



**EGA**   
Electrifying Green Aspiration





# EGA - Rule book

**Subscriber: “Rules are subjected to change without any prior notice.”**



# 1. Administration rules

- 1.1 EGA Overview
- 1.2 EGA SAE Bangalore organizer & authority
- 1.3 Individual participation requirements
- 1.4 Faculty advisor
- 1.5 Registration
- 1.6 Questions/Complaints/Appeal
- 1.7 Overall agenda/Deadlines
- 1.8 Recognitions/Awards/Rewards

## 2. Technical rules

- 2.1 Hybrid specification
  - 2.1.1 Engine specification
  - 2.1.2 Motor specification
  - 2.1.3 Battery, controller & charging specification
- 2.2 Vehicle specification
- 2.3 Professional assistance
- 2.4 Technical write-ups
- 2.5 Virtual evaluation

Items inside the marked zones are must to be followed by the team

## 2.1 Hybrid (Electric & Engine) specification

- EV mode for the vehicle is must.
- The vehicle shall meet minimum 10 km of EV range.
- In the pure EV mode, transmission drive shall not go back to crankshaft.
- The chosen hybrid layout must be disclosed along with power train in a block diagram.  
Hybrid mode for the vehicle is must (Drive by Electric & Engine).
- Emergency switch is required to electrically disconnect the electric drive systems & switch off the engine. It should be easily accessible to rider.
- The students has to demonstrate that the demonstrative brakes are functional.

The students are allowed to make series or parallel hybrid system. Shall have a smoother mode change over system.

### 2.1.1 Engine specification

- Engine CC is recommended as 75-125cc, 4 stroke engine.
- Donor vehicle engine shall be modified or replaced . Refer Tab -1 for details

Other parameters shall be covered by the students. Bore, Stroke, Max torq @ RPM, Max power @ RPM, Best BSFC, Ignition system, cooling system, lubrication system, transmission system type shall be CVT or Geared & ratio, Idle rpm & emission.



## 2.1.2 Motor specification

- Motor capacity shall be within 0.5 to 5kW**

Other parameters shall be covered by the students. Motor type, Max torque @ RPM, Max power @ RPM, No load RPM, Protection system & diagnostic system, Environment & safety standards .

Motor shall be mounted either on rear wheel or on the vehicle. Avoid front wheel hub motor application for higher safety.

### 2.1.3 Battery, controller & charging specification

- Battery specification shall be less than 60 V @ 100 % charge state.
- The vehicle shall be designed to cover 10km range in EV mode with the max battery power consumption of 1 kWh with min 25km top speed.
- Battery, controller and charger together must have safety protection for short circuit, over voltage & over charge.
- Controller must have control to stop unintentional vehicle movement without user giving throttle input.
- Controller rating has to be designed in-accordance to chosen Motor specification
- Constant/Peak discharge current must be defined
- Wiring harness design calculations along with fuse & wire gauge selection must be submitted.
- Automotive standard battery charger shall be used after approval by SAE Bangalore.
- During virtual, the students shall explain in detail about the measures taken on battery safety.
- Charger socket shall be present in the vehicle

Students shall explore on other parameters like capacity, type, cell chemistry, cell make, size and weight, cooling system, protection for thermal, water and diagnostic system, controller software, to meet safety standards. Onboard battery charging system is not a mandate.



## 2.2 Vehicle specification

- Design packaging based on given “Donor vehicle” only. (Usage of other vehicles will be disqualified)
- The vehicle shall be designed for 2 person as per tabulated vehicle architecture Tab-1. Also refer the pictorial representation of vehicle system.
- General pair clearances shall be 10-15 mm between parts for higher safety
- Routings of parts like harness, Cables, Hoses shall be fitted durable & safe
- Overall dry vehicle weight shall be preferably less than 110kg (Vehicle weight above 125 kg will be dis-qualified). And vehicle shall clear static ground clearance of 155 mm. Altered Wheel size shall be 90 x 100 -10 or 90 x 90 -12 with recommended air pressure.
- Vehicle parameters like LBH, Wheel base, castor angle, trail & saddle height are not allowed for modification from Donor vehicle.
- Top speed of the vehicle shall be minimum of 60 kmph in any of the Hybrid mode.

Students shall explore on other parameters like ergonomics, anthropometrics, safety standards, safety sensors etc.

All other parts except the donor vehicle shall be procured by the team.

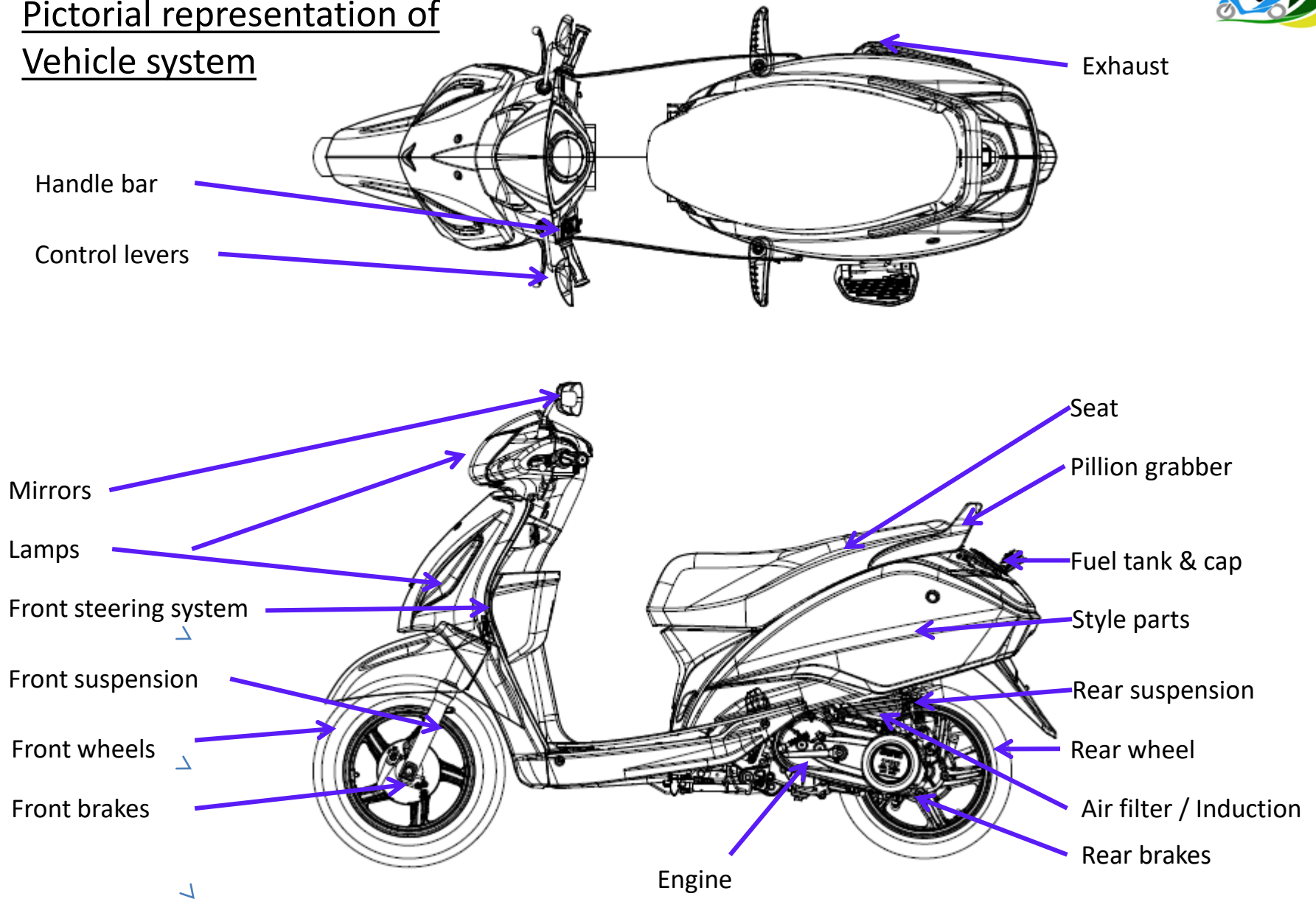


**Tab-1, Vehicle architecture**

Sub system	Standardize / Modify	Remarks
Front Wheels , front brake (130 drum), Rear brake (130 drum), Handle bar & control levers, Seat & style parts, Front suspension, steering system, Lamps, Rear view mirrors, Pillion grabber	<b>Use standard parts of Donor vehicle only. Do not modify these systems for better safety &amp; focus (For example : 1. Hub motor in front wheel is not acceptable )</b>	Shall be chosen from Donor vehicle only
Cylinder head & Valve train , Piston & Crankshaft, Crankcase & covers, Engine assy, control cables, Rear suspension, Motor, battery, cell, controller.	<b>Use standard automotive graded parts for higher safety</b>	Shall be chosen from Donor or other vehicles directly
Rear Wheels	<b>Use standard automotive parts (Rim profile, Tyre ) for better safety .</b> Rest part can modify	Shall be chosen/modified from Donor or other vehicles directly
Fuel system	<b>Use standard automotive tank for better safety.</b> Fuel hose lengths can be altered	Shall be chosen/altered from Donor or other vehicles directly
Frame	Can modify	Shall be modified from Donor vehicle only. Do FEA for safety
Induction system, Exhaust system, Engine Electrical, Clutch, Transmission, Vehicle electrical, lamps. Control switches, speedo , controller software	Can modify	Shall be modified from Donor or other vehicles.



# Pictorial representation of Vehicle system





## 2.3 Professional assistance

- After selection in Virtual, Donor vehicle-TVS Jupiter will be provided along with detailed briefing on the rule book.
- Each college once will be reviewed during the vehicle prototype stage by the SAE mentors.

The project team shall discuss with the SAE Bengaluru team in case of doubts as per section 1.6



## 2.4 Technical write-ups

### **Write-up in 2 pages contain**

- Idea / Abstract**
- Packaging details / arrangements (including Drawing / picture)**
- Schematic layout (including Drawing / picture)**
- Uniqueness of the idea**
- Estimated benefits (with quantification / units like % improvement, km/l increase)**
- Team members name & Dept, College name and address**

**Soft copy to be submitted along with registration form**



2.5 Virtual evaluation will be carried over based on following factors

- Adequacies of “must” in section 2.1 & 2.2 (50 marks)
- Summary (25 marks)
- Block diagrams (25 marks)
- Calculations on Electrical energy consumption, loss estimation & segregation, Transmission, cooling, fuel consumption in hybrid mode, selection of sub-systems, structural strengths, stiffness, Vehicle CG, etc. (100 marks)
- Drawings (50 marks)
- Application of problem solving & statistical tools (50 marks)
- System level weight & cost estimates (50 marks)
- Innovation on energy, safety etc. (50 marks)
- Gantt (25 marks)
- References (25 marks)

Note:

1. Kindly do scanning of said donor vehicle for conducting virtual structure engineering, packaging & simulation. (Use one of your family/friends vehicle for scanning).
2. You can also procure structures like frame, etc. to assist your virtual structure engineering & packaging.

## 3. Concept evaluation rules

- 3.1 Scoring
- 3.2 Static product evaluation
  - 3.2.1 Technical inspection
  - 3.2.2 Packaging,
  - 3.2.3 Fit & function
  - 3.2.4 Routings
  - 3.2.5 Innovation.
  - 3.2.6 Safety, Repair, Diagnostic tools.
- 3.3 Dynamic product evaluation
  - 3.3.1 Range
  - 3.3.2 Acceleration
  - 3.3.3 FE
  - 3.3.4 Grade-ability
  - 3.3.5 Noise
  - 3.3.6 Safety
- 3.4 Report & Presentation
  - 3.4.1 Presentation
  - 3.4.2 Engineering application
  - 3.4.3 Hand calculation & analysis
  - 3.4.4 Weight & Cost estimation
  - 3.4.5 Gantt
  - 3.4.6 DFM/DFA/DFX



### 3.1 Scoring

The scoring will be done based on the team's performance on Static, Dynamic & Report.

Static	- 200 points
Dynamic	- 400 points
Report	- 200 points
Total	- 800 points

### 3.2 Static product evaluation

3.2.1 Technical inspection (25 points) – The panel members will audit for the list of technical rules adherence in section 2. The panel members will audit for closeness of the Design report Vs. Manufactured Vehicle.

3.2.2 Packaging (25 points) – The packaging of hybrid components will be audited w.r.t their functional effectiveness. Packaging w.r.t DFA/DFS. Clearances shall be maintained as per section 2.2.

3.2.3 Fit & function (25 points) - Effectiveness of the mounting design of hybrid parts. Fit and finish of the overall arrangement. Also the vehicle will be audited for fuel and oil leak, before and after dynamic test. Touch and feel items like emergency switches, free plays are also inspected.

3.2.4 Routings (20 points) – All routings of wiring, fuel hoses etc will be audited for neatness and safety.

3.2.5 Innovation (25 points) – Innovations on new features, energy management, safety , light weight etc. will be considered for audits.

3.2.6 Safety, Repair, Diagnostic tools (80 points) – The panel will focus on safety w.r.t. said below 12 systems which covers about 60 points.

1. battery, 2. charger, 3. controller 4. frame, 5. rear wheel, 6. engine, 7. Exhaust system, 8. Engine Electrical, 9. Transmission, 10. Control switches, speedo 11. Fuel system & 12. Electrical routings in this section. The panel member will also rate the teams work on repair & diagnostics of the vehicle (This covers 20 points exclusively).





### 3.3 Dynamic product evaluation

- For all the dynamic events, second attempt is allowed based on team's request.
- Second only value will be considered for rating, if attempted.

3.3.1 Range (50 points) – The panel will look for the vehicle performance in Pure EV, Hybrid etc. (Flat terrain)

3.3.2 Acceleration (50 points) - The panel will look for the vehicle performance in a straight line on flat terrain for hybrid & pure electric mode.

3.3.3 FE (50 points) The panel will look for the vehicle performance in Pure electric & Hybrid mode.

3.3.4 Grade-ability(50 points) – Performance on grade-ability will be assessed. Performance in sol and duals.



3.3.5 Noise (50 points) - Overall vehicle noise will be accessed by panel members in idling & @ 40+/-5 kmph speed hybrid mode on stand conditions from 2 m distance from vehicle front wheel on a flat terrain.

3.3.6 Safety (150 points) – The panel members will check for the teams discipline towards the dynamic ride event. For example , this covers the adherence parts w.r.t. section 4 (21 rules) and a point penalty of fifty (50) points will be assessed for each violation.

**The team which got more than three penalties on safety will be dis-qualified for the top three award/reward position.**



### 3.4 Report & Presentation

3.4.1 Presentation (25 points) – The team’s contribution and communication skill will add value in this section. What they have made during the span of months? will be accessed

3.4.2 Engineering application (50 points) – Application of references, QC tools, DFMEA etc. will be accessed for rating. How the theories, learnings are applied shall be accessed here?

3.4.3 Hand calculation & analysis (50 points)– Hand calculations & verification by any software simulations etc. will be accessed for rating.

3.4.4 Weight & Cost estimation (25 points) – Efforts on light weighting & cost reduction will be accessed sub system wise.

3.4.5 Gantt (25 points) – Adherence to Gantt / Detail plan & application of schedule compression techniques will add points.

3.4.6 DFM/DFA/DFS. (25 points) – Panel members will check for application of different DFX tools applied to enhance project viability. For examples serviceability of spark plug etc.

## 4. Safety rules

- 4.1 Driver requirements
- 4.2 Safety equipment
- 4.3 Insurance
- 4.4 Driving rules
- 4.5 Others



#### 4.1 Riders requirements -

1. Riders shall possess valid driving license.
2. All riders of the event are required to attend the pre-event riders meeting(s). Pre-event rider meeting will cover the details about rider, Static pits, dynamic track, practice track etc.
3. The rider of an event will be disqualified if he/she does not attend the rider meeting or course walk for the event.
4. The weight of rider shall be minimum 50 kg without safety equipment.

#### 4.2 Safety equipment –

1. Driver's shall wear the safety equipment like helmet, jackets, gloves, etc. as recommended in pre-event riders meeting.
2. Everyone in a "dynamic" area (an area where bikes can be moving under their own power) must wear closed-toed shoes.

#### 4.3 Insurance-

1. Individual medical insurance coverage is required and is the sole responsibility of the participant/universities.
2. Participants without a valid Medical Insurance will not be allowed to participate in the Dynamic Events.



#### 4.4 Driving rules-

1. Panel members must conduct all fueling and refueling.
2. The vehicles will be allowed to charge completely prior to the start of the dynamic event.
3. Driving off-site is absolutely prohibited.
4. Rider has to adhere to all general road rules applicable for riding in the dynamic event.
5. Lane disciplines to be followed strictly
6. Time disciplines are to be adhered during the dynamic event in track.
7. Never stop on a freeway except for an emergency. If you must stop, turn on the indicators, slow down gradually and pull all the way off the pavement as soon as safely possible.



## 4.5 Others

1. Smoking is prohibited in all competition areas.
2. A practice track for testing and tuning the vehicles may be available at the discretion of the organizers. The practice area will be controlled and may only be used during the scheduled practice times.
3. Alcohol, illegal drugs, weapons or other illegal material are prohibited on the event site during the competition. This rule will be in effect during the entire competition.
4. Argument with, or disobedience to, any official is strictly prohibited
5. Each team shall have 2-3 nominated riders who has attended pre-rider meet.
6. Only 3 members, including riders, will be allowed from a team into dynamic area.



**Thanks**