ECO GREEN VEHICLE CHALLENGE 2017

RULE BOOK

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1. Introduction

Indian Automobile industry is one of the most promising and booming sector but at the juncture with the rising concerns regarding climate and the pollution levels, "Going Green" is the future of this industry. Eco Green Vehicle Challenge is propelled by engineering students and for the students. This competition is concerned with design and development of human powered vehicles which are ergonomically designed to have ease during maneuverability. It provides an opportunity for engineering students to demonstrate application of sound engineering principles towards the development of fast, efficient, sustainable and economical human-powered vehicles. Students have to tackle real world engineering problems, work in multidisciplinary teams, practice design for manufacturability and manage a full product development cycle.

Eco-green vehicle challenge is national level design competition for degree and diploma engineering students. In which, they have to design and manufacture the vehicle generally propelled only by human energy. This competition is concerned with design and development of human powered tri-cycle which are ergonomically designed with maneuverability. Provide an opportunity for engineering students to demonstrate application of sound engineering principles towards the development of fast, efficient, sustainable, and practical human-powered vehicles. Students have to tackle real world engineering problems, work in multidisciplinary teams, practice design for manufacturability and manage a full product development cycle of life.

The Schedule of all events will be made available on the EGVC website.www.egvc.in

2. Registration rules

PARTICIPANTS ELIGIBILITY & ADVISOR ROLE

- Eligibility is limited to undergraduate &diploma engineering students to ensure that this is an engineering competition rather than a race. Team members who are appearing the last semester prior to the competition remain eligible to participate.
- Student Registration: - Number of participants in team is 10 Minimum and 15 Maximum.
- Registration Fees: - Team have to pay ₹. 10,000 as registration charges. (Non-refundable amount).
- If the team has more than 10 members than team has to pay extra ₹ 1000 for each extra member along with the registration fees.

STUDENT STATUS

Team members must be enrolled as diploma/degree seeking undergraduate students in a college or university.

FACULTY ADVISOR

Each team is supposed to have a Faculty Advisor appointed by the college/university. The Faculty Advisor is required to accompany the team to the competition and will be considered by competition officials to be the official college/university representative.

ADVISOR RESPONSIBILITY

Faculty Advisors may advise their teams on general engineering and engineering project management theory and act as guide to them for this project. The Faculty advisors are allowed to attend static & dynamic events along with their team at event site but will not be allowed to provide answers or justifications for any question on behalf of team.

LIMITATION

Faculty Advisors should not design any part of the vehicle nor directly participate in the development of documentation or presentation. Additionally, Faculty Advisors may not fabricate nor assemble any components, nor assist directly in the preparation, maintenance, testing or operation of the vehicle. In Brief – Faculty Advisors may not design, build or repair any part of the vehicle. But they can support their team for proper upkeep of vehicle in case of any breakdown.

REGISTRATION PROCESS

- Teams are required to register online at our website www.egvc.in
- For any registration queries contact us: - registration@egvc.in

- All the process regarding registration will be updated on website.

- Registration fees for the event is ₹ 10,000/- Per team.
- Multiple teams from any college/university may register for the event. Multiple teams cannot have any team member of faculty advisor in common.
- All the updates are available on our website and it is responsibility of team to check for update.
- There will be no on-site registration and late registration process if you fail to register your team.
- **Registration fees is to be paid through a cheque in favor of "SAE INDIA LDCE COLLEGIATE CLUB".**

REQUIRED DOCUMENTS

- **NOC OF INSTITUTE**
- **UNDERTAKING**
- **COLLEGE IDENTITY**

Note: - Document format will be sent you via mail when you register your team.

3. Vehicle Specifications

A. **Vehicle type: Vehicle must be three wheeler and human powered ONLY. More than two wheels must not be aligned in longitudinal direction. Vehicle must have two Riders. Both Riders have to drive the vehicle simultaneously during dynamic events.**

B. **Vehicle dimensions:** - Width- **60 inches** Maximum. There is no bar for length, height and ground clearance.

C. **Vehicle frame** – There is no boundary for selection of material. Minimum thickness of the (tube/pipe) shall be 2mm. material must meet engineering standards with appropriate certification report. Frame of the vehicle must be articulated with good **welding process**. In case of rollover, Riders must be safe by providing proper design of frame.

D. **Power Train**: Vehicle can be equipped with any kind of power transmission system including shafts, chain sprockets, belts, pulleys, gear trains, clutches, coupling etc.

E. **Brakes** – Teams can use hydraulic and mechanical brakes. All wheels must be equipped with brakes. However, mounting of brakes on drive axle is also allowed in which wheels on that axle will not require brakes.

F. **Steering**- Teams can use any steering geometry and mechanism. However, teams have to justify for various steering geometry angles whenever needed. Teams have to ensure its safety against sharp and cutting edge. Turning radius of vehicle must not exceed 6 m.

G. **Suspension**: It is not mandatory to use suspension system. However, vehicle provided with suspension will have advantage in various dynamic events for which teams have to justify the suspension geometry whenever needed.

H. **Wheels & Tires**: Teams are allowed to use any kind of wheels and tires keeping in mind the dynamic tests. Spare wheels are not allowed to be assembled on vehicle. However teams can keep at least one spare wheel with them and in case of any damage, teams can replace it only in pit area.

I. **Fasteners**: - Teams are allowed to use automobile fasteners according to their requirements. However Lock nuts **must** be used for critical assemblies.

J. **Safety Guard:** All moving parts such as chains, idlers, gears etc must be provided with **metal or plastic** guards to protect the Rider from injury.

K. **Seat & Seat belt:** Vehicle must be provided with bucket seat. Bench seats are not allowed. Riders must be secured with seat belt. Teams can use any kind of seat belt. Riders are not allowed to drive the vehicle in standing position. Riders must remain held in seat during dynamic condition.

L. **Electrical:** Vehicle must be provided with one headlamp, four side signals and one tail lamp. Headlamp should provide proper illumination during night events. Side signals must be in working condition. Tail lamp must also indicate brake light whenever brakes are applied. All the electrical must work with the help of dynamo. Wiring must be concealed properly and should not remain loose or projected.

M. **Aerodynamic Aids:** Vehicle provided with aerodynamic aids will be given extra points. Team has to justify this design and usefulness during design evaluation. However, it is not mandatory to use aerodynamic aids. Teams with aerodynamic aids, will have to remove it during endurance test.

N. **Team Number**: - Vehicle must contain at least two sets of "team number" rigidly screwed or fixed or sticked at front and side of the vehicle. The numbers must be clearly visible from all sides. The size of the digit should be 8cm wide and 15cm in height. The numbers should be approximately 1inch thick.

O. **College Name**: - The name must be on the vehicle and should be visible properly.

P. **Prohibited Items**: -

- Vehicle must not have any sharp edges which can hurt the Riders and others.
- The use of horns and bells is prohibited.
- Vehicle body should not have any reflective surfaces or reflective paint. Use of ORVM is allowed but they should be accommodated within the maximum vehicle dimensions.
- Any type of hazardous or explosive materials must not be used in the vehicle.
- **Other than this, the teams cannot carry any type of energy drink, liquors, alcohols or energy boosting drugs at the event site. If any team found violating this rule will be disqualified with immediate effect without certificates and fees amount.**

Q. **Utility Requirement:** Vehicles participating in the main event should be capable of carrying extra load of 20 kg. This extra 20 kgs will be added to vehicle in various dynamic events which will be declared on field. Vehicles can be equipped with a utility box of dimension 10 inches x 6 inches x 14 inches (LxBxH). Utility box must be covered from all side and operative from top and should be strong enough to hold the luggage firmly and must be mounted firmly on vehicle frame. Hanged mountings are not allowed.

4. Safety Rules

RIDER SAFTEY AND CLOTHING

- Any rider/team found unsafe in the opinion of Technical Inspectors, would not be allowed to take part in dynamic events until approved by respective Technical Inspectors.
- Clothing intended for cycling use or to decrease wind resistance is allowed (skin suits).
- Riders are advised NOT to wear loose clothing during the dynamic events.
- All Riders MUST wear cycling helmet, cycling jersey, shorts, shin, elbow and knee guards and running shoes.
- The riders must be secured to their vehicles by seat belts, subject to requirement and decision of inspecting authority, for rider safety.
- The vehicle may be equipped with a cyclist' water bottle for Riders. Vehicle should be free from any kind of sharp edges and protrusions that can harm the rider or crew members.
- Riders should have his eyes protected while driving either by safety glasses.
- Riders are required to wear shoes and gloves while driving.
- Use of knee and elbow guards and shin guards is compulsory.
- Both Riders must wear the well fitted cyclist helmets with an integrated (one composite shell) belt to tighten the helmet.

RIDER RULES

- A rider must have a medical insurance.
- A rider cannot push any other person or vehicles during the event.
- Riders can exchange their positions in specified zones only.
- The Vehicle may not receive pacing of any form from a team member or another person.
- A rider may not ride a vehicle with a flat tire or other mechanical problems that the Event Official deems unsafe.
- The rider must stop or proceed on foot thereon with the vehicle until it is repaired.
- A rider may proceed on foot along the track as long as the vehicle is present on track (carried, dragged, or pushed).
- A rider separated from his vehicle may not proceed along the race route, but may travel backward by any means along the route.
- Riders must not block or impede the progress of other vehicles.
- During all the tests same Riders shall drive the vehicle. Only in case of some injury extra Riders can replace the injured Riders with prior acceptance from Event Officials, but in no case both primary Riders will be changed simultaneously.

- **All repairs MUST be carried out off the track. Riders MUST comply with the instructions of the track volunteers & announcements.**

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5. Static and Dynamic Events

To ensure the safety of all the vehicles participating in the event, a technical inspection will be done. Vehicle must clear the following tests in order to proceed for the dynamic events. Any team who fails to clear any test during the technical inspection round will be given three chances to rectify various defects. Teams who fails to clear the technical inspection even after three chances will not be allowed to participate in the dynamic events.

RULEBOOK/SAFETY CHECK:

- Safety test will be done to ensure the safety of the vehicle as well as the Rider. Vehicle will be tested according to the rulebook as well as safety compliances. Teams must ensure that any part of the vehicle do not violate the rulebook.
- There will be maximum 3 attempts to appear for technical inspection. During this check, Technical Inspectors may ask to make any changes/modification in the vehicle that is not according to the rulebook or seems challenging the Riders' & bystanders' safety.
- Final decision in this regards lies with the Technical Committee Head.

DESIGN EVALUATION:

- **AIM:** The aim of the Design Event is to provide an opportunity for the engineering students to develop an innovative human powered vehicle design, document it and present it to a panel of judges who will evaluate the design. Design assessment consists of two events: As-Built Vehicle Report and Design Evaluation.
- At the time of design evaluation, vehicle and team must be present before the judging panel. Teams will be asked to explain their design methodology, design of the subsystems, material and part selection, ergonomics, safety, calculations and analysis carried out etc. Marks will be given according to the justification of team over such questions asked by the judging panel.

COST EVALUATION AND MARKETING PRESENTATION:

- **AIM:** The aim of the Cost Event is to provide an opportunity for the engineering students to carry out the cost assessment of their vehicle, document it and present it to a panel of judges who will evaluate the cost.
- **COST REPORT:** Cost Report is a document which provides the method of calculating the vehicle cost. The format and guidelines of cost report will be published on the official website. Teams have to follow the specified formats only. The basic concept behind the cost report is to make students understand that cost is an important parameter in the design and manufacturing considerations. On the basis of this document teams may practice to optimize their design, manufacturing and part selection processes.

- Teams must understand that score of Cost Evaluation will not be given on the basis of only minimum cost projected in the cost report; but is the overall score depending upon the cost projected, penalties applied and the justifications given by teams against the questions of judging panel.
- Cost evaluations do not have any concern with the performance of team/vehicle in other static and dynamic events in the competition.

WIDTH CHECK:

- **AIM:** The maximum dimension of any vehicle must not exceed as specified in the rulebook. A width gauge will be used to check the dimension of the vehicle.

SKID PAD TEST:

- **AIM:** Figure of double "O" test will be done to ensure the driving capabilities of Rider on a maneuvered path and also the dynamic stability of vehicle.

BREMSE TEST:

- **AIM:** Bremse Test will be performed to ensure the maximum braking performance of vehicle in case of any emergency during the dynamic events.
- All three wheels must be locked at a time.
- It will be conducted on Brake patch only after clearing the above 3 tests. Brake patch will contain dry, wet and muddy surfaces.

STICKERS:

- After successful completion of first 3 tests, 'TECHNICAL INSPECTION OK' sticker will be issued by the Head of Technical Committee.
- After successful completion of brake test, 'BRAKE TEST OK' sticker will be issued by Brake Test judges.
- Vehicle must carry these two stickers during the whole event. It will be allowed to participate in any dynamic event only if both the stickers are present on the vehicle.
- If stickers on the vehicle are lost or tampered, EGVC Organizing Committee or EGVC Technical Committee will not be responsible and stickers will not be issued again.

CHANGES IN VEHICLE AFTER TECHNICAL INSPECTION:

- Any types of changes are not allowed in vehicle after 'TECHNICAL INSPECTION OK' sticker is issued. Vehicle must participate in the event in As-OK condition. No part of vehicle can be changed, modified, removed or replaced thereafter.
- Any type of repairing/maintenance works is permitted only after the permission of EGVC Technical Committee.
- EGVC Organizing Committee or EGVC technical Committee reserves the rights to remove the stickers at any stage of event in such cases or the vehicle may be barred from event for certain duration.

ACCLIVITY TEST:

- **AIM:** The aim of the acclivity test is to check the practical ability of vehicle to climb the slope or hill.
- Vehicle along with two riders, have to undergo the acclivity test.
- Vehicles will be loaded with extra 20 kgs.
- Vehicle will be climbing a slope of approx. 10° from halt condition. Riders will not be allowed to push or pull the vehicle unless they quit the test in-between.

DECLIVITY TEST:

- **AIM:** The aim of the declivity test is to check the practical ability and dynamic stability of vehicle during downhill condition.
- Vehicle along with two riders, have to undergo the declivity test.
- Vehicles will be loaded with extra 20 kgs.
- Vehicle will dive down the slope of approx. 10° from halt condition. Riders will not be allowed to brake the vehicle unless they quit the test in-between. The farther distance covered, more marks will be allotted.

MANEUVER TEST:

- **AIM:** The goal of the Utility Event is to provide engineering students an opportunity to demonstrate the utility capability of their vehicles in a non-race condition.
- The course will be a maneuvered path full of turns, bends and obstacles. Track will be having restricted width according to the specified maximum vehicle dimensions. Penalty cones will be placed on the track. Team will have to line-up at start line. There will be no separate run-up/warm-up zone.
- The Riders must ride the vehicle wearing all Rider safety equipment.
- Vehicle will be loaded with the 20 kg in utility box during the event.
- Vehicle will be allowed to run on the track only when signaled by the track judges.
- Team will be asked to start from standstill and to cover the complete track in the minimum possible time. Time taken to cover the complete track will be noted down.
- Maximum 2 attempts are permitted per team. The minimum time out of two attempts will be considered for evaluation.
- In case of touching the penalty cones, touching ground by foot, lifting of tires from ground or upon violating the track lines; penalty will be applied in terms of adding 2 seconds in total time for each violation.
- Total time of attempt = Time taken to finish the lap + 2 seconds x No. of Penalties
- In case of vehicle breakdown or rollover on track, departure from track before finish line; that attempt will be considered as void. No other chance will be given in lieu of.

KNOCKOUT SPRINT:

- **AIM:** The goal of the knockout sprint is to check and measure maximum acceleration of vehicle. **Positioning in endurance test will be done on the basis of best acceleration time reflected in knockout sprint.**
- The competition will include a sprint format.
- The Sprint Event is an individual, timed event with a flying start to achieve top acceleration on a track.
- The track will consist of a level paved surface of suitable width and having small obstacles, bumps, cracks and potholes.
- Any two teams will be selected randomly for sprint. Both have to start the race from start line in standstill condition.
- The team who reaches the finish line first will be winner. The looser team will be knocked out from this test.
- The winning team will be clustered. Again a random selection will be done for further proceeding. By following above method, finally one team will be declared as knockout winner.
- Time measured by and with instruments available with EGVC team will be final. Dispute regarding time will be considered as penalty.

ENDURANCE EVENT

- **AIM:** To provide teams the ability to demonstrate the functionality, agility, and durability of their vehicles.
- Warm-up lap will be held before endurance test. This lap will not be taken into account. It is helpful to understand the track.
- Each vehicles eligible for the endurance test will have to run for 2 hrs constantly. However, depending upon numbers of eligible teams and conditions, time can be changed by EGVC team with prior intimation.
- Team completing maximum laps during the definite time period will be declared as winner of endurance test.
- No team members are allowed on the track during endurance test. On violating the same, 2 laps will be deducted as penalty.
- Rider changeover are allowed for 2 times. Both riders cannot be changed at one time. Vehicle must be pulled out of the track through bypass lane only. Driver change is allowed only in pit area.

- Any four predefined team member will be allowed to run towards the vehicle in case of breakdown after proper announcement from EGVC team.
- Riders' meeting will be held prior to the endurance test. It is mandatory for riders to attend this meeting. Necessary and important instructions will be given in this meeting.

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6. General Rules and Regulations

- **DRIVER'S TRAINNING:** The trainings will clarify operating procedures and signals and it will identify tracks features, hazards, landmarks and penalties which can be applied on team in case of not being driven safely. If drivers of any team are not present during the drivers training session, the concerned team would not be allowed to participate in dynamic events. In unavoidable absence of drivers, team may be represented by other team members.
- **VEHICLE IDENTIFICATION:** During the events- Vehicle must carry the Vehicle Numbers and Event Logos. Vehicle Identification items must be clearly visible from both sides. In case of obscured, tampered, damaged or lost vehicle identification marks, team will be responsible of any loss in lap counting or scoring.
- **EGVC LOGO:** An EGVC logo must be displayed on both sides of the vehicle. This logo will be provided by event committee.
- **RULES CLARIFICATION:** In case of any doubt in rules, teams are advised to clarify it from EGVC Technical Committee. All communication in this regard must be made with e-mail IDs provided on the official website of EGVC (http://www.egvc.in). Teams must keep the copy of such communications for future reference. Communication with other e-mail IDs or individual event organizers will not be considered as official.
- **PROTEST:** Participating teams are assumed to have full faith in the Rulebook and Event Procedures and hence any team may not protest against particular event procedures or the rulebook interpretation. In case of any objection/misunderstanding with the judgment taken during the event or any issue with the competitors, teams may discuss with the event organizers. But all such complaints will be taken in account for official consideration and further action only when submitted in written. Written complaints should be addressed to EGVC Organizing Committee. Protest must be filed within 2 hours of the completion of related event. Decision of event organizing committee will be considered as final. Team must ensure that if complaint is found to be false or unjustified; 50 marks will be deducted as penalty from total score of the complaining team.
- **WORKSHOP FACILITIES AT EVENT SITE:** Each team will be allotted a pit in the Pit Area to park their vehicle and to keep the tools and spare parts. General workshop facilities like welding machines, cutting tools etc may be provided at event site, but teams are advised to bring their own necessary tools to avoid any difficulties. Power supply & adequate illumination will be provided in pit area.
- **VEHICLE PRESENTAION AT EVENT SITE:** Vehicle must enter to event site before the start of technical inspection or as specified by the organizing committee before the main event. Vehicle must be parked in the assigned pit after the finish of events each day. Vehicle is not

allowed to go outside the event site in any case before completion of the complete event except in case of voluntarily withdrawing participation form event. If vehicle found outside the event premises, it will be barred from participation. Teams must carry all necessary arrangements to event site with them.

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7. Event Schedule

- **Team has to first verify their team at registration desk. Kit will be provided and each team member have to present his/her college ID card.**
- **Event would follow the tentative schedule as given below:**
- **Day 1 (6th April, 2017)**
  - Inaugural Ceremony
  - Design evaluation
  - Cost evaluation
  - Marketing presentation
  - Rulebook/ safety check
  - Width check
  - Skid pad Test
  - Bremse Test
- **Day 2 (7th April, 2017)**
  - Acclivity test
  - Declivity test
  - Maneuver test
- **Day 3 (8th April, 2017)**
  - Knockout Sprint
  - Endurance Race
  - Valedictory Ceremony

For further technical support please mail us on: technical@egvc.in

Further documentation will be uploaded on website

For more updates keep visiting our website: www.egvc.in

THANK YOU
AND
WISH YOU
ALL THE BEST