allowed (including painting, polishing and lightening).

Other engine cases must be made of the homologated material. The crankcase/gearbox casing, ignition, clutch and generator covers may be protected by additional means i.e. protective covers made of stainless steel or other ferrous metal.

Holes may be added in dry clutch covers to allow additional cooling.

Engine case guards in the form of strengthened engine side covers may be installed. These covers must be no lighter in weight than the standard part.

The countershaft cover may be removed.

The addition of a crankcase protector at the countershaft is allowed.

7.4.12 Transmission/Gearbox

The engine must drive the rear wheel axle. Four wheel drive transmission is forbidden.

Method of final drive must remain as the homologated engine.

All transmission/gearbox ratio, shafts, drums, and selector forks are free.

Primary gear ratios are free.

The number of gears must remain as homologated.

Additions to gearbox or selector mechanism, such as quick shift system, are not allowed.

Countershaft sprocket, rear sprocket, chain pitch, and size can be changed.

Any form of traction control system is forbidden.

7.4.13 Clutch

Aftermarket or modified clutches are permitted.

Back torque limiter is permitted.

Clutch system (wet/dry), method of operation (cable/hydraulic), and actuation (automatic/manual) must remain as the homologated.

7.4.14 Ignition/Engine Control System

Ignition/ Engine control system may be modified or changed.

Spark plug and plug wire may be replaced.

7.4.15 Generator, Alternator, and Starter

The generator may be altered, replaced, or removed from those fitted to the homologated engine.

A starter must be fitted with electrical or other source of energy carried aboard the car, and able to be controlled by the driver when seated normally. The starter must be capable of starting the engine at all times.

The car must be equipped with a functional ignition kill switch or button mounted at the cockpit (within reach of the hand of the driver when seated and can be reached from outside) that is capable of stopping a running engine.

7.4.16 Exhaust System

Exhaust pipes may be altered or replaced from those fitted to the homologated engine.

Exhaust silencers may be altered, replaced, or removed from those fitted to the homologated engine. However number of final exhaust must remain as homologated.

For safety reasons, the exposed edge(s) of the exhaust pipe(s) outlet(s) must be rounded to avoid any sharp edges.

Wrapping of exhaust systems is not allowed except in the area in contact with the bodywork, frame, or seat for protection from heat.

8.0 Carburetion Instruments

8.1 Carburettor

Carburetion instruments refer to both throttle body and carburettor.

Throttle body may be altered or replaced from those fitted to the homologated engine.

The size of throttle body is free.

Number of throttle body must remain as homologated.

Carburettor may be altered or replaced from those fitted to the homologated engine.

The size of carburettor is free.

Number of carburettor must remain as homologated.

Intake manifold may be altered or replaced to fit the altered/replaced throttle body and/or carburettor.

Variable-length carburettor intake tract devices that function while the engine is operating are prohibited, unless such a system is used on the homologated engine.

9.0 Fuel

All engines must function on normal unleaded fuel, available from the normal fuel pump.

10.0 Machine Specification

10.1 Main Frame Body

The main frame must be space-frame tube construction, with engine positioned at the centre of the car at the back of drivers. Any kind of monocoque for the main frame construction is prohibited.

Main frame must consist ferrous metal as the basic material.

The paint scheme is not restricted.

10.2 Cockpit

10.2.1 Cockpit Opening

The opening giving access to the cockpit must allow the horizontal template, shown in Appendix B, to be inserted vertically, from above the car into the survival cell and bodywork, with the steering wheel, steering column, seat and all padding removed.

The forward extremity of the cockpit opening must be at least 50mm in front of the steering wheel.

The driver must be able to enter and get out of the cockpit without it being necessary to open a door or remove any part of the car other than the steering wheel or cockpit padding. Sitting at his steering wheel, the driver must be facing forward.

On both sides of the cockpit, two impact beams must be installed.

10.2.2 Firewall

A firewall must separate the driver compartment from all components of the fuel supply, the engine oil and the liquid cooling systems. It must protect the neck of the tallest driver. It must extend sufficiently far upwards and/or rearwards such that any point less than 100 mm above the bottom of the helmet of the tallest driver shall not be in direct line of sight with any part of the fuel system, the cooling system or the engine oil system. The firewall must be a non-permeable surface made from a fire resistant material. Pass-through for wiring, cables, etc. are allowable if grommets are used to seal the pass-through. Also, multiple panels may be used to form the firewall but must be sealed at the joints.

10.2.3 Driver Restraint System (Seatbelt)

All drivers must use either H-type or Y-type restraint harness. The restraint system installation is subject to approval of the Chief Technical Inspector. The restraint system must be worn as tightly as possible at all times.

10.2.4 Steering Wheel

The steering wheel must be fitted with a quick release mechanism.

The steering wheel rim must be continuously closed but the shape is free.

10.3 Suspension and Steering

All kinds of active suspension are forbidden.

Chromium plating of any steel suspension components is forbidden.

10.3.1 Suspension

All suspension members must be made from the homogeneous metallic material.

Cars can be fitted with sprung suspension. Any kind of suspension using torsion springs are not permitted.

10.3.2 Steering

The steering must consist of a mechanical link between the driver and the wheels.

Four wheel steering is forbidden.

No part of the steering wheel or column, nor any part fitted to them, may be closer to the driver than a plane formed by the entire rear edge of the steering wheel rim. All parts fixed to the steering wheel must be fitted in such a way as to minimise the risk of injury in the event of a driver's head making contact with any part of the wheel assembly.

10.4 Brakes

10.4.1 Separate Circuits

All cars must have a brake system which has at least two separate circuits operated by the same pedal. This system must be designed so that if leakage or failure occurs in one circuit, the pedal shall still operate another brake.

10.4.2 Brake Discs

Brake discs must be made from ferrous material.

At least 2 discs must be attached to the rear wheel axle.

10.4.3 Brake Calliper

All brake callipers must be made from the homogeneous metallic material.

Each disc may only be operated by one calliper, and each calliper must have no more than four pistons.

The use of steel-braided hose is permitted.

10.4.4 Brake Cooling

Brakes may only be cooled by air.

Liquid cooling of any part of the braking system is forbidden.

10.4.5 Brake Pressure Modulation

Anti-lock brakes and power braking are forbidden.

10.5 Wheels and Tyres

10.5.1 Location

Complete wheels must be external to the bodywork in plan view, with the rear aerodynamic device removed.

10.5.2 Wheel Material

Exotic materials such as titanium, carbon fibre, or composite are not allowed.

10.5.3 Wheel Dimensions

Compulsory wheel diameter: 13.0 inches.

Width: Minimum 4.0 inches, maximum 6.5 inches.

These measurements will be taken horizontally at axle height.

10.5.4 Maximum Number of Wheels

The number of wheels is fixed at four.

10.5.5 Pressure Control Valve

Pressure control valves on the wheels are forbidden.

10.5.6 Tyre

Slick tyres, hand-cut tyres, or tyres marked "NOT FOR HIGHWAY USE" are strictly forbidden.

The use of tyre warmer is not allowed.

10.6 Fuel Tank

All fuel tanks must be filled with fire retardant material, or be fitted with a fuel cell bladder.

The maximum capacity of fuel tank is 10 litres.

Fuel tank filler caps must be leak proof when closed. Additionally, they must be secured to prevent accidental opening at any time.

The same size fuel tank used in practice must be used during the entire event.

10.7 Air Box

The air box may be altered or replaced from those fitted to the homologated engine (a special design for racing is allowed).

The air filter element may be altered, replaced, or removed.

The air box drains must be sealed.

10.8 Carburettors

(See Article 8.1)

10.9 Fuel Supply

Fuel pump and pressure regulator may be modified or changed.

Fuel lines may be replaced.

The fuel line(s) going from the fuel tank to the carburetion instruments must be located in such a way that they are protected from possible defects.

Fuel vent lines may be replaced.

Fuel filters may be added.

Fuel petcock may be altered or replaced from those fitted to the homologated engine.

10.10 Roll Structure

The basic purpose of safety structures is to protect the driver. This purpose is the primary design consideration.

The chassis must include both a main hoop and a front hoop as shown in Appendix A. The main hoop and front hoop design must be integrated into the chassis design.

10.10.1 Main and Front Hoops – General Requirements

When seated normally and restrained by the seatbelt, a straight line drawn from the top of the main hoop to the top of the front hoop must clear by 50.8 mm (2 inches) the helmet of the helmet of all the team's drivers and the helmet of a 95th percentile male (anthropometrical data).

A two dimensional template used to represent the 95th percentile male is made to the following dimensions:

- A circle of diameter 200 mm (7.87 inch) will represent the hips and buttocks.
- A circle of diameter 200 mm (7.87 inch) will represent the shoulder/cervical region.
- A circle of diameter 300 mm (11.81 inch) will represent the head (with helmet).
- A straight line measuring 490 mm (19.29 inch) will connect the centres of the two 200 mm circles.
- A straight line measuring 280 mm (11.02 inch) will connect the centres of the upper 200 mm circle and the 300 mm head circle.

With the seat adjusted to the rearmost position, the bottom 200 mm circle will be placed in the seat, and the middle 200 mm circle, representing the shoulders, will be positioned on the seat back. The upper 300 mm circle will be positioned up to 25.4 mm (1 inch) away from the head restraint (i.e. where the driver's helmet would normally be located while driving).

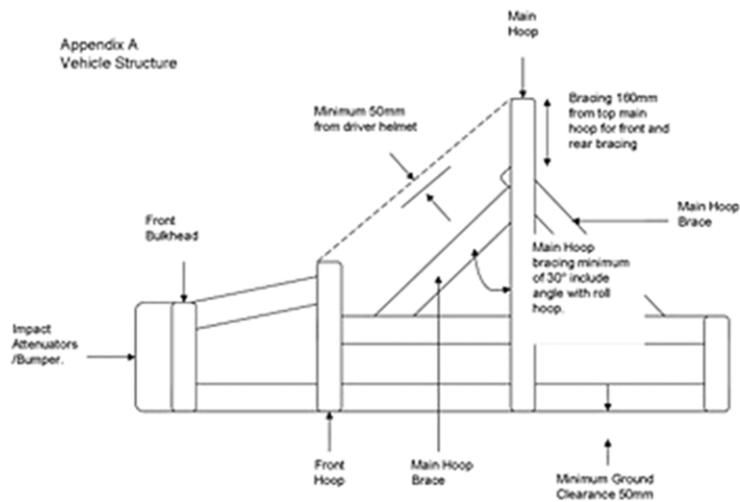
The minimum radius of any bend, measured at the tube centreline, must be at least three times the tube outside diameter. Bends must be smooth and continuous with no evidence of crimping or wall failure.

10.11 Brake Light

The car must be equipped with a red brake light of at least 15 watts, or equivalent, clearly visible from the rear. If an LED brake light is used, it must be clearly visible in very bright sunlight. This light must be mounted between the wheel centreline and driver's shoulder level vertically and approximately on vehicle centreline laterally.

*We hope that all the specification would be followed in order to ensure safety and the competitiveness of this event.

Appendix A



Appendix B

Appendix B
Cockpit Opening Template

