Go Kart Design Challenge 2015

"The Never Ending Journey"

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Event Calendar (Tentative)

S. No.	Activity (Reference)	Date*
1.	Registration (www.isnee.in/gkdcregistration.aspx)	Jan 26th – 28th Feb, 2015
2.	Last Date of Registration Fee Payment (Section – B, Rule No-4)	March 1st, 2015
3.	Registration Confirmation (Team Account on Website)	March 5th, 2015
4.	GKDC 2015 Workshop (Compulsory) (Team Account on Website)	March 7th -8th, 2015 March 14th-15th, 2015
5.	Last Date of Sending the List of Team Representativesfor PFR (Team Account on Website)	June 20th, 2015
6	First option of Editing the Team (Team Account on Website)	June 20th, 2015
7.	Pre-Final Round (Acropolis Technical Campus, Indore)	July 4th-5th, 2015
8.	Result of Pre-Final Round (www.isnee.in)	July 12th, 2015
9.	GKDC 2015 Workshop (Optional) (Team Account on Website)	July 25th-26th, 2015
10.	Engine Registration (Section F)	Aug 16th, 2015
11.	Final Design Report Submission (Team Account on Website	Sep 15th , 2015
12.	College Level Technical Inspection (Team Account on Website)	Sep 20th- 30th, 2015
13.	Last option of Editing the Team (Team Account on Website)	Sep 25th, 2015

Section A

Organization and the Event

About "Indian Society of New Era Engineers"-

"Indian Society of New Era Engineers" is an organization for students focusing on their technical and managerial development. It gives the opportunity to the undergraduate and diploma engineers to research and develop innovative projects. We inspire them to imagine because imagination is more important than knowledge. Knowledge is limited, imagination encircles the world. Events organized by ISNEE give students a chance to form teams and to work for a common goal with a team spirit and to demonstrate and prove both their creativity and their engineering skills in comparison to the teams from other Universities/Colleges across the country. Future of a country is highly dependent on the students, so nurturing them becomes very important. Any student can be theoretically strong but practicality is very much different from the theoretical world. Commitment unlocks the doors of imagination, allows vision, and gives us the right stuff to turn our dreams into reality.

We are making a bridge which will connect the imaginations of students to real engineering. When a team works for any project, they learn to research, develop and manage various things related to the project which prepares them to join the industry as a complete professional and having a good knowledge of engineering and management and that is what our aim is.

About "Go Kart Design Challenge"-

Go Kart Design Challenge is a design challenge initiated by **Indian Society of New Era Engineers** to bring and enhance good engineering approach and practice in graduate and diploma students. The objective of the competition is to design and fabricate a Go-Kart. The challenge takes place in two stages; 1st is Pre-Final Round and 2nd is Final Round. This competition will consist of several tests and tasks to be performed by the vehicle and successfully clearing each test and task will decide their existence in the competition. All the participating teams have all creativity and innovation flexibility with few restrictions mentioned in this rule book. This design challenge gives teams the chance to demonstrate and prove both their creativity and their engineering skills in comparison to the teams from other universities across the country. **The vehicle and associated documentation must be researched, designed and fabricated by the team members without direct /indirect involvement of professional engineers, faculty or professionals inracing** .Proof of manufacturing (photograph/video) can be asked to present at any time during the event. Vehicles, which have been professionally fabricated, may be penalized or even disqualified from the competition. The decision of the organizing committee in this regard will be final.

Section B

Registration Requirement

1. **Team Requirement-** The team registering for ***Go Kart Design Challenge 2015*** must have a Team Name, Team Logo, Team Captain and the Faculty Facilitator. Maximum three teams can register from one College and in case of multiple registrations from a single College, the Team Name, Team Logo, Team Captain and the Faculty Facilitator must be different. There cannot be more than 25 members in a team under any circumstances.

1.1. **Team Name and Team Logo**- Every team must have unique team name and an impressive team logo.

1.2. **Discipline-** All the team members must be from engineering diploma/degree. Students passing out in year 2015 are also allowed to participate.

1.3. **Driver's Age-** Every driver must be 18 years or above on January25th, 2015.

1.4. **Driver's Licence-** The driver of the team is required to have a valid driver's licence (Four Wheeler) and the licence may be verified at any time during the dynamic event.

1.5. **Medical Insurance-** Each team must be having two drivers and both must possess a valid medical insurance which must be presented on the event site when asked by the officials.

1.6. **Faculty Advisor-** Every team is required to have a faculty advisor from respective college/university. Presence of Faculty Advisor in Final Round is not mandatory.

2. **Team Registration-** Online registration will open 24x7 on our website www.gkdc.inandwww.isnee.infrom January 26th, 2015 to February 28th, 2015. Once the team has been registered online, the payment must be done within 10 working days from the date of registration [In case of payment failure within the due dates, online registration will be cancelled]. ISNEE will provide accounts to all the teams on its website and all the relevant information/announcements will be displayed in the respective accounts. In the accounts teams will be able to download and upload payment proof, reports etc.

3. **Registration Agreement-**By registering in GKDC 2015 The Team Captain/Team Member/Faculty Advisor/College Management must agree with the rules and regulations of ISNEE. They understand that all the information provided in the registration documents and online registration forms are correct to the best of their knowledge. Also, they accept that team would undertake all the activities without the help of a professional directly or indirectly. In case of violation of rules and regulations specified in this Rule Book, the team is liable for disciplinary actions as per the decision of the ISNEE Management. The team is also liable for any loss of documentation/communication on part of discrepancy in the information as provided registration.

4. **Registration Fee-** Team registration fees of Rs. 15484/- (inclusive of all taxes) per team.

5. **Mode of Payment-** The registration money can be paid through the following modes :

5.1. Money transfer through bank

5.2. Money transfer through ATM

5.3. Money transfer through Online Banking

5.4. DD in favour of Indian Society of New Era Engineers payable at Punjab National Bank- Basta

Note:No other than above mentioned payment modes will be accepted

Address to send the DD –

Indian Society of New Era Engineers
S 215 – Krishna Apra Royal Plaza
Aplha 1, Greater Noida - 201306

6. Official Announcements

All the official announcements and the information regarding the competition will be displayed on the website of **Indian Society of New Era Engineers** which is www.isnee.in and www.gkdc.in . On completion of registration, important information will be communicated via emails. The rules will be same throughout the event. However, amendments (if any) will immediately be made known to all the participating teams.

Section C

Judgment Categories

Judgment Categories- The participating teams will be judged in two rounds. The first one is **PFR (Pre Final Round)** and the other is **FR (Final Round)**. PFR is the stage in which the documents like Vehicle Design, Design Report, FMEA, DVP and the Cost Report are to be evaluated by the judges followed by a presentation and interview of the team representatives.The decision of the judges will be final.

PFR- In PFR the following documents will be evaluated by the judges and the points will be awarded accordingly. PFR consists of 250 points distributed as follows:

<table>
<tr><th>S. No.</th><th colspan="3">Category</th><th>Maximum Points</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">Design Report</td><td>Sub Category</td><td>Maximum Points</td><td rowspan="6">110</td></tr>
<tr><td>IEEE Format</td><td>10</td></tr>
<tr><td>Analysis</td><td>35</td></tr>
<tr><td>Calculations</td><td>30</td></tr>
<tr><td>Vehicle Drawing and Dimensioning</td><td>10</td></tr>
<tr><td>Useful Content</td><td>20</td></tr>
<tr><td>References</td><td>5</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Innovation</td><td>Concept</td><td>-</td><td rowspan="4">Points will be awarded in Final Round</td></tr>
<tr><td>Effects on Environment</td><td>-</td></tr>
<tr><td>Feasibility</td><td>-</td></tr>
<tr><td>Cost VS Utility</td><td>-</td></tr>
<tr><td>3</td><td colspan="3">Cost Report</td><td>50</td></tr>
<tr><td>4</td><td colspan="3">Business Plan</td><td>Points will be awarded in Final Round</td></tr>
<tr><td>5</td><td colspan="3">DVP</td><td>30</td></tr>
<tr><td>6</td><td colspan="3">Gantt Chart</td><td>30</td></tr>
<tr><td>7</td><td colspan="3">FMEA</td><td>30</td></tr>
<tr><td colspan="3">Total</td><td>250</td></tr>
</table>

In **FR (Final Round)** the selected teams will be coming on the event site with the vehicle fabricated by them and will have to undergo a set of tests and will be awarded the points accordingly. **"Technical Inspection"** and **"Brake Test"** are two tests for which no team will get points. But passing these both tests is essential; no teams will be allowed to perform further in any of the dynamic events without passing in these tests.

S. No.	Category	Maximum Points
1	DisAsm	60
2	Technical Inspection	NA
3	Brake Test	NA
4	Best Design Evaluation	NA
5	Manufacturing Level	50
6	Business Plan	80
7	Acceleration	60
8	Skid Pad	70
9	Autocross	80
10	Fuel Economy and Endurance	350
Total		750

Section D
Prize Money

The competition will have following categories and the prize money worth:

S. No.	Category	Prize Money (INR)
1	Champion	1,00,000/-
2	Runner- Up	40000/-
3	Best Design	Winner – 15,000/- Runner Up – 10,000/
4	Skid-Pad	Winner – 15,000/- Runner Up – 10,000/
5	Autocross	Winner – 15,000/- Runner Up – 10,000/
6	Endurance and Fuel Economy	15000/-
7	Innovation	Winner – 15,000/- Runner Up – 10,000/
8	CAE Award	10000/-
9	Best Aesthetics	10000/-
10	Best Business Plan	10000/-
Total		2,85,000/-

Section- E
Event Requirements

1. **Driver's Requirements-**

1.1. **Age-** Every team is supposed to have two drivers and both the drivers must be at least 18 years of age.

1.2. **Driver's Licence-** Each driver must have a valid Driver's Licence (Four Wheeler) issued by the Government of India (Lerner's licence not allowed). Both drivers must provide a licence copy when insisted by Technical Committee.

1.3. **Medical Insurance-** Each team must be having two drivers and both must possess a valid medical insurance which must be presented on the event site when asked by the officers.

1.4. **Drivers Safety Gear-** The following are the minimum requirements and restrictions that will be enforced through technical inspection, at any stage of competition. Noncompliance if any observed by the inspection/organizing/judging committee members must be corrected and no vehicles without passing the technical inspection would be allowed to participate further in the event.All the parts of Driver's Safety Gear must meet the required rating (specified). No driver would be allowed to drive the vehicle without the complete driver's safety gear in any of the dynamic event. The complete driver's gear of GKDC will consist of the following items:

1.4.1. **Driver's Suit**- A fire resistant one piece suit, made from a minimum of 1 layer that covers the body from the neck down to the ankles and the wrists. The suit must be certified to either one of the following standards and be labelled as such:

1.4.1.1. SFI 3-2A/5 (or higher)

1.4.1.2. FIA Standard 1986

1.4.2. **Underclothing-** It is strongly recommended that all drivers wear fire resistant underclothing (long pants and long sleeve t-shirt) under their approved driving suit. This fire resistant underclothing should be made from an acceptable fire resistant material and should cover the driver's body completely from neck down to ankles and also the wrists.
Note: If you do not wear fire resistant underclothing, it is strongly recommended that you wear cotton underclothing (t-shirt and long underpants) under your approved driving suit.

1.4.3. **Helmet-** A well-fitting closed face helmet that meets one of the following certifications and is labelled as such
- Snell K2000, K2005, K2010, M2000, M2005, M2010, SA2000, SA2005, SA2010 or equivalent
- SFI 31.2A, SFI 31.1/2005
- FIA 8860-2004, FIA 8860-2010

Open faced helmets are not allowed. All helmets to be used in the competition must be presented during Technical Inspection where approved helmets will be stickered. The organizer reserves the right to impound all non-approved helmets until the end of the competition.

1.4.4. **Balaclava-** A balaclava which covers the driver's head, hair and neck, made from an acceptable fire resistant material as or a full helmet skirt of acceptable fire resistant material. The balaclava requirement applies to drivers of either gender, with any hair length.

1.4.5. **Neck Support-** The neck support must be a full circle (360º) and SFI rated. Horseshoe collars are not allowed. Simpson, RCI, GForce, Deist or Leaf Racing Products supply neck collars that meet this requirement.

1.4.6. Gloves- Leather gloves with extra foam are acceptable.

1.4.7. Shoes- Fire resistant shoes made from acceptable fire resistant material shoes must be certified to the standard and labelled as such:

1.4.7.1. SFI 3.3

1.4.7.2. FIA 8856-2000

1.4.7.3. OMP

Note: Sport shoes/Canvas shoes/Leather shoes/Industrial safety shoes are not allowed at any point of the event.

1.4.8. Shocks- Fire resistant socks made from acceptable fire resistant material, which covers the bare skin between the driver's suit and the boots or shoes.

2. Vehicle Requirements

2.1. Chassis Design Requirements- The vehicle must have four (4) wheels that cannot be in a straight line in longitudinal direction. The vehicle must have a wheelbase of at least 1066.8 mm (42 inches). The wheelbase is measured from the centre of contact on ground of the front to rear tires with the wheels pointed straight ahead. The mountings and designing of chassis should be such that there should be minimum 3 inches clearance between the driver and any component of the vehicle in static and dynamic condition – hands, torso, thighs etc. Body parts making contact with the parts at normal seating position are excluded from the rule.

2.2. Chassis Material- The tube/rectangular pipe used in the fabrication of the chassis or the other frames/supports must be seamless. Minimum cross section must be 1 inch (25.4mm), for pipe it will be OD and for rectangular section or square section it will be its minimum height. Material certification is essentially required to be produced during the technical inspection. Material should be certified from any of the material testing laboratories for its chemical and mechanical properties, the same report should be presented at the time of inspection.

2.3. Wheelbase and Track Width- The wheelbase of the vehicle must be between 42-55 inches and the smaller track width (front or rear) must be no less than 80% of the wheelbase of the vehicle. Refer to the figure-1

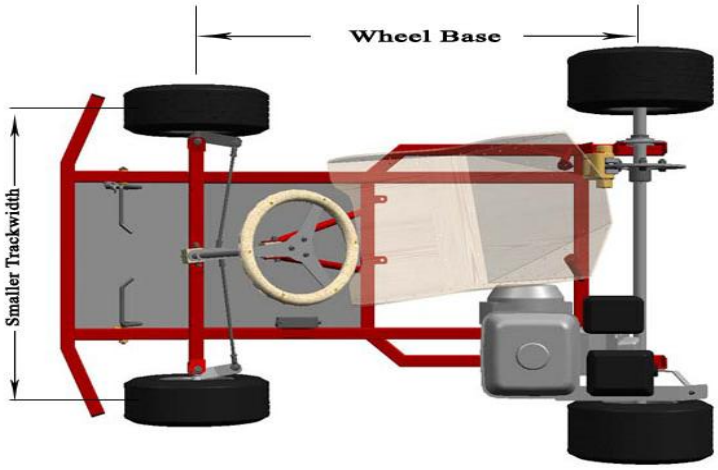


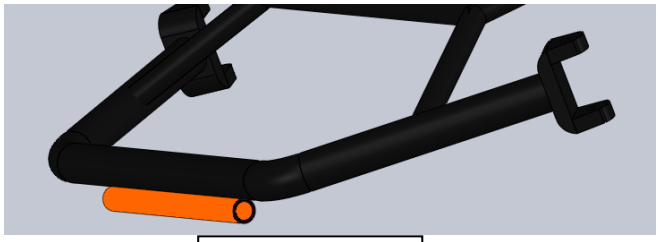
Figure-1

2.4. Ground Clearance- With the driver aboard there must be a minimum of 25.4 mm (1 in) of static ground clearance measured from thelowest point (except tyres) of the vehicle, under the complete vehicle. No compensation (like chain

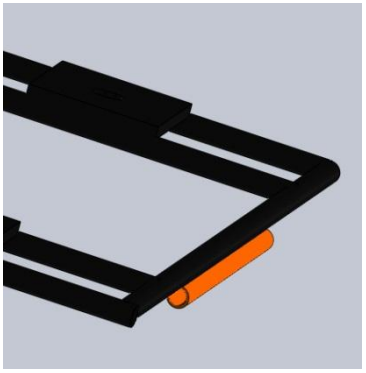
sprocket, brake disc) in ground clearance would be entertained. Ground clearance would be measured in similar lines to that of IS 9435.

2.5. Maximum Turning Radius- Maximum turning radius allowed for every vehicle is 3.5 m. Every vehicle has to clear figure of 8 test before proceeding for dynamic events.

2.6. Jack Point- There must be two jack points in the vehicle one in front and the other in the rear. These jack points must be polished with the orange colour for easy visibility.



Front Jack Point



Rear Jack Point

Just below the main chassis frame tube there must be a 10 inches (with minimum 1inch OD) steel tube welded and equally distributed to both the sides from centre line of the vehicle (As shown in the figure 2) which will serve the purpose of the jack point and the same arrangement must be installed in the front of the vehicle.

2.7. Toe Point- There must be two toe points in the vehicle one in front and the other in the rear. These toe points must be polished with the orange colour for easy visibility.

NOTE: The installation of toe point must be done in such a manner that it can rotate at least 180^{0}without compromising the strength of the joint(Figure-2). Dimensions are in inches.

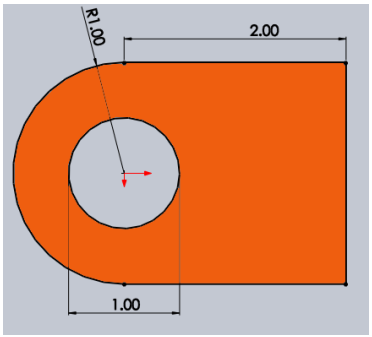


Figure-2

2.8. Bumper (Front and Rear) - Bumpers must be installed in the front and rear of the vehicle such that they cover the tyres and protect them from front/rear collision which may occur during the track events. It must be made up of continuous and seamless tubes having minimum OD 1inch (25.4mm)and minimum wall thickness 1.65mm. Bumper tubes

having joints will be discarded and the vehicle will not be given a TI OK. The bumpers must be covered with foam pipe insulation so as to avoid injuries which may occur at any time during TI or minor collision. Refer to Figure 3.

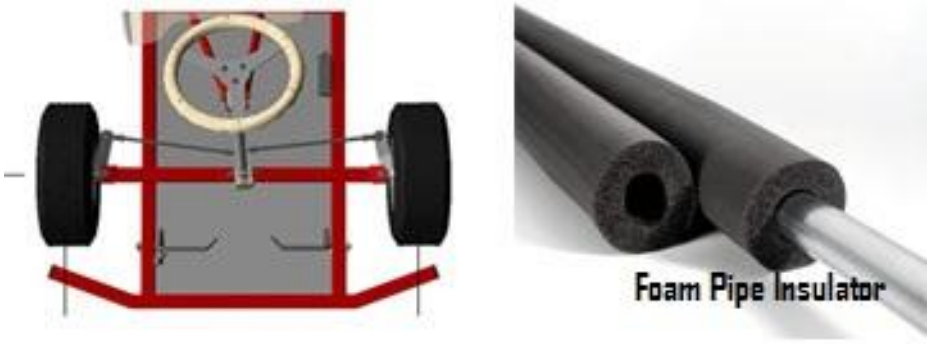


Figure -3

2.9. Suspension-Teams can use suspension system but it must be in proper working conditionwith a total travel of at least 2 inches i.e., 1inch for jounce and 1inch for bounce. The suspension system if used;must be installed in front as well as in the rear of the vehicle.Care should be taken that there is no spillage of oil from the suspension or dashpot.

2.10. Steering System- The steering system must be able to control (simultaneously) at least two (2) wheels. The steering system must have positive steering stops that prevent the steering linkages from locking up either in RH or LH turning (the inversion of a four-bar linkage at one of the pivots). The stops may be placed on the uprights or on the steering mechanism (rack etc.) and must prevent the tires from contacting suspension, body, or frame members during the track events. Allowable total steering system free play (inclusive of play in all the steering linkages) is limited to 7 degrees, measured at the steering wheel. The steering wheel must be mechanically connected to the front wheels, i.e. steer- by-wire or electronic steering is prohibited. The steering column should be rigidly fixed to the supports and steering wheel should be properly mounted. Welding steering wheel on the column is strictly prohibited. Shape of steering wheel must be nearly circular.

2.11. Braking System- The brake system installed must be capable of stopping the vehicle in a straight line without losing control during the brake test (minimum speed must not be less than 40 kmph in the brake test). Electronic braking systems are strictly prohibited. In case of any wheel via disc brake mechanism bleeding ports for disc calliper should be upside to that of piston mechanism of calliper.There should be no leakage from the tandem master cylinder(tmc) or reservoir.

2.12. Visibility Requirements- The engine compartment must be completely visible to the examiners.

2.13. Fuel Tank Spill Over Prevention and Drain (Modified) – Every vehicle must have a spill over prevention container mounted on the top of the fuel tank which should prevent the fuel being accidentally fall on any part of the engine or exhaust. The side walls of the Spill over tank should be atleast 6 inches in height. The spill over tank should be manufactured and mounted properly. The fuel in the spill over tank must be transported to the ground by the use of proper drain linings. Drain lining could be a fuel line material or any pipe. Drain lining should be directed towards the ground with the rigid support of the frame with proper Nylon ties.

2.14. Driver Seat (Modified) -Every team have to use proper Go karting Seats as shown in Figure 5 (a).The seat mounting must be rigid enough to withstand the dynamic conditions during the track events. The driver seat should bewell cushioned and at least 3 inches away from the firewall. Alignment of the driver seat/driver sitting direction must be parallel to vehicle's longitudinal axis.

Figure – 5(a)

2.15. Driver Seat Belt (Modified) - Strictly Prohibited.

2.16. Front and Side Panels (Bodyworks) -Every Vehicle should be equipped with proper side panels and front steering column panel. Front steering column panel should have proper area to paste vehicle identification number and other logo's given in below section.

2.17. Front Bodywork- The bodywork of the front part must be designed such that the vehicle number and the ISNEE logo may be displayed clearly. Refer to Figure-6.

Figure-6

2.18. Brake Light- The vehicle must be installed with a brake light red in colour which is 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.All the electrical connections done must be well insulated. The wiring should be done by sound engineering practice.

2.19. Rear View Mirror- Vehicle must be equipped with the rear view mirror in both the sides of the driver. The mirrors should be installed properly; no vehicle will pass the technical inspection without the rear view mirror.

2.20. Reverse Light and Alarm- It is mandatory that each vehicle (introducing reverse gear) must be equipped with a reverse light (White colour, visible at a minimum distance of 10 meters from vehicle). Reverse alarm is mandatory to install for safety reason which shall operate when the reverse gear is engaged.

2.21. Exhaust System (Modified) - The exhaust system can be re-routed with proper dimension tubing .The exhaust system must be properly shielded preventing the delicate parts which may get affected if exposed to the heat. The exhaust must be mounted properly to avoid the physical contacts of the viewers or the technical inspectors. Shielding to exhaust pipe with cotton rope, jute rope is strictly prohibited. Team can use metallic porous sheet to cover the exhaust pipes. The shielding of exhaust must be such that it does not cause hindrance in the heat dissipation of the exhaust pipe.

2.22. Kill Switch- The vehicle must be equipped with at least two kill switches. These kill switches must be able to cut off all the electrical connections including ignition system and must be rigidly mounted near the steering wheel where the driver can easily control it. Second kill switch should be placed in left side of the vehicle such that in emergency the bystander can operate it easily. Refer to figure 7 and figure 8 for the location/installation and type of kill switches to be used. **Kill switch which needs continuous pressure to be applied for the operation are not allowed.**

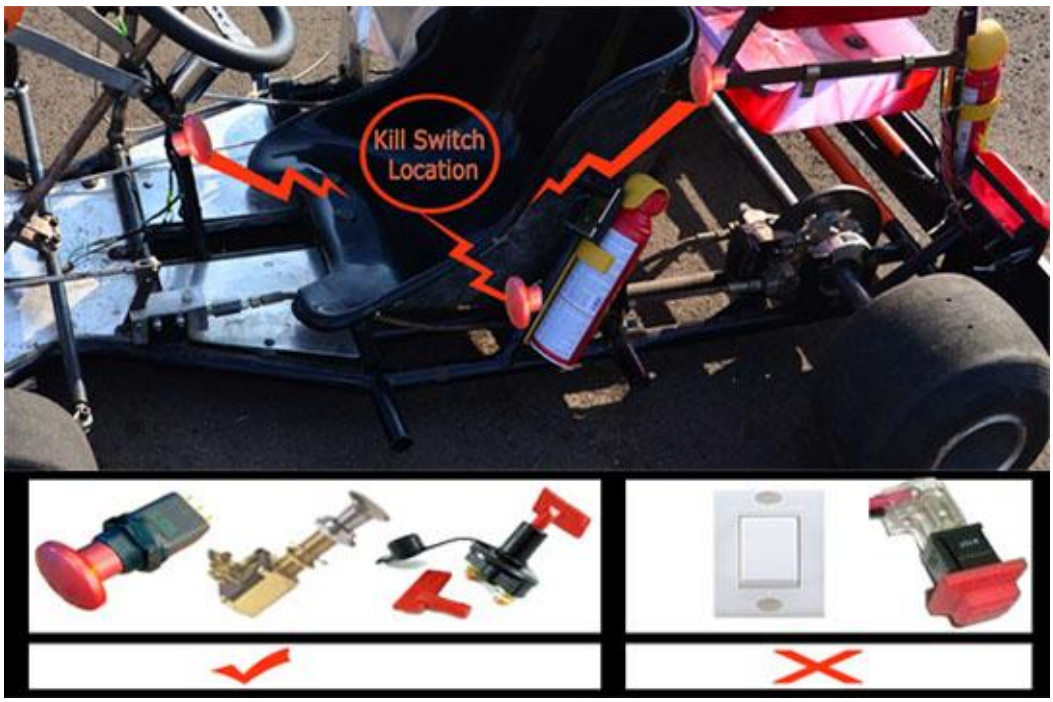


Figure-7

The kill switch must be installed properly and rigidly in a case. Mounting the kill switch with plastic/metallic ties or wires is strictly prohibited.

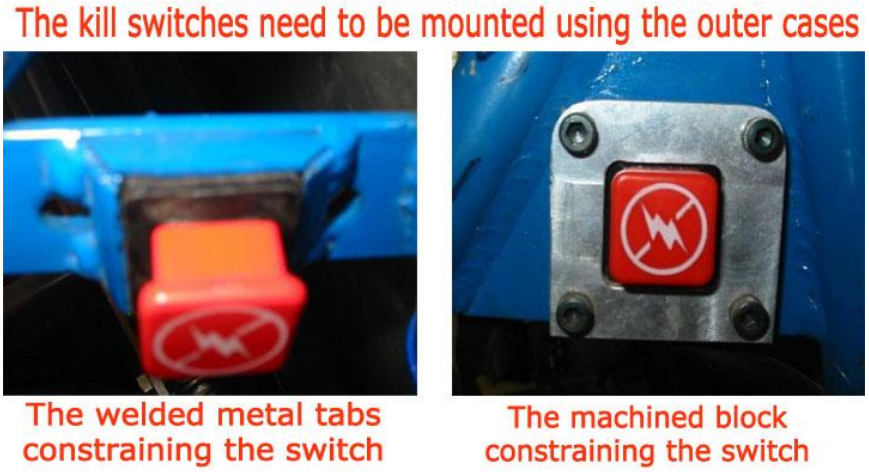


Figure-8

2.23. Brake Over travel Switch- All the vehicles must have a properly mounted brake over travel switch. This switch should not be operable in normal braking conditions, it must act in case of brake failure or the over travel of the brake paddle in case of brake failure. This switch must kill the engine but not the brake light connection when pressed.**Kill switch which needs continuous pressure to be applied for the operation are not allowed.**

2.24. Wheels and Tyres- Teams are free to use any of the tyres compatible to their setup meeting the necessary requirements of the rules and regulations. Justification about selecting particular rims and tyres should be provided at the time of PFR and Technical Inspection.

2.25. Base floor-Every vehicle should be equipped with base plate protecting driver from any foreign material accidentally entering from base of the vehicle. Base plate should completely cover the vehicle from front end of the vehicle to the rear part of the driver seat as shown in the figure with bluecolour.

NOTE: All the Electrical harness and Brake linings should be properly clamped above the base plate.

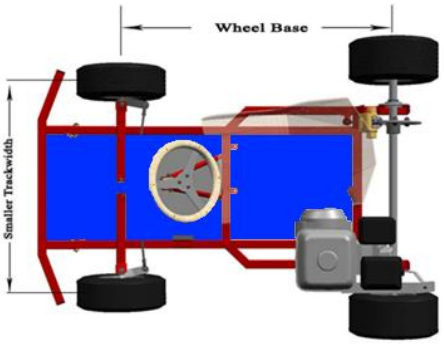


Figure - 9

2.26. Electric Start (Modified) - Not Required

2.27. Lock Nuts- Locking nuts are mandatory to be used everywhere in the vehicle. Failure to fulfil this, no team will get "T.I. OK" for the vehicle.

2.28. Bolts-All bolts used in the system must meet metric grade M8.8. No fasteners used should be lessthan 8.8 hardness. Thread lockers spring washers are prohibited. All fasteners used should have min 2 threads showing past the nut.

2.29. Fire Extinguisher- Each team must have at least two (2) nos of 02 kg each ABC type fire extinguishers. One to be placed with vehicle and another with crew member at all dynamic events. Fire extinguisher should be working in condition. It should bear a sticker or a bill clearly mentioning its expiry.

2.30. Path for Wires and Pipes- No pipelines/wire connections must go under the chassis. It is strictly prohibited. Doing so may lead to disqualification of the team.

2.31. Firewall-Firewall is a boundary which protects the driver from the heat produced by the engine. So, the firewall must be made up of a suitable material which can solve the purpose. It should be made in such a manner that driver's body parts are not affected by the engine heat/fire at any time during the dynamic/static condition. There should be min 3 inches clearance between the firewall and the engine.

NOTE: Acrylic/Plastic/perforated sheets are not acceptable. Tested specimen with the testing results/reports is required to be produced during the inspection of the vehicle if any material which is not easily decipherable is used in the manufacturing of the firewall.

2.32. Unstable Vehicle-Any vehicle exhibiting handling or other vehicle dynamics that are deemed unstable by the technical inspectors will not be permitted to participate in the dynamic events. The decision of the Head of the Technical Committee of ISNEE in this regard will be final and binding to all. This is in the interest of safety of all teams.

2.33. Vehicle's Mass - The overall weight of the vehicle should be less than 200 kg when driver is not on-board.

2.34. Vehicle Stand (New) – Every team must have a Go kart stand of feasible dimension according to vehicle design.

NOTE: Teams can use prefabricated stands also.

Section F

Vehicle's Powerhouse (Modified)

1. **Teams have to use the engine provided by ISNEE.**

Engine Name	-	Briggs and Stratton (550 Series)
Maximum Capacity	-	127cc
Type of Transmission	-	No Restrictions

2. **Engine Usage-** One engine can only be used for two consecutive events/years.
3. ***Energy boosting devices/hybrid systems are strictly prohibited.***
4. **Engine Tuning-**Teams are strictly restricted to tune the engine or do any modification with the engine.
5. **Positive lock should be provided with the throttle pedal.**
6. **Chain Guard-** Every vehicle should be equipped with proper chain guard. It should restrict accidental contact of any person standing outside. It should be mounted properly any un-usual sound is not acceptable.

NOTE: Perforated sheets are not allowed for chain guard.

Engine Registration- After the Pre Final Round, Every team will get the notification of Engine Registration with ISNEE. Every Team has to deposit the amount for engine within the deadline given by ISNEE, Failing to do will cause immediate disqualification of the team from Design Challenge.

F.2 Waiting List (New): If the teams from top fail to make the necessary requirement to confirm their participation in design challenge the teams from waiting list will get the chance in their place to do the same.

List of Qualified teams and Waiting list teams will be announced after PFR.

Note: Teams are strictly instructed to do not do any modification and changes with engine.

Section G

Vehicle Identification

Each team will be given a vehicle number, and the vehicle will be known by this number in the whole event.Teams are required to have a team name with an impressive team logo along with the college logo which is to be placed on the vehicle's body.

Teams are advised not to place any logos on the front of the vehicle because the vehicle number will be placed on the front of the vehicle.

Figure-10

Section H

Pre Final Round (PFR) and Final Round (FR)

1. **Pre Final Round (PFR)-** PFR consists of 250 points in which presentation of all the research and development over the vehicle is to be given in front of the judges in 20 minutes (including questionnaire round). **Documents Required in PFR-**

1.1. Complete Engineering Design of the Vehicle
1.2. Business Plan
1.3. Design Report (IEEE format)
1.4. Innovation Report (IEEE format)
1.5. Cost Report (Annexure-1)
1.6. FMEA (Annexure-2)
1.7. DVP (Annexure-3)
1.8. Gantt Chart (Annexure-4)

NOTE: All the annexure are available on www.gkdc.in andwww.isnee.in.

1.1. Complete Engineering Design of the Vehicle- Different views of completely assembled design of the vehicle must be presented in this report. It must be a .pdf file.

1.2. Business Plan- Please see Rule No. 2.1.2 given below.

1.3. Design Report- The design report must contain all the necessary details related to the vehicle like analysis, calculations, etc. This report must not exceed 12 pages (including acknowledgement, abstract, introduction, references) and it is recommended to provide at least three different views of vehicle drawing with proper dimensions. IEEE format must be followed in the design report.

1.4. Cost Report- Theformat of Annexure-1 must be followed for the cost report. The cost report must include all the calculations and cost of the parts procured and also its machining cost as per market rates. No need of accounting vat and other taxes in the cost report. Cost without vat is expected in the report.

1.5. FMEA- Failure modes and effects analysis (FMEA) is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service. "Failure modes" means the ways, or modes, in which something might fail. Failures are any errors or defects, especially ones that affect the customer, and can be potential or actual. "Effects analysis" refers to studying the consequences of those failures. Annexure-2 must be followed as the format of FMEA.

1.6. Design Validation Plan- The design validation plan is the assurance that a product, service, or system meets the needs of the customer and other identified stakeholders. It often involves acceptance and suitability with external customers. All the virtual and real time tests and analysis are to be included in the design validation plan. Teams are advised to follow the Annexure-3 for the format of DVP.

1.7. Gantt Chart- Gantt Charts illustrate the start and finish dates of the terminal elements and summary elements of aproject. Terminal elements and summary elements comprise the work breakdown structure of the project.This chart is basically the management of the project and distribution of different tasks in the team members with completion deadlines. Annexure-4 must be followed as the format.

2. **Final Round-** Final Round consists of three stages; **Static Test, Dynamic Test** and the **Endurance Test**. Participating teams are suggested to take hard copy of all the documents and reports at the time of these tests, anything can be asked by the judges to show and failure to present may lead into the disqualification from the respective test.

2.1. Static Tests-

2.1.1. Design Report VS Vehicle Analysis- The vehicle will be verified with the final design report. Deviating up to 10% from the final design report is acceptable but on further deviations teams will be penalized accordingly

2.1.2. Business Plan- This is a presentation round in which teams will need to present their business strategies considering their team as a manufacturer company of the vehicle. A report must be prepared containing following:

2.1.2.1. Infrastructure Required

2.1.2.2. Cells/Departments

2.1.2.3. Machinery Required

2.1.2.4. Production Plans

2.1.2.5. Annual Turnover

2.1.2.6. Initial Investment

2.1.2.7. Sales and Marketing Strategies

Note: The cost report will be verified the actual cost of the components and systems used in the vehicle at the time of Dynamic Event. The cost of the components/systems mentioned in the cost report must not vary with that of used in the vehicle. Teams will need to present all bills of material used in the vehicle.

2.1.3. Manufacturing Level- Good engineering practice will reflect a great manufacturing level. The vehicle will be examined by the judges at the time of Dynamic Event, so the participating teams are advised to manufacture the vehicle with pre-planned strategies so that the vehicle would be able to compete in several tasks and tests.

2.1.4. DISCUSSION (QUESTIONNAIRE) - In the static test event while examining the vehicle, judges may throw questions on any of the team members. The team members are advised to be prepared with the vehicle. Every team member is required to have a hard copy of the vehicle documents.

2.1.5. Before the dynamic event there will be TI (technical inspection) which does not carry any points but is necessary for participating in dynamic event. TI will be based on rulebook parameter and safety checks of the vehicle. The team will be allowed only 2 chances for the TI test failing which the team will be considered disqualified for the dynamic events.

2.1.6. Safety Equipment's- Every team are advised to use proper safety equipment's during manufacturing or during any repair work on site. Safety equipment's will be checked by Technical Inspector during Technical Inspection.

Requirements – Welding face shield, safety gloves, full sleeves cotton inner shirt,apron, safety shoes, safety goggles

2.1.7. DisAsm- This event consists of the dismantling and assembling the different parts of the vehicle. Maximum six (6) members can engage in this activity and maximum time limit for the completion of this event is fifty (50) minutes.

2.1.8. Safety Precautions

- Vehicle lifting by hand is not allowed, every team must use jack to lift the vehicle during DisAsm.
- Every member should wear proper shoes, workshop gloves and full sleeves cloths.

Parts to be dismantled and assembled from the vehicle:

2.1.8.1. Body works- All the body parts/panels must be detached from the vehicle

2.1.8.2. Wheels- Wheels must be detached from the vehicle

2.1.8.3. Engine (not internal parts)- Only the engine is required to be removed out of the vehicle, not its internal parts

2.1.8.4. Steering- Steering wheel and all the links must be dismantled.

2.1.8.5. Fuel tank- Removal of fuel tank is necessary in this event

2.1.8.6. Exhaust system- Exhaust system must be taken out of the vehicle.

DisAsm Scoring Formula:

DisAsm Score = $60x[(T_{longest}-T_{yours})/(T_{longest}-T_{shortest})]$

Where: "$T_{shortest}$" is the fastest time by any team

"$T_{longest}$" is either (a) the slowest time by any team or

(b) 2x the fastest time whichever is the shorter interval.

"T_{yours}" is your team's best time

2.1.9. Innovation- The innovation done in the vehicle in PFR will be discussed with the team and its working will be examined by the technical inspectors in the respective paddock of the teams. Team needs to present innovation report at the time of explaining the innovation. The innovation should be working and not just the concept.

2.1.10. Driver Exit Time- Maximum driver out time is 5sec, within this interval of time driver has to come out of the vehicle.

2.2. Dynamic and Endurance Events-

2.2.1. Brake Test- It's mandatory for a vehicle to pass the brake test to participate in any of the dynamic events. The vehicle must stop in a straight line after the brake is applied on the vehicle and the wheels on which the brake mechanism is actingmust get locked immediately after pedal is pressed. Each vehicle will be given 4 attemptsto pass the brake test. After the successful brake test attempt, vehicle will not be allowed to avail remaining attempts (if left any).
Vehicle dynamic stability will also be checked during the test, vehicle possessing abnormal behaviour will be checked again. The TI can be cancelled ifthe vehicle is found dynamically unstable or unsafe in the Brake Test. Few frequently occurred problems are listed below-

- Un-usual sound from transmission (generally sound produced by chain).

- Unsafe frame (Design and manufacturing)
- Improper wheel alignment etc.

If these issues found with the vehicle after static inspection, vehicle Technical Inspection will be cancelled and again will be given chance to rectify it.

Note: Vehicle's speed must not be less than 40kmph while attempting brake test. Brake Test is not having any points, but it's mandatory for a vehicle to pass the test to go for any of the dynamic event.

2.2.2. Acceleration Test- Acceleration determines the time it takes the vehicle to accelerate along 100 ft (30.48 m) flat course.
Procedure- The acceleration will be evaluated during the brake test. Acceleration of the vehicle in attempt in which the vehicle is passing brake test will be considered as final.

Scoring Formula-

$$\text{Acceleration score} = 60 \times [(T_{longest} - T_{yours}) / (T_{longest} - T_{shortest})]$$

2.2.3. Skid Pad - The objective of the skid-pad event is to measure the vehicle's cornering ability on a flat surface while making a constant-radius turn. The skidpad layout may be a figure of 8 or 'S' depending on the track condition but minimum track width will be 3m and shortest turning radius 2.5m.

NOTE: Each team may make two (2) attempts but with different rivers. Scoring will be based on the better of the two attempts. Timing may be done using either electronic systems or stop watches.

Scoring Formula-

$$\text{Skid Pad score} = 70 \times [(T_{longest} - T_{yours}) / (T_{longest} - T_{shortest})]$$

Penalties-

- **Cones Down Or Out-** A penalty of 1 second will be added to the time for every cone that is knocked —down or out (including gate cones).
- **DNF-** Vehicles that spin-out can continue as long as they have not gone off course will be classified as DNF.
- **Incorrect Laps-** Vehicles that do not follow procedure, i.e. run an incorrect number of laps or run the Laps in the wrong sequence will be classified as DNF.

2.2.4. Autocross- The objective of the autocross event is to evaluate the vehicle's maneuverability and handling qualities on a tight course without the hindrance of competing vehicles. The autocross course will combine the performance features of acceleration, braking, and cornering into one event.

Procedure- The vehicle will be staged such that the front wheels are 6 m (19.7 feet) behind the starting line. The timer starts only after the vehicle crosses the start line. There will be no particular order of the vehicles to run each heat.

The organizer will determine the allowable windows for each heat and retains the right to adjust for weather or technical delays. Vehicles that have not run by the end of the heat will be disqualified for that heat.

NOTE: Each team may make two (2) attempts but with different drivers. Scoring will be based on the better of the two attempts. Timing may be done using either electronic systems or stop watches.

Autocross Course Specifications & Speeds

The following specifications will suggest the maximum speeds that will be encountered on the course. Average speeds should be 40 km/hr (25 mph) to 48 km/hr (30 mph).

Straights: No longer than 60m with hairpins at both ends (or) no longer than 45m with wide turns on the ends.

Hairpin Turns: Minimum of 7m outside diameter (of the turn).

Slaloms: Cones in a straight line with 7.62 m to 12.19 m Spacing.

Miscellaneous: Chicanes, multiple turns, decreasing radius turns, etc. The minimum track width will be 3.5 m (11.5 feet).

The length of each run will be approximately 0.805 km (1/2 mile) and the driver will complete a specified number of runs.

Scoring Formula-

$$\text{Autocross score} = 80 \times [(T_{longest} - T_{yours}) / (T_{longest} - T_{shortest})]$$

Penalties-

- **Cones Down Or Out-** Two (2) seconds per cone, including any after the finish line.
- Driver must re-enter the track at or prior to the missed gate or a twenty (20) second penalty will be assessed. Penalties will not be assessed for accident avoidance or other reasons deemed sufficient by the track officials.
- **Missed Slalom-** Missing one or more gates of a given slalom will be counted as one "off-course" per occurrence. Each occurrence will incur a twenty (20) second penalty.

Note- The track layout is flexible

2.2.5. Endurance and Fuel Economy - The following are general guidelines for conducting the endurance and fuel economy event. The organizers reserve the right to establish procedures specific to the conduct of the event at the site.

Endurance Objective (225 points) - The Endurance Event is designed to evaluate the overall performance of the vehicle and to test the vehicle's reliability.

Fuel Economy test (125 points) - The fuel economy test is based on the average litres per kilometre fuel economy obtained during the endurance heat.

NOTE- The vehicle's fuel economy will be measured in conjunction with the endurance event. The fuel economy under racing conditions is important in most forms of racing and also shows how well the vehicle has been tuned for the

competition. This is a compromise event because the fuel economy score and endurance score will be calculated from the same heat. No refuelling will be allowed during an endurance heat.

Course speeds can be estimated by the following course specifications. Average speed should be 45 km/hr to 55 km/hr with top speeds of approximately 90 to 100 km/hr.

Procedure- The event will be run as a single heat approximately 27.6 km (12 Laps) long. Teams are not allowed to work on their vehicles during the heat. A driver change can be made during a two (2) minute period at the midpoint of the heat. Wheel-to-wheel racing is prohibited. Passing another vehicle may only be done in an established passing zone.

Note – Procedure and number of laps of endurance test are flexible

Endurance Fuel Fill- Before entering the event each vehicle's fuel tank must be filled to the fuel level line at the fuelling station. During fuelling, once filled to the scribe line, no shaking or tilting of the tank or fuel system (incl. entire vehicle) is allowed.

Vehicle Starting/Restarting-The vehicle must be capable of starting / restarting without external assistance at all times once the vehicle has begun the heat. If a vehicle stalls out on the track, it will be allowed one (1) lap by the car that is following it (approximately one (1) minute) to restart. If a vehicle has a restart problem at the end of Driver Change, it will be allowed a further two (2) minutes to restart the engine. If restarts are not accomplished within the above times, the car will be deemed disabled and scored DNF for the heat.

Driver Changing Procedure- Elapsed time will begin when Driver A enters the course and crosses the timing line. Driver A will drive for half of the total laps (6), and pull into the driver change area Two (2) minutes are allowed for the team to change drivers.

Driver 1 will exit the vehicle and any necessary adjustments will be made to the vehicle to fit Driver B (seat cushions, pedal position, etc.). Only three (3) team members, including the driver or drivers, will be allowed in the driver change area, and only the tools necessary to change drivers and/or tires will be carried into this area (no tool chests etc.). Extra people entering the driver change area will result in a 20 point penalty to the final endurance score for each extra person entering the area.

Driver 2 will then be secured in the vehicle. The driver change area will be placed such that the timing system will see the driver change as an extra-long lap. Unless this driver change takes longer than two minutes, this extra-long lap will not count. If the driver change takes longer than two minutes, the extra time will be counted into the final time. **Driver 2** will drive for rest of the laps (6) and elapsed time will stop when the car completes the total 12 laps. **Driver 2** will proceed directly to the fuelling station. The tank will be filled to refill mark and the amount will be recorded.

Vehicle Breakdown and Stalls- If a vehicle breaks down it will be removed from the course and will not be allowed to re-enter the course. If a vehicle stalls, or ingests a cone, etc., it will be allowed to restart and re-enter the course where it went off, but no work may be performed on the vehicle. If a car stalls and cannot be restarted without external assistance, the track workers will push the car clear of the track. At the discretion of event officials, two (2) team members may retrieve the car under direction of the track workers.

Endurance Minimum Speed Requirement- If a car is unable to maintain lap times within 133% of the fastest lap time for the course, and then it must exit immediately. Disqualification for failure to maintain the minimum speed will be made at the discretion of the Director of Operations.

Endurance Lap Timing- Each lap of the endurance event will be individually timed either by electronic means, or by hand. The time for an individual heat will be determined by subtracting the extra-long lap for the driver change from the total time and adding any penalty points.

Penalties-

- **Cones Down Or Out-** Two (2) seconds per cone. This includes cones before the start line and after the finish line.
- **Off Course-**For an OC, the driver must re-enter the track at or prior to the missed gate or a twenty (20) second penalty will be assessed.
- **Missed Slalom-** Missing one or more gates of a given slalom will incur a twenty (20) second penalty.
- **Penalties for Moving Violations-**
- **Failure to obey a flag**: 1 minute
- **Over Driving (After a closed black flag):** 1 Minute
- **Vehicle to Vehicle contact**: DISQUALIFIED
- **Out of Order-** Running out of order – two (2) minute penalty
- **Mechanical Problem-** No additional penalty other than the time lost to ensure that the car is safe to continue.
- **Reckless or Aggressive Driving-** Any reckless or aggressive driving behaviour (such as forcing another car off the track, refusal to allow passing, or close driving that would cause the likelihood of car contact) will result in a black flag for that driver. When a driver receives a black flag signal, he must proceed to the penalty box to listen to a reprimand for his driving behaviour. The amount of time spent in the penalty box will vary from one (1) to four (4) minutes depending upon the severity of the offense.
- **Inexperienced Driver-** The Chief Director of Operations may disqualify a driver if the driver is too slow, too aggressive, or driving in a manner that, in the sole opinion of the event, officials, demonstrates an inability to properly control their car resulting in a DNF.
- **Poor Fuel Economy-** Mileage exceeding 1 litres/25 km

Endurance Score Formula-

$$\text{Endurance score} = 225x\left[(T_{longest} - T_{yours})/\ (T_{longest} - T_{shortest})\right]$$

NOTE- $T_{longest}$ will be 1.333 times the $T_{shortest}$

Fuel Economy- The fuel economy score is based on the average litres per kilometre fuel economy obtained during the endurance heat.

Fuel Economy Score Formula-

If V_{your} is less than V_{max} then the following equation will be used to determine the fuel economy score:

$$\text{Fuel Economy Score} = 125\ X\left[(V_{max} - V_{yours})/\ (Vmax - V_{min})\right]$$

NOTE- V_{max} is equal to 5.2 litres and will be adjusted to represent 1 litres/25 km (9.04 mpg) if the course is shortened or lengthened. **In case, if V_{your} is greater than V_{max} then 0 points will be given to the performing vehicle.**

Section I

General Rules and Regulations

Rules Authority

There are several rules and restrictions which are to be followed by each and every team. Indian Society of New Era Engineers is having right to impound each and every rule associated with the event the event. Violation by anyone of the participating member may be liable to be penalized severely, inclusive of and up to debarring of the team from the competition at any stage or withdrawal of award/awards, as well.

Validity of the Rules:

The rules will be same throughout the event and any amendments will immediately be made known to all the participating teams through emails and the same will be uploaded on the website www.gkdc.in andwww.isnee.in.

Rule Compliance:

By registering for this event the team, members of the team as individuals, faculty advisors and other personnel of the college and university agree to comply with, and be bound by, these rules and all rule interpretations or procedures issued or announced by ISNEE. All team members, faculty advisors and other university representatives are required to cooperate with, and follow all instructions from, competition organizers, officials and judges.

- All the technical queries will only be answered through proper mailing channel. None of the technical queries will be entertained on telephones.
- Teams will need to submit their weekly reports via mails. Failing to do so will lead to penalties.
- None of the queries regarding the event will be entertained after the 15 days from the end date of the event

Right to Impound:

Indian Society of New Era Engineers reserves the right to impound any onsite registered vehicle at any time or at the stage during the competition for inspection and the examination by organizers, officials and technical inspectors.

Behaviour-

Unsportsmanlike Conduct- In the event of unsportsmanlike conduct, the team will receive a warning from an official. A second violation will result in expulsion of the team from the competition. Failure of a team member to follow an instruction or command directed specifically to that team or team member will result in a twenty five (25) point penalty.

Arguments with Officials- Argument with, or disobedience to, any official may result in the team being eliminated from the competition. All members of the team may be immediately escorted from the grounds.

Smoking and Illegal Material- 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. Any violation of this rule by a team member will cause the expulsion of the entire team. This applies to both team members and faculty advisors. Any use of drugs, or the use of alcohol by an underage individual, will be reported to the local authorities for prosecution.

Vehicle Related

Vehicle Movement- Vehicles may not move under their own power anywhere but on the practice or competition tracks. Off track vehicles must be pushed at a normal walking pace by means of Push Bar/members pushing the vehicle, with all four (4) wheels on the ground, a team member sitting in the cockpit to steer and brake and with another team member walking beside the car. During performance events when the excitement is high, it is particularly important that the car be moved at a slow pace in the pits. Violation of this rule will result directly into the 25 points penalty.

List of Prefabricated Parts- All the teams have permission to buy the readymade/fabricated parts but use of these parts in excess may lead to the disqualification of the vehicle or penalty of 200 points.

List of the prefabricated parts-

Shock Absorber, Springs, Brake drum, disc, calliper and brake holding assembly, master cylinder, Steering gear box, Steering column, Steering wheel, Wheel rims & Tyres,tie rod ends, Engine, Fuel tank & exhaust system.

1. **Other Penalties-**
   - 1.1. **Violation of rules-** 100 points/ disqualification
   - 1.2. **Misbehaviour/arguments with officials or volunteers-**100 points/ disqualification
   - 1.3. **Tampering with TI sticker or making restricted changes in vehicle after TI –**100 points/disqualification
   - 1.4. **Entry without permission on tracks-** 100 points/ disqualification
   - 1.5. Intentional damage of track/tent/other resources will result to the penalty of Rs 5000/- on the team also prize and certificates will not be awarded to the particular team/team member