



IMPERIAL SOCIETY OF INNOVATIVE ENGINEERS (ISIE)

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**ISIE-INDIAN
KARTING**

ISIE-IKR RULBOOK 2016
ISIE-IKR RULBOOK 2016

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Imperial Society of Innovative Engineers

Drive Your Dreams

Event Schedule:

S. No.	Activity (Reference)	Tentative Dates*
1.	Registration open www.imperialsociety.in	IKR'16
2.	Team detail submission <i>Team Account on website</i>	Refer Team Account
3.	IKR Workshop Compulsory <i>Team Account on website</i>	Dec 2015 & January, 2016 (Dates and Venue will confirm as per teams comfort)
4.	Team editing 1st Chance <i>Team account on Website</i>	Refer Team Account 5th Feb, 2016
5.	Report Submission	27th and 28th February, 2016
6.	Engine Registration	Jan and Feb , 2016
7.	Team List with Team ID www.imperialsociety.in	5th March, 2016
8.	Material & Component Registration www.imperialsociety.in	10th March, 2016
9.	Last Chance for team editing www.imperialsociety.in	15th October, 2015
10.	College Level Technical Inspection	10th April, 2016
11.	Final Round (Dynamic Round) GOA/BHOPAL/PUNJAB/COIMBATORE	August, 2016

*These are the tentative date it can be changed as per requirement.

Part A

Article 1. Event Overview and Objectives:

A1.1 Introduction:

“ISIE-INDIAN KARTING 2015” is going to be organized 2nd time in India by Imperial Society of Innovative Engineers (ISIE).

(IKR 2014-2015 held at Kari Motor Speed Way from 27th Jan, 2015 to 29th Jan, 2015. In that Event 51 teams from 9 state of India Participated.)

IKR is the Student GO-Karting Design and Manufacturing competitions challenge teams of university undergraduate and graduate students to conceive, design, fabricate, develop the Go-Kart.

A1.2 Objectives of Student Go-Karting:

The objective of the competition is to design and fabricate a Karting under ISIE Design Restriction so as to compete with other teams all over the country. Teams will use Internal Combustion Engine to run their Go-Kart. This will help them face real-world engineering design projects and other related challenges. Our focus to develop interest among the engineering student towards alternative power sources, those which are the future of Automobiles.

This can enhance their practical skills as well as learn team management, so our engineering student will avail to face any hurdles in the way of real engineering.

A1.3 About organizer:

IMPERIAL SOCIETY OF INNOVATIVE ENGINEERS (ISIE)

We are well known Society of India for organizing Motorsports events and live projects based Industrial Training. ISIE provides platform to the students for development and enhancement of their engineering skills as well as Managerial skills. We are developing platform especially for engineering students where they can easily face real time engineering problems and find the best solution.

ISIE is the India’s best platform for the engineering students to develop practical skills. We believe in “learning, Implementation and sharing”.

The Society has a very strong placement and consultancy wing that has an excellent network with the top Companies of the corporate world. Our Core Competencies include effective personalized industry based training and excellent placements.

ISIE is committed for the development in the field of renewable source of energy, these are the best solution to save our environment and development of our country. We are organizing Hybrid and Solar Race Car events.

A1.4 Go-Kart Design Objective:

- The STUDENT Go-Karting competition, teams are to assume that they work for a design firm that is designing, fabricating, testing and demonstrating a prototype Go-Kart for the non-professional, weekend, competition market.
- The Go-Kart should have very high performance in terms of acceleration, braking and handling and be sufficiently durable to successfully complete all the events described in the Rulebook and held at ISIE competitions Venue.
- Additional design factors to be considered include: aesthetics, cost, ergonomics, maintainability, manufacturability, and reliability.
- Each design will be judged and evaluated against other competing designs to determine the best overall Go-Kart.

Article 2: Judging Categories:

Event will be in two round 1. Document Submission Round 2. Dynamic round includes: technical inspection, cost, presentation, engineering design and high performance track endurance. Points are distinctively divided for the two rounds. All the teams will design and manufactured their kart and participate in final round.

A2.1 Document Submission

In this round teams are required to submit their reports online in their team account, Teams required to present following:

1. Design Report
2. DFME
3. CAD/CAE
4. Project Plan
5. DVP
6. Innovation Report
7. Research Paper
8. B-Plan & Cost Report

S.NO.	CATEGORY	
1.	Design Reports	100
3.	Innovation	100
4.	DFMEA	25
5.	DVP	25
6.	Project Plan	25
7.	CAD/CAE	75
8.	Research Paper	150
9.	Business Plan & Cost Report	50
	Total	500

A2.2 Dynamic Event:

All the teams will bring their karts in dynamic round fabricated, all teams will undergo TECHNICAL INSPECTION and BRAKE TEST. After passing both test team will permitted to participate in rest of event. Point table is following for dynamic round:

Point distribution for dynamic round:

Sr. No.	CATEGORY	Point
1.	Acceleration Test	75
2.	Auto Cross	200
3.	Skid Pad	100
4.	Innovation	100
5.	Manufacturing Level & Design	125
6.	Fuel Economy	150
7.	Endurance	150
8.	Weight Test	100
	TOTAL	1,000

Article 3: ISIE- Karting Participation Requirement:

A3.1 Team Name:

Every team should have an inspirational and meaningful name.

A3.2 Team Logo:

Every team should have an attractive team logo (Not downloaded from internet).

A3.3 Team Captain:

Every team requires a team captain and vice team captain.

A3.4 Discipline:

Every team member must be diploma/undergraduate/postgraduate student of any discipline. But final year students can take part in this Event.

A3.5 Driver:

Every team should have two drivers; driver must be minimum 18 years old. The driver should have a valid driving licence and we can verify that any time during event. Both driver must have medical insurance.

A3.6 Faculty Advisor:

Every team requires **one faculty advisor**.

A3.61 Faculty Advisors may advise their teams on general engineering and engineering project management theory.

A3.62 Faculty Advisors may not design any part of the Go-Kart nor directly participate in the development of any documentation or presentation. Additionally, Faculty Advisors may not fabricate nor assemble any components nor assist in the preparation, maintenance, testing or operation of the Go-Kart. In Brief - Faculty Advisors may not design, build or repair any part of the car.

A3.7 Team Member:

Every team requires **minimum of 8 members and maximum of 20 members**.

- The members of the team can be of the same college/university or from different colleges.
- More than one team can participate in event from same college/university.

A3.8 Driver's License:

Team members who will drive a competition Go-Kart at any time during a competition must hold a valid, government issued driver's license.

A3.9 Liability Waiver:

All on-site participants, including students, faculty and volunteers, are required to sign a liability waiver upon registering on-site.

A3.10 Medical Insurance:

Individual medical insurance coverage is required for both driver and is the sole responsibility of the driver. Driver without a valid Medical Insurance will not be allowed to drive in the Dynamic Events.

Article 4: Registration:

A4.1 Team Registration:

Teams can register through our official Website: www.imperialsociety.in

Registration
process

Register for event

Select Event Name and Complete your Details

Add Details of Team Members

Submit (You will receive confirmation SMS and mail)

A4.21 Once the team has been registered, the Confirmation will be given within 24 hours and payment should be done within 7 working days from the date of registration and teams have to send scanned copy of payment proof at isie.ikr@imperialsociety.in

A4.22 After receiving your payment proof, an online Registration form with team account details will be provided by us.

A4.23 Copy of the online registration form (attested by higher authority of the team respective Industry/College/University) and the bank deposit slip must be uploaded to www.imperialsociety.in in your team account before the last date as per scheduled dates.

A4.24 The payment is only confirmed in team account on ISIE website, when teams upload their payment slip it in their team account.

A4.25 Entry Fees of ISIE-Karting'16:

INR 11,500 + @14% tax: INR 1610/-

Entry Fee INR 13,110 (Including all taxes) and this Entry Fee will not be refunded in any case. This amount will be submitted after the registration of the team.

A4.26 Account details:

Account name: Imperial Society of Innovative Engineers

A/C No. 4942002100000336

Account type: Current

IFSC Code of Bank: PUNB0494200

Branch: Punjab National bank, Chaheru, Phagwara (Punjab).

A4.27 Entry Fee Mode:

- Money transfer through bank.
- Money transfer through ATM
- Money transfer through Internet Banking/ NEFT
- Demand Draft In favor of Imperial Society of Innovative Engineers, Payable at Punjab National Bank, Chaheru.

A4.2 Registration Fee Deadline and Refund Policy:

Registration fees must be paid to the organizer by the deadlines, within 7 working days after registration.

Registration fees is not refundable and may not be transferred to a subsequent year's competition.

Article 5: Documentation, Deadline and Penalty

A 5.1 Team Registration form:

Team Registration with complete details of team and approved by college HOD/Principal should be uploaded in team account as per schedule/intimation by mails.

A5.2 Team Change form:

We will give a chance to update online your team before Document submission round as well as after this round. Make sure it should be submitted as per given deadlines. Deadlines will be published and intimated by organizer.

A5.3 College Level technical Inspection:

College level Technical Inspection will be done by Faculty Adviser, Teams are required to submit only soft copy of T.I. sheet as per given deadline.

A5.4 Deadline and Penalties:

There are no exceptions to the document submission deadlines and late submissions will incur penalties. Please note that different documents or submissions may have different deadlines - check the website/Facebook Page.

Article 6: Query about Student Karting:

A6.1 Query Submission and Publication: Teams can submit their query to our official mail id.

isie.ikr@imperialsociety.in / event.isie@imperialsociety.in / info@imperialsociety.in

Query should be done by only team mail Id, and mail should contain the name of team as well as name of college/university.

A6.2 Query Type:

The Committee will answer any query that are not already answered in the rules that require new or novel rule interpretations. The Committee will not respond to questions that are already answered in the rules. For example, if a rule specifies a minimum dimension for a part the Committee will not answer questions asking if a smaller dimension can be used.

Part B

ARTICLE B1: GO-KART REQUIREMENTS & RESTRICTIONS

B1 Chassis Material: Teams are allowed to use Seamless pipe, it should be a circular cross section of outer diameter in the range of 0.8 to 2 inches. Thickness of the pipe should be minimum 1mm.

B1.1B Driver's leg compartment

In this area driver's leg will be placed. Teams have to design the Go-Kart in such a way that during impact this compartment and Driver's seat compartment should not be crushed. Teams can place other components like brake lever etc.

B1.1C Driver's Seat compartment

There driver's seat will be place this area has to be well protected with enough space for driver to come out easily as per guidelines given in the ergonomics section. Other safety requirements like seat belts, fire extinguishers, at least one kill switch etc., has to be placed within this area. No heat from the engine compartment should reach this area.

B1.1D Drivers must be able to exit the Go-Kart in not more than 5 seconds. The time begins with the driver in the fully seated position, hands in driving position on the connected steering wheel and wearing the required driver equipment. Egress time will stop when the driver has both feet on the pavement.

B1.1E Engine Compartment

This area holds the power house of the Go-Kart. This area should be well equipped to hold the heavy components of the Go-Kart.

B1.2 Jack Points: There must be two jack points on the Go-Kart, one at the rear and other at the front. The jack point must be oriented horizontally and perpendicular to the centerline of the kart.

B1.3 Front Bodywork

Sharp edges on the forward facing bodywork or other protruding components are prohibited.

B1.4 Driver's Seat

The lowest point of the driver's seat must be no lower than the bottom surface of the lower frame rails or by having a longitudinal tube (or tubes) that meets the requirements for Side Impact tubing, passing underneath the lowest point of the seat.

When seated in the normal driving position, adequate heat insulation must be provided to ensure that the driver will not contact any metal or other materials which may become heated to a surface temperature above sixty degrees C (60°C).

B1.5 Seat Belt: The seat belt may be of 3 point or 5 point harness. All the harness should be directed properly for the driver safety and will be checked again and again during dynamic event .Normal shoulder straps, side release buckle straps, belts with metal cam lock buckles etc. will not be considered as seat belts.

B1.6 Firewall

A firewall must separate the driver compartment from all components of the fuel supply, the engine oil, the liquid cooling systems and any high voltage system. It must protect the neck of the tallest driver. It must extend sufficiently far upwards and/or rearwards such that any point, above the bottom of the helmet of the tallest driver shall not be in direct line of sight with any part of the fuel system, the cooling system or the engine oil system.

The firewall must be a non-permeable surface made from a rigid, fire resistant material.

B1.7 Floor Close-out

All Go-Karts must have a floor closeout made of one or more panels, which separate the driver from the pavement. If multiple panels are used, gaps between panels are not to exceed 3 mm (1/8 inch). The closeout must extend from the foot area to the firewall and prevent track debris from entering the kart. The panels must be made of a solid, non-brittle material.

B1.8 Driver Visibility

The driver must have adequate visibility to the front and sides of the kart. With the driver seated in a normal driving position he/she must have a minimum field of vision of two hundred degrees (200°) (a minimum one hundred degrees (100°) to either side of the driver). The drivers view should not be restricted by steering wheel positioning.




Article 2: Steering System

B2.1 steering system: The steering wheel must be mechanically connected to the wheels, i.e. “steer-by-wire” or electrically actuated steering is prohibited.

B2.2Steering wheel:

The steering wheel must have a continuous perimeter that is near circular or near oval, i.e. the outer perimeter profile can have some straight sections, but no

concave sections. “H”, “Figure 8”, or cutout wheels are not allowed. Allowable steering system free play is limited to Seven degrees (7°) total measured at the steering wheel.

Steering Wheel:		
		
Allowed		Not Allowed

B2.3 Steering Type:

Teams are allowed to use any kind of steering system. There is also no restriction on steering ratio. Teams are free to use any configuration according to their compatibility. Teams are allowed to use 1:1 Mechanical steering system.

Note: Those team want to use custom made steering system i.e. 7:1, 6:1 and 12:1 then can give their requirement as soon as possible. Delivery and manufacturing will take time, so if your team interested then make order to ISIE as soon as possible. ISIE will provide this steering from our part manufacturing partner on least prize.

B2.4 Steering lock:

The steering system must have positive steering stops that prevent the steering linkages from locking up (the inversion of a four-bar linkage at one of the pivots). The stops may be placed on the uprights or on the rack and must prevent the tires from contacting suspension (if used), body, or frame members during the track events.

Article3: Suspension System & Go-Kart Dimensional Configuration:

B3.1 Suspension system:

If teams are using suspension system then their kart should be equipped with a fully operational suspension system with shock absorbers, front and rear, with usable wheel travel of at least 50.8 mm (2 inches), 25.4 mm (1 inch) jounce and 25.4 mm (1 inch) rebound, with driver seated.

B3.2 Wheel base:

The Kart must have a wheelbase of at least 1117.6 mm (44 inches). The wheelbase is measured from the centre of ground contact of the front and rear tires with the wheels pointed straight ahead.

B3.3 Track width:

The smaller track of the Go-Kart (front or rear) must be not be less than 75% of the Wheel Base.

Article 4: Braking System:

B4.0 Brakes

The kart must be equipped with a hydraulic braking system that acts on all four wheels and is operated by a single control.

B4.1 Brake type

It must have 1 hydraulic circuit such that in the case of a leak or failure at any point in the system, effective braking power is maintained on at least two (2) wheels. Each hydraulic circuit must have its own fluid reserve, either by the use of separate reservoirs or by the use of a dammed, OEM-style reservoir. "Brake-by-wire" systems are **prohibited**.

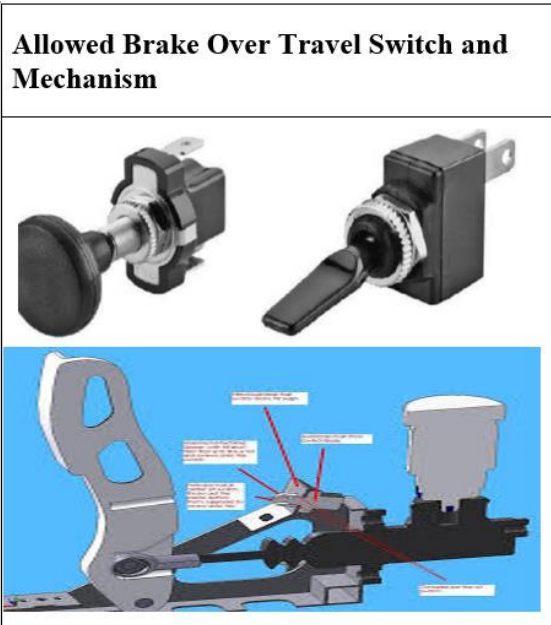
B4.2 Brake pedal:

The brake pedal must be fabricated from steel or aluminium or machined from steel, aluminium or titanium. Pedal should only be operated from driver's foot and no usage of hand operated levers for braking mechanism is allowed. The pedal travel should be restricted after some distance by some kind of locking mechanisms.

B4.3 Brake Over-Travel Switch:

A brake pedal over-travel switch must be installed on the kart as part of the shutdown system and wired in series with the shutdown buttons. This switch

must be installed so that in the event of brake system failure such that the brake pedals over travels, it will result in the shutdown of the system, which will eventually help controlling the system.



B4.4 Brake light:

The kart must be equipped with a **red** brake light. The brake light itself must be rectangular, triangular or near round shape. Each brake light must be clearly visible from the rear in very bright sunlight.

Article 5: Tire and Wheel:

B5.1 Tires and wheel:

Teams are allowed to use any kind of tires and wheel as per their design and requirement. However Hand cutting, grooving or modification of the tires by the teams is specifically prohibited.

B5.2 Tyre dimensions:

There is no restrictions for the dimension of the wheel teams are free to choose as per their design.

Article 6: Engine and Transmission (Drive Line):

B6.1 Engine CC and type

Teams are allowed to use maximum 127 cc Engine. Only 4 Stroke engine are allowed.

Engine should be of naturally aspirated air cooled type. There should be no modification or alteration in the engine.

B6.2 Brand New Engine:

Engine will be provided by ISIE after document submission round of the event on best price by IKR sponsor, which will be a brand new engine. Engine technical details will be intimated by official mail.

B6.3: Engine Usage: One engine can be use for 2 consecutive events i.e. IKR 2015-2016 and IKR 2016-2017. Teams can also use same brand engine maximum 1 year old.

B6.4: Throttle Paddle: Only foot operated paddle is allowed, Hand operated lever will not allowed. There should be a positive lock provided with the throttle paddle.

B6.5 Transmission:

The transmission to be used in the Go-Karts must be of rear wheel drive only. The teams are free to use any sort of designs i.e. the use of differential, through the axle, the wheel mounting hub or by any other means.

B6.6 Fuel and Position of Fuel Tank:

To avoid any alterations in the properties of the fuel at the time of race, ISIE will be providing the fuel to all the teams at the standard market rate. The capacity of the fuel tank must not exceed 7 liters in volume. The placement of fuel tank should be such that it maintains a proper distance from the engine and also it should not be above the battery. It must be securely fixed to the chassis and be designed in such a way that neither it nor the fuel pipes (which must be flexible) present any danger of leakage during the event. A quick attachment to the chassis is strongly recommended. It is mandatory to place it between the main tubes of the chassis-frame

B6.7 Muffler and Exhaust:



We at ISIE strongly believe in green future. The teams must keep in mind that they should select the appropriate exhaust system. In order to reduce the noise, efficient exhaust silencers are compulsory.

Exposed high-speed final drivetrain equipment such as Continuously Variable Transmissions (CVTs), sprockets, gears, pulleys, torque converters, clutches, belt drives and clutch drives, must be fitted with scatter shields in case of failure.

B6.8 Kill switch

There should be two **kill switch** in the Go-Kart. They should be placed in such that one can be easily accessed by driver and other outside the Go-Kart for

organizers. Kill switch be clearly visible from a long distance with a bright red colour.

Kill Switch	
	
ALLOWED KILL SWITCH	NOT ALLOWED SWITCH

B6.9 Kill Switch Mounting:

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. The kill switches will be rigidly mounted using the outer cases.



B6.10 Fusing:

All electrical systems must be appropriately fused.

B6.11 Weight of the Go-Kart: The weight of the Go-Kart should not be exceed more than 195 kg (Excluding the weight of the driver).

PART C

Article 1: Event details and Challenge for teams:

C1.1 Challenge:

The teams will be competing in two rounds, one is the document submission and the other one is the dynamic round. Points are distinctively divided for the two rounds.

C1.2 Document Submission Round:

This is document submission round, in which teams are required to submit their report as per specified by IKR Organizing committee.

Document submission round consists of 500 points. **(For Point distribution refer article A2.1)**

C1.4 Document Requirement:

1) Overall design report: This report should consist data of following departments and their calculations.

- Design
- Steering
- Braking
- Suspensions
- Innovation (including the process flowcharts and calculation if any)

2) CAD file: (This includes a document with all the views of the chassis, assembled Go-Kart and an isometric view of the complete Go-Kart.)

3) FMEA

4) DVP

5) Project Plan

6) Cost report

7) Research Paper

1) FMEA: Failure Mode and Effect Analysis is a step by step representation of mode of failure during manufacturing and assembly process and analysis of

effect or cause of error which will effect on efficiency and potential of the Go-Kart.

- Define and guide a logical design process
- Identify, quantify, and reduce design risk
- Provide a traceable document for design and development
- Justify design activities
- Provide a means for continuous product improvement.
- A successful DFMEA activity helps a team to identify potential failure modes based on past experience with similar products or processes, enabling the team to design those failures out of the system with the minimum of effort and resource expenditure, thereby reducing development time and costs.
- It is widely used in manufacturing industries in various phases of the product life cycle and is now increasingly finding use in service industry.
- Failure modes are any errors or defects in a process, design, or item, especially those that affect the customer, and can be potential or actual.

2) DVP: Design Validation Plane is the assurance of the Go-Kart service, which meets the customer satisfaction. It also involves the acceptance, reliability, durability and suitability with external customer. All the virtual and test during implementation and analysis are to be included. The proper way to look at testing and planning for verification of designs must include considerations for speed and effectiveness as well. This is a multiple step process considering many factors including:

- Leveraging of Supply Chain capability and experience
- Computer Aided Engineering (CAE) Finite Element Analysis etc...
- Component Testing or Bench Testing with Noise Factor Management
- Sub-Systems testing.
- Final product or process validation
- Legacy capture and feed-back

Each level listed above is executed in sequence which follows a low cost (fast verification) to high cost (slow verification).

3). Project Plan: Project Plan includes all the process during manufacturing of Go-Kart from starting date to final date. This chart is basically the management of the project and distribution of different tasks in the team members with completion deadlines.

4. Research Paper: This is golden opportunity for the teams to publish their paper in International Journals, it's compulsory for every team to prepare a research paper in the field of Automobile Engineering. No of paper can be submit by a team. **For** one paper only maximum 7 author allowed. Faculty adviser can be also part of this paper.

Article2: Final event:

C2.1 All the teams will design and fabricate go-kart and will participate in the dynamic round with the Go-Kart fabricated by them; all teams will undergo TECHNICAL INSPECTION and BRAKE TEST. After passing both test team will permitted to participate in rest of event.

(Point distribution for dynamic round refer article A2.2 in Part A)

C2.2 Static test:

C2.2A Technical Inspection (T.I):

Objective: The objective of technical inspection is to determine if the Go-Kart meets the requirements and restrictions of ISIE rules. T.I is a non-scoring round.

- Each Go-Kart must pass all parts of technical inspection and testing before it is permitted to participate in any dynamic event. The exact procedures and instruments employed for inspection and testing are entirely at the discretion of the Chief Technical Inspector.
- Visible access can be provided by removing body panels or by providing removable access panels to check the various components.
- Go-Karts must be presented for technical inspection in finished condition, i.e. fully assembled, complete and ready-to-run. Technical inspectors will not inspect any Go-Kart presented for inspection in an unfinished state.

C2.3B Scrutiny:

The teams must provide a detailed description of the electronic and electrical devices that they have manufactured. It must be documented accurately and must be provided during the time of inspection.

C2.4C Corrections: If a Go-Kart is deemed to a concern or does not comply with the rules, then correction must be done to get re-inspected. Only 3 attempts will be given to clear their TI.

C2.5D Questionnaire:

There will be a questionnaire round to any of the team members by the judges. Questions will be related to manufacturing of the Go-Kart and other technical aspects of the Go-Kart. Engineering practices of the teams is also evaluated here.

Article 3: Design report Vs. Manufactured Go-Kart:

C3.1 Objective:

The objective of the design event is to evaluate the engineering effort that went into the design of the kart. The teams are also checked on the basis of how the engineering meets the intent of the market. The kart that illustrates the best use of engineering to meet the design goals and the best understanding of the design by the team members will win the design event.

C3.1A: In the design report to be submitted, the document should contain a brief description of the Go-Kart with the majority of the report specifically addressing only the engineering, design features, and Go-Kart concepts new for this year's event.

C3.1B: It can also contain the various analysis reports for the Go-Kart and the evidence must be brought up for the judges to check.

C3.2C: The judges will evaluate the engineering effort based upon the team's Design Report, responses to questions and an inspection of the kart. The design judges will inspect the kart to determine if the design concepts are adequate and appropriate for the application.

C3.3D: It is the responsibility of the judges to deduct points if the team cannot adequately explain the engineering and construction of the kart.

Article 4: B-Plan and Cost Analysis Presentation:

The presentation round consists of two rounds, first being.

C4.1: Round1. Business & Marketing and the second is Cost report.

C4.1A: The Objective of the Presentation round is to evaluate the team's ability to develop and deliver a business case summary that will convince investors that the team's design best meets the demands of the racing market and that it can be profitably manufactured and marketed.

C4.1B: The issues with which engineers engage have become more and more multidimensional, and engineers' expected proficiencies now include project and professional skills.

C4.1C: The Presentation Event requires participants to consider wider communication, team management principles, and marketing critical to career success as well as an understanding of financial, ethical, societal and global issues, beyond the usual technical competencies.

C4.1D: Presentations will be evaluated on content, sustainability, organization, visual aids, delivery, timing and the team's response to the judges' questions.

C4.1E: Hard copy of the reports is compulsory at the time of presentation.

C4.2 Round 2: Cost report:

In this report, the cost of the components used in the Go-Kart must be specified. It is cross checked with the Go-Kart to ensure every component and system is present. The actual cost must not vary with that in the report.

C4.3 Manufacturing Level: Good engineering practice will reflect a great manufacturing level. The Go-Kart will be examined by the judges at the time of Dynamic Event, so the participating teams are advised to manufacture the Go-Kart with pre-planned strategies so that the Go-Kart would be able to compete in several tasks and tests.

C4.4 Weight Test: The weight of the Go-Kart should not exceed more than 195 kg without driver. Light weight Go-Kart will be awarded.

Article 5: Dynamic Tests:

C5.1 Brake Test- All the Go-Karts have to pass the brake test to participate in any of the dynamic events. The Go-Kart must stop in a straight line after the brake is applied on the Go-Kart. Each Go-Kart will be given 3 attempts to pass the brake test. But in case if the Go-Kart passes the test in first attempt it will not be given any other trials.

C5.1A: Teams have to clear the braking test. Brake Test does not have any points, but it is mandatory for the teams to qualify this round to participate in the dynamic round.

C5.2 Acceleration Test:

The acceleration event evaluates the Go-Kart's acceleration in a straight line on flat pavement.

C5.2A Procedure: The karts will accelerate from a standing start over a distance of 50 m on a flat surface. The foremost part of the Go-Kart will be staged at exactly behind the starting line. The time taken to accelerate would be measured.

C5.2C Scoring: The acceleration score is based upon the corrected elapsed time. Elapsed time will be measured from the time the karts crosses the starting line until it crosses the finish line.

C5.2D Scoring formula: Scoring formula: $150 \times [(T_{\text{longest}} - T_{\text{yours}}) / (T_{\text{longest}} - T_{\text{shortest}})]$

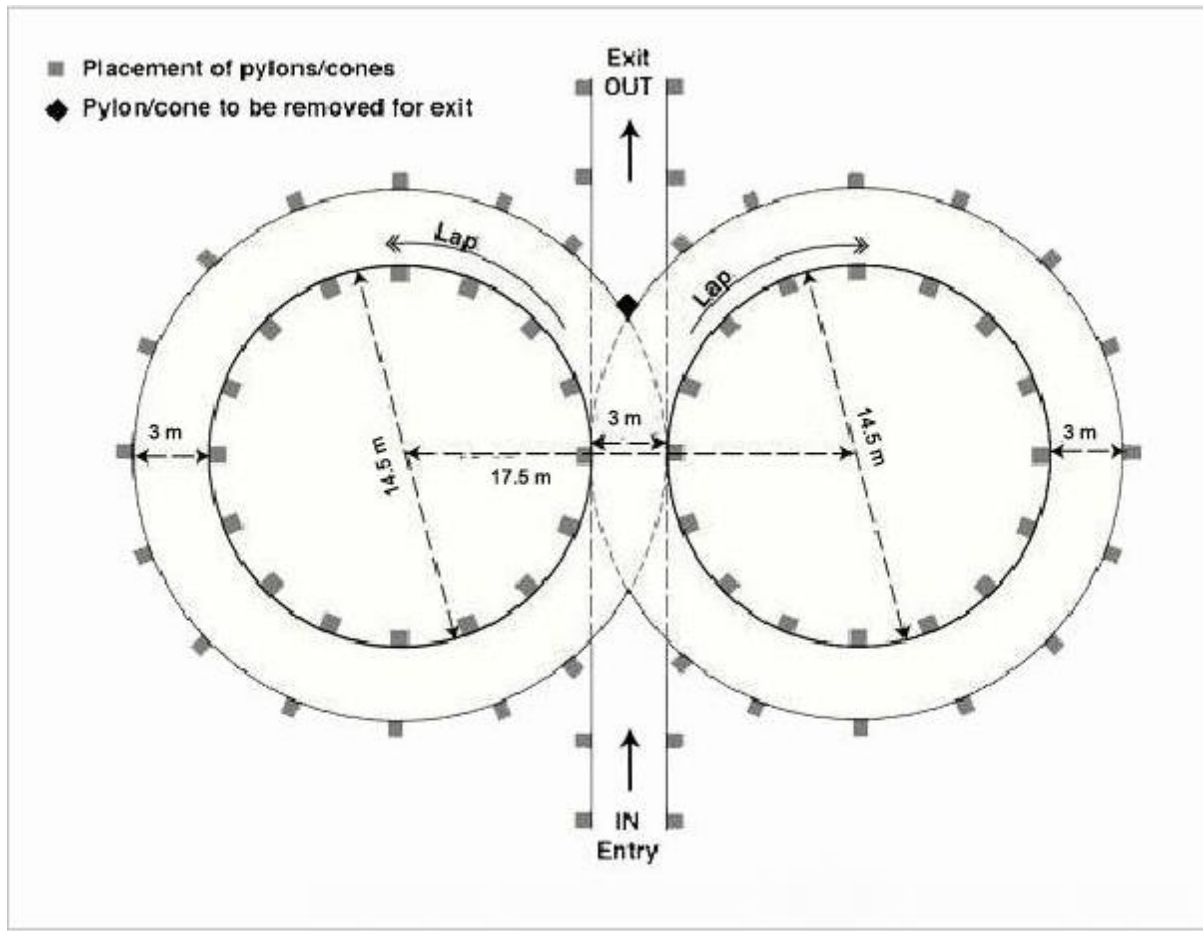
C5.2E Penalty: Cones Down or Out: A two (2) second penalty will be added for each DOO (including entry and exit gate cones) that occurred on that particular run to give the corrected elapsed time.

C5.2F Did Not Attempt (DNA): If the Go-Kart did not attempt or if it does not complete the event, then those teams would receive DNA.

C5.3 Skid Pad Test:

The objective of the skid-pad event is to measure the Go-Kart's cornering ability on a flat surface while making a constant-radius turn.

C5.3A Skid Pad Layout- There will be two (2) pairs of concentric circles in a figure of eight pattern. The centers of these circles will be 17.5m apart. The inner circles will be 14.5 m in diameter, and the outer circles will be 20.5m in diameter. The driving path will be the 2.5 m (8.2 feet) path between the inner and outer circles. The Go-Karts will enter and exit through gates on a 3 m wide path that is tangential to the circles where they meet. The line between the centers of the circles defines the start/stop line. A lap is defined as travelling around one of the circles from the start/stop line and returning to the start/stop line.



C5.3B Procedure-

- The track is laid as shown above and the Go-Karts will enter the track perpendicular to the figure eight. They must take one full lap on the right circle to establish the turn and the Go-Kart must move on to the left circle to complete the lap. This completes one lap and will be timed. Immediately upon finishing the circle the lap will be completed, and the Go-Kart will exit the track. The Go-Kart will exit at the intersection moving in the same direction as entered.
- A driver has the option to take a second run immediately after the first.

NOTE: Each team may make two (2) attempts but with different drivers. Scoring will be based on the better of the two attempts.

C5.3C Penalties-

- **Cones Down or Out-** A penalty of 1second will be added to the time for every cone that is knocked down or out (including gate cones).

- **Unfinished-** Go-Karts that has gone out of the track will continue as long as they have not gone off course will be classified as Unfinished.
- **Incorrect Laps-** Go-Karts that do not follow procedure, i.e. run an incorrect number of laps or run the Laps in the wrong sequence will also be classified as unfinished.

C5.3D Scoring: Skid Pad score = $150 \times [(T_{\text{longest}} - T_{\text{yours}}) / (T_{\text{longest}} - T_{\text{shortest}})]$

C5.4 Autocross event:

The objective of the autocross event is to evaluate the Go-Kart's handling qualities without the hindrance of competing Go-Karts. The autocross course will combine the performance features of acceleration, braking, and cornering into single event.

The manoeuvrability of the Go-Kart is also checked in this event.

C5.4A Specifications & Speeds:

The following specifications will suggest the maximum speeds that will be encountered on the course.

- **Straights:** No longer than 50 m (165 feet) with hairpins at both ends (or) no longer than 35 m (115 feet) with wide turns on the ends.
- **Constant Turns:** 15 m (50 feet) to 30 m (100 feet) diameter.
- **Hairpin Turns:** Minimum of 7 m (23 feet) outside diameter of the turn.
- **Slaloms:** Cones in a straight line with 5 m (16.4 feet) to 10 m (32.8 feet) spacing.

C5.4B Penalties: The karts are judged on elapsed time plus penalties. The following penalties will be added to the elapsed time:

- **Cone Down or Out (DOO):** Five (5) seconds per cone, including any after the finish line.
- **Off Course:** Driver must re-enter the track at or prior to the missed gate or a twenty (30) second penalty will be assessed. .
- **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 (30) second penalty.
- **Stalled & Disabled Go-Karts:** If a kart stalls and cannot restart without external assistance, the kart will be deemed disabled. karts deemed disabled will be cleared from the track by the track workers. At the

direction of the track officials team members may be instructed to retrieve the Go-Kart. Go-Kart recovery may only be done under the control of the track officials.

- The teams would be given a chance of 3 runs. The time required to complete each run will be recorded and the team's best corrected elapsed time will be used to determine the score.

C5.4D: Scoring Formula:

$$\text{Autocross score} = 200 \times [(T_{\text{longest}} - T_{\text{yours}}) / (T_{\text{longest}} - T_{\text{shortest}})]$$

C5.5 Endurance event & Fuel Economy test:

Objective: The endurance event is designed to evaluate the Go-Kart's overall performance, reliability and efficiency. Unlike fuel economy tests that result in Go-Karts going as slow as possible in order to use the least amount of fuel, IKR rewards the team that can cover a designated distance on a fixed amount of energy in the least amount of time.

C5.5A Procedure & Specifications:

- In general, the team completing the laps in the shortest time will earn the maximum points available for this event. The endurance distance is approximately 10km (6.21 miles).
- Driver changes will be made after completion of 5 km. Also 4 Wheel to wheel racing is prohibited.
- Passing another Go-Kart may only be done in an established passing zone.
- 1. Course speeds can be estimated by the following course specifications. Average speed should be around 45 km/hr. (28 mph) with top speeds of approximately 70 km/hr. Endurance courses will be configured, where possible, in a manner which maximizes the advantage of regenerative braking.
- 2. (a) **Straights:** No longer than 40.0 m (132 feet) with hairpins at both ends (or) no longer than 35.0 m (115 feet) with wide turns on the ends. There will be passing zones at several locations.
b) **Constant Turns:** 20.0 m (65.5 feet) to 45.0 m (147.5 feet) diameter.
c) **Hairpin Turns:** Minimum of 9.0 m (29.5 feet) outside diameter (of the turn).
d) **Slaloms:** Cones in a straight line with 10.0 m (32.8 feet) to 15.0 m (49.2 feet) spacing.
e) **Minimum Track width:** The minimum track width will be 4.5 m (14.76 feet).

(f) **Miscellaneous:** The organizers may include various turns or decrease the turns and the other specifications according to the situation.

C5.5C Fueling & Charging: Before the beginning of the endurance event, the Go-Kart fuel tank and any downstream fuel accumulators, e.g., carburetor float bowls, will be drained. The allocated amount of fuel will then be added to the tank by the organizers and the filler will be sealed.

C5.5D Endurance Penalties: The penalties in effect during the endurance event are listed below:

- **Cone down or out:** Five (5) seconds per cone. This includes cones before the start line and after the finish line.
- **Off Course (OC):** For an off Course, 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.
- **Go-Kart to Go-Kart Contact:** DISQUALIFIED
- **Running Out of Order:** 2 Minutes

C5.5E Endurance Go-Kart Restarting:

- The Go-Kart must be capable of restarting without external assistance at all times once the Go-Kart has begun the event.
- If a Go-Kart stops out on the track, two min. will be given and if team is not able to make the Go-Kart run in specified time, than some points will be deducted.
- At the end of Driver Change, the Go-Kart will be allowed two (2) minutes to reenergize the electrical system and restart the Go-Kart drive system.

C5.5F Breakdowns & Stalls:

- If a Go-Kart breaks down it will be removed from the course and will not be allowed to re-enter the course.
- If a Go-Kart spins, stalls, 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 Go-Kart.

- If a Go-Kart stops on track and cannot be restarted without external assistance, the track workers will push the Go-Kart clear of the track. At the discretion of event officials, two (2) team members may retrieve the Go-Kart under direction of the track workers.

C5.5G Endurance Driver Change Procedure:

- There must be a maximum of two (2) drivers for the endurance event; one driver may not drive in three consecutive segments.
- Each driver will drive half of the track (5 km), and then be signaled into the driver change area.
- Only three (3) team members, including the driver or drivers, will be allowed in the driver change area. Only the tools necessary to adjust the Go-Kart to accommodate the different drivers will be carried into this area (no tool chests etc.). Extra people entering the driver change area will result in a twenty (20) point penalty to the final endurance score for each extra person entering the area.
- The Go-Kart must come to a complete stop, the IC engine turned off and the TSV shut down. These systems must remain shutting down until the new driver is in place.
- The driver will exit the Go-Kart and any necessary adjustments will be made to the Go-Kart to fit the new driver. The new driver will then be secured in the Go-Kart.
- Three (3) minutes are allowed for the team to change drivers. The time starts when the Go-Kart comes to a halt in the driver change area and stops when the correct adjustment of the driver restraints and safety equipment has been verified by the driver change area official. Any time taken over the allowed time will incur a penalty.
- Once the new driver is in place and an official has verified the correct adjustment of the driver restraints and safety equipment, a maximum of two (2) minutes are allowed to re-energize the electrical system, restart the Go-Kart drive system and begin moving out of the driver change area.

C5.5H Reckless or Aggressive Driving

- Any reckless or aggressive driving behavior (such as forcing another Go-Kart off the track, refusal to allow passing, or close driving that would cause the likelihood of Go-Kart contact) will result in a black flag for that driver.
- When a driver receives a black flag signal, he/she must proceed to the penalty box to listen to a reprimand for his/her driving behavior.
- 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.

- If it is impossible to impose a penalty by a stop under a black flag, e.g. not enough laps left, the event officials may add an appropriate time penalty to the team's elapsed time.

C5.5I Inexperienced Driver:

- The Chief Marshall/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 Go-Kart. This will result in a Did Not Finish (DNF) for the event.

C5.5J Fuel economy test:

- The fuel economy test is based on the average liters per kilometer fuel economy obtained during the endurance heat.
- The Go-Kart'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 Go-Kart has been tuned for the Challenge.
- This is an event where optimization is needed because the fuel economy score and endurance score will be calculated from the same heat. No refueling will be allowed during an endurance heat.

C5.5K Flags: There are two types of flags which are command flags & Informational flags. The command flags command the teams and they must obey without any question while the informational flags give us information to guide along the laps.

C5.5L Command Flags

- BLACK FLAG** - Pull into the penalty box for discussion with the Director of Operations or other official concerning an incident. A time penalty may be assessed for such incident.
- BROWN FLAG** - Pull into the penalty box for a mechanical inspection of your Go-Kart, something has been observed that needs closer inspection.
- BLUE FLAG** - Pull into the designated passing zone to be passed by a faster competitor or competitors. Obey the course marshal's hand or flag signals at the end of the passing zone to merge into competition.
- CHECKER FLAG** - Your segment has been completed. Exit the course at the first opportunity after crossing the finish line.

- (e) **GREEN FLAG** - Your segment has started, enter the course under direction of the starter.
NOTE: If you are unable to enter the course when directed, await another green flag as the opening in traffic may have closed.
- (f) **RED FLAG** - Come to an immediate safe controlled stop on the course. Pull to the side of the course as much as possible to keep the course open. Follow course marshal's directions.
- (g) **YELLOW FLAG** (Stationary) - Danger, SLOW DOWN, be prepared to take evasive action, something has happened beyond the flag station. NO PASSING unless directed by the course marshals.
- (h) **YELLOW FLAG** (Waved) - Great Danger, SLOW DOWN, evasive action is most likely required, BE PREPARED TO STOP, something has happened beyond the flag station, NO PASSING unless directed by the course marshals.

C5.5M Informational Flags:

- (a) **ORANGE FLAG** - Something is on the racing surface that should not be there. Be prepared for evasive maneuvers to avoid the situation. (Course marshals may be able to point out what and where it is located, but do not expect it.)
- (b) **WHITE FLAG** - There is a slow moving Go-Kart on the course that is much slower than you are. Be prepared to approach it at a cautious rate.

PART D

Article 1: Driver Equipment:

D1.1: 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 Go-Karts 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 Go-Kart without the complete driver's safety gear in any of the dynamic event.

D1.2 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 such as: **SFI 3- 2A/5 (or higher) / FIA Standard 1986**

D1.3 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.

D1.4 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-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 sticker. The organizer reserves the right to impound all non-approved helmets until the end of the competition.

D1.5 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.

D1.6 Neck Support-The neck support must be a full circle (360°) and SFI rated. Horseshoe collars are not allowed. Simpson, RCI, G Force, Deist or Leaf Racing Products supply neck collars that meet this requirement.

D1.7 Gloves- Leather gloves with extra foam are acceptable.

D1.8 Shoes-Fire resistant shoes made from acceptable fire resistant material shoes must be certified to the standard and labelled as such:

SFI 3.3

FIA 8856-2000

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

D1.9 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.

All the safety gear will be provided by sponsor of event on subsidy rates to all the teams by organizer. Teams Must follow all the points as above mentioned, we will not allowed any teams in dynamic round without complete safety gears at any rate.

PART E:

Article1: ISIE RULES AND ORGANIZER AUTHORITY:

E1.1 Official Announcement:

All the official announcements and the information regarding the competition will be displayed on the official websites of **Imperial Society of Innovative Engineers**.

Our official sites are <http://www.imperialsociety.in> and you can also join us through Facebook for quick updates:

Official Page: <http://www.facebook.com/ISIE2014>

After completion of registration, important information will be sent through the emails to the respective team captains/Faculty Advisor. The rules will be same throughout the event and any amendments done will immediately be informed the entire participating team through mail/face book group/page.

E1.2 Rules Authority:

All the authority of rules is under ISIE organizing Committee. Official announcements from ISIE Organizing Committee shall be considered part of and have the same validity as these rules. Query regarding event questions concerning the meaning or intent of these rules will be resolved by the Technical committee of ISIE.

E1.3 Validity of Rules:

The rules and other information related to events is valid to till completion of the event and schedule as per decided by the ISIE. Rule of other may be different.

E1.4 Right to Impound:

During the event any registered team can be called for technical inspection and examination at any point of time and stage and can be questioned for any technical element related to the Go-Kart during the event to any team member.

E1.5 Rules Compliance:

By entering through registration a ISIE national level competition, the team members, faculty advisors and other personnel of the entering university

agree to comply with, and be bound by, the rules and all rules interpretations or procedure issued or announced by ISIE Organizing Committee. All team members, faculty advisors and other university/college representatives are required to cooperate with, and follow all instructions from competition organizers, officials and judges.

E1.6 BEHAVIOUR:

All the member of each and every team will be requiring following the rules laid by ISIE, during the competition. Any member's failure to follow the rules will result in 20 % point reduction or elimination from the event. Arguments with officials may also result in the team being eliminated from event.

E1.8 Smoking and Illegal Material: Alcohol, illegal drugs, weapons or other illegal material are strictly not allowed 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 authorities for prosecution.

E1.9 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.

E1.10 Official Instructions: 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. There should not be directly involvement of faculties of Industrial in Designing and manufacturing of the Go-Kart.

E1.11 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.

E1.12 Parties: Disruptive parties either on or off-site should be prevented by the Faculty Advisor.

E1.13 Trash Clean-up: Cleanup of trash and debris is the responsibility of the teams. The team's work area should be kept uncluttered. At the end of the day, each team must clean all debris from their area and help with maintaining a clean paddock.

E1.14 Competition Objective – A Reminder

The ISIE-Karting event being organized by ISIE is a challenge of design engineering and manufacturing competition that requires performance demonstration of Karting's and is NOT a race. Engineering ethics will apply. It is recognized that lots of hard work has been put in by the teams for an entry into IKR . It is also recognized that this event is an “innovation enhancement experience” but that it often times becomes confused with a high stakes race. In the heat of competition, emotions peak and disputes arise. The officials of ISIE are trained volunteers and maximum effort will be put in to settle the disputes an equitable, professional manner.

Article 2: Organizing Team contact Details:

S. No.	Department	Contact No
1.	Registration Related Query	+91-7696141486 +91-9041466699
2.	Technical Query	+91-9465185122+91-9041466699
3.	Sponsorship	+91-8427417781 +91-9041466699
4.	Workshop & Venue	+91-7307236596
5.	Any Suggestion	+91-8427417781
	Mail ID www.imperialsociety.in	isiekarting@gmail.com event.isie@imperialsociety.in

Imperial Society of Innovative Engineers
Drive Your Dreams

PART F

PRIZE MONEY AND HONOUR:

S. No	Categories	Prize Worth
1.	Champion	Rs. 80,000
2.	Runner Up	Rs. 40,000
3.	Endurance	Winner Rs. 10,000 Runner Up Rs. 5,000
4.	Autocross	Rs. 10,000
5.	Skid Pad	Winner Rs. 10,000
6.	Acceleration	Winner Rs. 10,000
7.	Best Design	Rs. 5,000
8.	Best Innovation	Rs. 10,000
9.	Light Weight	Rs. 5,000
10.	B-Plan & Cost	Rs. 5,000
11.	Best Team Professionalism	WRs. 20,000
12.	Best Driver Award	WRs. 10,000
13.	Best Captain Award	WRs. 10,000
14.	ISIE-Future Award to 3 most young and dynamic teams	WRS 1,20,000
	Total	3,50,000

*WRs: Worth Rupees Scholarship