



SRI RAMAKRISHNA INSTITUTE OF TECHNOLOGY
(AN AUTONOMOUS INSTITUTION)
COIMBATORE -10



DEPARTMENT OF MECHANICAL ENGINEERING
IN COLLABORATION WITH



MECHATRON MOTORS
 EXPERIENCE THE ELECTRIC


PROUDLY PRESENTS

A NATIONAL LEVEL ELECTRIC BIKE DESIGN CHALLENGE

RULEBOOK




 **24-27, Sep, 2024**

 **Team Size: 8 - 25**

 **Cash Prize: 130K+**

CONTACT US:

 **+91-9688472728**

 **mechatronmotors@gmail.com**

EBDC'2024

Season - 4.0



SRI RAMAKRISHNA INSTITUTE OF TECHNOLOGY
(AN AUTONOMOUS INSTITUTION)
COIMBATORE -10



A NATIONAL LEVEL ELECTRIC BIKE DESIGN CHALLENGE

RULEBOOK

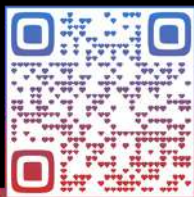


EBDC'2024

Season - 4.0

 **DREAM IT...DESIGN IT..DRIVE IT.**

24-27 SEPT, 2024



Scan to Register

**POWERED BY
MECHATRON MOTORS**

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WWW.MECHATRONMOTOR.COM



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE
SEASON 4.0 (A Dynamic Event)**

Organized by
Department of Mechanical Engineering

Co-Host by



September 24-27, 2024





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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



Table of Contents

About Rulebook..... 6

1 EVENT SCHEDULE..... 7

2 ORGANIZATION AND GOVERNANCE 8

 About SRIT..... 8

 About the Department of Mechanical Engineering..... 8

 About Mechatron Motors..... 9

 About Electric Bike Design Challenge..... 9

 About Previous Seasons of EBDC..... 10

3 RULES AND REGULATIONS..... 11

 3.1 Rules Authority..... 11

 3.2 Validity of Rules..... 11

 3.3 Rules Compliance 11

 3.4 Right to Impound..... 11

 3.4 Official Announcements 12

 3.5 General Authority..... 12

 3.6 Documents Submission..... 12

 3.7 Participating in the Competition 12

 3.8 Misbehavior..... 13

 3.9 Arguments with Officials 13

 3.10 Smoking and Illegal Materials..... 13

 3.11 Bike Shipping 13

 3.12 Penalties 13

 3.13 Remonstrations..... 14

 3.14 Protests 14

 3.15 Loopholes 14

4 PARTICIPANTS INFORMATION 15

 4.1 Eligibility Criteria 15

 4.2 Team Entry Requirement..... 15

5 REGISTRATION PROCESS 19

 5.1 Online Registration..... 19



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



| | |
|--|-----------|
| 5.2 Registration fee payment..... | 19 |
| 5.3 Team details submission | 20 |
| 6 VEHICLE DESIGN REQUIREMENTS | 21 |
| 6.1 General Design Requirements..... | 21 |
| 6.2 Frame Restrictions | 22 |
| 6.3 Frame Material Specifications | 23 |
| 6.4 Suspension and Steering | 23 |
| 6.5 Brakes | 24 |
| 6.6 Bike Seat | 24 |
| 6.7 Dashboard System..... | 25 |
| 6.8 Tyres & Wheels..... | 25 |
| 6.9 Others | 25 |
| 6.10 Electrical System..... | 26 |
| 6.11 Battery | 26 |
| 6.12 Charging System | 27 |
| 6.13 Motor | 27 |
| 6.14 Transmission | 27 |
| 6.15 Kill Switch | 28 |
| 6.16 Throttle..... | 28 |
| 6.17 Fusing | 28 |
| 6.18 Wiring | 28 |
| 6.19 Safety | 28 |
| 7 RIDERS SAFETY GEAR..... | 29 |
| 7.1. Rider's Suit | 29 |
| 7.2. Underclothing | 29 |
| 7.3. Helmet..... | 29 |
| 7.4. Balaclava | 30 |
| 7.5. Neck Support..... | 30 |
| 7.6. Knee Pads and Elbow Pads..... | 30 |
| 7.7. Gloves | 30 |
| 7.8. Shoes..... | 30 |
| 7.9. Socks | 30 |



A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0



8 STATIC ROUNDS -PHASE I 31

8.1 Design Report (100 Pts.) 32

8.2 Innovation Report (100 Pts.) 34

8.3 Business Plan Report (50 Pts.) 35

8.4 Cost Report (50 Pts.) 36

9 STAIC ROUNDS - PHASE II 37

9.1 Design Presentation (100 Pts.) 37

9.2 Innovation Presentation (100 Pts.) 37

9.3 Business Plan and Cost Presentation (150 Pts.) 38

9.4 On-Site Design Evaluation (75 Pts.) 39

9.5 Weight Test (75 Pts.) 39

9.6 Presentation Scoring 39

10 DYNAMIC ROUNDS 40

10.1 Self-Certification Check Sheet- Pre-inspection Required 40

10.2 Technical Inspection 40

10.2.1 Rulebook Inspection 41

10.2.2 Safety Inspection 41

10.2.3 Electrical Inspection: 41

10.3 Brake Test 42

10.4 Acceleration Test (100 Pts.) 42

10.5 Autocross Test (100 Pts.) 43

10.6 Off Road Test (100 Pts.) 43

10.7 Hill Climb Test (100 Pts.) 44

10.8 Maneuverability Test (100 Pts.) 45

10.9 Endurance Test (200 Pts.) 46

11 SCORE POINTS - STATIC ROUNDS 48

12 POINTS DISTRIBUTION - DYNAMIC ROUNDS 49

13 AWARD CATEGORIES & EVENT PRIZES 50

14 ORGANIZING COMMITTEE 52

15 EBDC OFFICAL HEADS 53

16 CONTACT DETAILS 54



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



About Rulebook

1. The Rulebook of Electric Bike Design Challenge comprising with official rules of EBDC, hereafter it will be referred as EBDC Rulebook or Rulebook.
2. It is responsibility of every participating team to get awareness and understanding of rules incorporated in the rulebook. In order to aid better understanding of frequently misunderstood rules, descriptions are given below the particular rules. Either team captain or Vice-Captain shall get in touch with either technical committee or organizer for clarification on rules (if any).
3. Text set in *Italic* indicates a note or explanation of the rule above to aid its understanding.
4. The various functions and roles are defined as follows:
 - 4.1. Organizer: The specific EBDC team and Board members of EBDC who organize event and all personnel acting on its behalf.
 - 4.2. Participants: The individual (students) who will be taking part in this event and will be registered for this event.
 - 4.3. Team: Group of participants with a team name and one Electric Bike that has been registered for participation at EBDC.
 - 4.4. Team Captain: A participant who has been appointed in the event registration document will be a primary point of contact for his/her team towards the organizers.
 - 4.5. Vice-captain: A participant who has been appointed in the event registration document will be a secondary point of contact for his/her towards the organizers.
 - 4.6. Faculty Advisor: A Professional staff member of the education institute who represents the team to the institute.
 - 4.7. Race Director: Person appointed by the organizers, who is responsible to manage and sanction all on track (dynamic) activities.
 - 4.8. Track Marshall: A person appointed by the Race Director to act his/her behalf, in particular to ensure the track safety and observe the track rule compliance.
 - 4.9. Technical Director: A person appointed by organizing committee, who is responsible to ensure the technical standards and integrity of the EBDC.



SECTION 1

EVENT SCHEDULE

| S.NO | SCHEDULE | IMPORTANT DATES |
|------|--|--|
| 1 | Registration Starts | 01 st May 2024 |
| 2 | Rule Book Release | 05 th May 2024 |
| 3 | Registration Ends | 30 th August 2024 |
| 4 | Registration Fees Deadline | 30 th August 2024 |
| 5 | Phase 1 Report Submission (Design and Innovation Report) | 05 th September 2024 |
| 6 | Phase 2 Report Submission (Business Plan and Cost Report) | 15 th September 2024 |
| 7 | Inaugural Function | 24 th September 2024 |
| 8 | Static Rounds | 24 th & 25 th September 2024 |
| 9 | Dynamic Rounds | 26 th & 27 th September 2024 |
| 10 | Valedictory Function | 27 th September 2024 |



SECTION 2

ORGANIZATION AND GOVERNANCE

About SRIT

Sri Ramakrishna Institute of Technology (SRIT), an Autonomous Institution, and Affiliated to Anna University is one among the most eminent Educational Institutions in Coimbatore district. SRIT is recognized as one of the leaders in Engineering Education, Research and Application of knowledge for the betterment of the society and the country. The college has imprinted a position in the Engineering Education by creating graduates to the industry and the society. Since its inception in the year 2002, the institution has been continuously motivated to make a permanent mark in the education field by creating technocrats, sound in Academics and Value system.

SRIT is one of the seventeen leading institutions managed by SNR Sons Charitable Trust which includes Polytechnic College, Schools, Dental College, Colleges of Pharmacy, Physiotherapy, Arts & Science, and Advanced Training Institute. The institution is located in a tranquil environment appropriate for constant learning. It is situated at the outskirts of the city. Well-constructed buildings with state-of-the-art educational aids are spread over the 50 acres with built up area of 65,117 Sq. m.

About the Department of Mechanical Engineering

We are Passionate. Doers in Innovative Engineering Education

The Department of Mechanical Engineering was established in the academic year 2005-06 enrolling 60 students. The department is headed by Dr.B.Chokkalingam, who has vast experience in academics and research. The department comprises of 15 well qualified and experienced dynamic young staffs who hold their master degrees in their interest from renowned institutions. Among them, three members of the faculty have obtained their Ph.D. degree. The member of faculty has published papers in their research domains and two faculty members are recognized as supervisors to guide doctoral candidates in Anna University.

The department has full-fledged and well established laboratory facilities and all the instruments used in every laboratory are being calibrated for usage. Internet facility has been enabled in many computers for the faculty to effectively search for useful study materials. Wi-Fi connection has been enabled for them to use their personal computers for research purposes.



A NATIONAL LEVEL ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0



The department has well equipped smart class rooms with necessary teaching aids viz., multimedia computers with LCD projectors in order to enable power point presentations for specific/necessary lecture topics. With regard to the technical data, NPTEL videos, Online Class Rooms with EDUSAT Connectivity are available. The department has signed MoUs with the leading organizations/industries in the city namely CODISSIA, KKM Soft, Roots Industries and SALZER Electronics.

About Mechatron Motors

MECHATRON MOTORS LLP is a Student's Start-up unit of SRIT, Coimbatore founded in 2021 who were working towards excellence in two wheeler hybrid technology. We have introduced our smart hybrid technological services to convert an existing two wheeler into hybrid vehicle and pursue business through innovation and technology. Our team possess good experience in electric vehicle field and comprise of a highly motivated set of specialists for technical support. We are an experienced, dedicated and energetic team, cognizant of the market and customer requirements.

About Electric Bike Design Challenge (EBDC)

The National level Electric Bike Design Challenge aims to foster innovation, creativity, and sustainable transportation solutions by inviting participants to design and develop electric bikes that excel in performance, efficiency, and environmental sustainability. The Indian government has set ambitious targets to accelerate the adoption of Electric Vehicles. The Automotive Industries are also rapidly moving towards the development of Electric Vehicles. In this scenario, to provide a platform to our budding technocrats for enhancing their knowledge and technical skills into the reality of e-mobility, SRIT provides a platform for young engineers to exhibit their innovative ideas into reality. Their skills are accessed by various static and dynamic events with the guidance of industrial experts. SRIT recognizes team building activities and individual talents by providing a technical platform associate with huge awards and prizes.

Mechatron Motors Electric Bike Design Challenge is an initiative for the newbie engineering student teams to gain exposure on Design Challenges in India and develop their career. Teams around the country will get an opportunity to design an electric bike powered by 2 KW Brushless DC Motor using different CAD Modeling software. Every team must do complete research and development to develop an efficient Electric Bike. They must build complete reports on different components used in the bike and the showcase the calculation behind it. Teams will also get an opportunity to present their vehicle design and its durability to our esteemed technical committee and receive valuable feedback from them. Teams also earn an opportunity to become nationally recognized and win many awards and prizes.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



SRIT E-Bike Design Challenge is a competition to explore the theoretical and technical skills of engineering and diploma students. The main motto of this competition is to perform design, analysis and documentation of electric bike. The participating teams have the liberty to exhibit their innovation and new findings allied with the rule book. SRIT provides this exciting platform to budding young engineers to exhibit their innovative ideas into reality. SRIT forum encourage the team members to perform detailed literature survey before starting the design and manufacture of electric bikes.

About Previous Seasons of EBDC

The Department of Mechanical Engineering in association with Mechatron Motors, a student start-up of SRIT have successfully organized and completed three seasons of Electric Bike Design Challenge (EBDC). The previous three seasons of the Electric Bike Design Challenge have been a grand success, with the active participation of twenty five teams from various engineering colleges across the country. Our SRIT is the only Engineering college from South India to conduct the electric bike events for the past three years.

Over the past three seasons, the Electric Bike Design Challenge has sparked innovation and creativity in sustainable transportation. From sleek, aerodynamic frames to cutting-edge battery technology, each season has pushed the boundaries of electric bike design. Participants have showcased their ingenuity, striving to balance performance, efficiency, and style. Judges have been impressed by the diverse range of entries, reflecting a global passion for eco-friendly mobility solutions. As the event evolves, it continues to inspire the next generation of electric bike designers and enthusiasts. The overall champions of previous three seasons are:

1. *EBDC'21, Season 1.0 – Team Moto Manipal from Manipal Academy of Higher Education, Karnataka*
2. *EBDC'22, Season 2.0 – Team Fuerza from Thiagarajar Polytechnic College, Salem*
3. *EBDC'23, Season 3.0 – Team Sapphire from Sri SaiRam Institute of Technology, Chennai*

Objective

- ✓ To raise awareness among youths towards E-Mobility.
- ✓ To skill the engineering students towards new & trending technologies through this innovative platform.
- ✓ To inculcate a culture of innovation & technologies.
- ✓ Bridging the gap between the industries and academia.
- ✓ To facilitate a career forum for engineering and diploma students.



SECTION 3

RULES AND REGULATIONS

3.1 Rules Authority

The Mechatron Motors shall be the official organizer of the E-Bike Racing Challenge and shall be responsible for all the management oversight and application of the regulation for the event. Mechatron Motors team which has been instrumental in promoting motor sports events and ushering a new era of engineers, where they will know, and what practicality in technical world stands for. The Mechatron Motors will act as a launch-pad to accord the seamless endurance of engineers and their prolific inputs. We will craft a world, where knowledge and wisdom in engineering domain will lead to imagination and innovation.

The teams must follow each and every rule, regulations and restrictions given in the rule book. The organizing committee of EBDC have reserves right to modify each and every rule, regulation associated with the competition. Violation of rules by any individual or as a team or representative member may be liable to be penalized severely resulting in or withdrawing or debarring of the team from the competition processed by withdrawal of awards as well.

3.2 Validity of Rules

The rules, regulation, and restriction will be the 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.

3.3 Rules Compliance

By registering for this event, the team members of the team as individuals, faculty advisors and other personnel of the college/university agree to comply with and will be bounded by these rules, interpretations or procedures issued or announced by EBDC 2024. All team members, faculty advisors and other university representatives are required to cooperate with, and follow all instructions, penalties and results from competition organizers, officials and judges.

3.4 Right to Impound

Any team can be asked for a Technical Inspection and Evaluation at any time and stage throughout the race and they can be questioned about any technical aspect of the vehicle.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



3.4 Official Announcements

All the official announcements and information regarding the competition will be displayed on the official website of the event organizers. Our official website is www.mechatronmotor.com or www.srit.org. After completion of registration, important information will be emailed to the respective team mail id.

3.5 General Authority

EBDC organizing committee reserves the sole rights to revise the schedule or awards or rewards of the competition and interpret or modify the competition rules at any point of time and in any manner that is, in their sole judgement, required for the efficient operation of the event or the EBDC as a whole.

The organizers may re-conduct a certain round or event in case of any disputes, confusion, failure in maintaining strictness or for any other reason as their sole discretion without being questioned.

3.6 Documents Submission

The team members are advised to submit the documents in prescribed schedule to avoid delays in publishing the points and notifications. If any team wants to extend time due to their university examinations and or other academic activities, please email a request mail through the team advisor duly forwarded by the head of the department/head of the institution stating the actual reason for requesting time extension.

3.7 Participating in the Competition

The registered team, team captain, members, participant individuals, faculty advisor and college representatives of colleges and universities who are all present on competition venues are considered as participating in the competition. If earlier departure from the competition venue due to problem in the bike/ medical reason/ not cleared in the technical inspection or any other personal and official or non-personal reason will be considered as earlier withdrawal by the team from the competition. At any circumstances, the registration fee is not adjustable or refundable.

Teams which do not appear in –

1. Static Round
2. College level technical Inspection
3. Onsite Technical Inspection and Dynamic round within stipulated time shall not be eligible to appear in the next level of the event.



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



3.8 Misbehavior

Misbehavior activity in any form of the registered team, individual or representative of the college/university will receive a penalty of points.

3.9 Arguments with Officials

Arguments with or disobedience to any official may result in the team being imposed with a high penalty of points.

3.10 Smoking and Illegal Materials

Alcohol, illegal drugs, weapons or other illegal materials 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 is applicable to all the 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, if found.

3.11 Bike Shipping

The teams must ensure that their shipping agency or Freight Forwarder or Commercial carrier complies with all rules laid by the government for Inter-State Transportation. It is the responsibility of teams to ship the vehicle at the proper time so that it reaches the event-site before the start of the event. Teams must keep proper care during transport to avoid any damage to the bike. Proper care must be taken while selecting the mode of shipping (Train/Truck etc).

3.12 Penalties

Violation of Rules:

Penalty of 100 points imposed.

Misbehavior/Arguments with officials or volunteers:

A penalty of 100 points.

Tampering with TI sticker or making restricted changes in vehicle after TI:

A penalty of 100 points.

Others:

EBDC organizers have the rights to modify the penalties listed in the various events.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



3.13 Remonstrations

SRIT and Mechatron Motors is recognized the students involvement and efforts to manufacturing the bike by spending hard and valuable days and hours. The EBDC organizers will make nevertheless effort to review all questions and disputes to resolve their problems quickly and efficiently.

3.14 Protests:

- ✓ EBDC organizing committee understands all the efforts of students put to manufacture an Electric Bike and bring it to the competition, so we will make every effort to fully review all questions and resolve the problems, if any. At the same time, we have zero tolerance to any kind of indiscipline.
- ✓ At first, the team Captain/ Faculty Facilitator must approach the organizer and inform informally regarding any objections & questions about scoring, judging, policies or any official action.
- ✓ If the problem is not resolved, then the team can fill the Protest Form attached with the file provided to team during Induction and submit the form in the Control Room.
- ✓ Only team captain or authorized acting captain (in absence of captain during dynamic round) / faculty advisor is permitted to file a protest in written before 30 minutes of end of event related to which protest is to be filed. The protest must be filed only if it has caused any direct or considerable damage to your Team or else severe action will be taken against the team.

3.15 Loopholes:

It is virtually impossible for a set of rules to be so comprehensive that it covers all possible questions about the vehicle's design parameters or the conduct of the competition. Please keep in mind that the safety remains of paramount importance during EBDC, so any perceived loopholes should have resolved in the direction of increased safety/concept of the competition.



SECTION 4

PARTICIPANTS INFORMATION

4.1 Eligibility Criteria

Competition is exclusively for **post graduates, undergraduates and diploma students** (1st to final year of any branch) to ensure that this is an engineering design competition.

Educational Qualification

- ✓ Team members must be enrolled as degree seeking undergraduate or postgraduate or diploma student from any department in a college or university.
- ✓ Team members who have graduated within seven (7) months period prior to the competition remains eligible to participate.

4.2 Team Entry Requirement

Guidelines for selecting team name and logo for team:

Team Name

- ✓ No two teams will have same names.
- ✓ In case of any dispute, the team using name from past will be given authority to use the name.
- ✓ If any two teams use the same name then the team registered first with full payment will retain the name and other team will have to change the team name.
- ✓ A meaningful and inspirational team name is required to distinguish the team in the competition.
- ✓ The chosen team name should not hurt the sentiments of any person/religion and should not have any religious word.
- ✓ The chosen team name should not criticize any social action of any group of people or an Individual.

Team Logo

- ✓ An attractive team logo (not downloaded from the internet) is required from the participating team.
- ✓ Teams should use their team logo in Reports, on their vehicle design and videos.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



Team Members

- ✓ Teams can have members from different colleges too. But they will represent only one of the college/ organization as per their mutual agreement.
- ✓ It is not necessary for students to represent their college, they can also represent other organization that is sponsoring/ supporting the team.
- ✓ If the team representing organization means, they should submit NOC from their organization. Age limit for the participants should be less than 24 years of age.
- ✓ In case the team is seeking help from some industrial professional/experienced personals, then it should be purely for the advisory purpose. Design of the vehicle should be done only by the team members.

Team Size

- ✓ A team can comprise of 8 to 25 members for the participation in EBDC'24.
- ✓ It is preferable that the team has good representation of students from 2nd, 3rd, or 4th year and from various department like Mechanical/Production/Automotive/Electrical & Electronics etc.
- ✓ Every Team should have a Captain and Vice-Captain.

Team Mail ID

- ✓ Teams are supposed to have their unique mail ID.
- ✓ Create your team mail Id in your own interest which should include your team name.
- ✓ Any query or communication with EBDC is to be done through this mail ID only.

Note: Any communication done by personal email ID or ID other than mail ID will not be entertained once the team has been registered. Queries will be resolved and replied within 48 hours. If you feel like your query has not been solved then you can contact us using the number given.

Team Advisor

- ✓ Participants should have at least one team advisor from their college/university/industry, whom they are representing. Teams can allowed to have a maximum of two team advisors.
- ✓ Each team is supposed to have a Faculty Advisor appointed by the college/university.
- ✓ The Faculty advisor is required to guide the team during the competition and will be considered by competition officials as the official college/university representative.
- ✓ Faculty advisors are allowed to attend virtual rounds along with their team in online mode but will not be allowed to provide answers or justifications for any question on behalf of the team.



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



- ✓ Faculty advisors may advise their teams on general engineering and engineering project management theory and act as a guide for the team. But it should be noted that at no point of time, faculty advisors can participate in the design of vehicle. This is done to ensure learning as well as design experience by participating students.

Note: In case of any changes in Team Leader/Faculty Advisor/Team name, they have to send an application with the details and signature of Previous Team Leader/Faculty Advisor and current Team Leader/Faculty Advisor from the Team Mail Id.

Driver's eligibility

- ✓ Team members (at least 2) who will drive the vehicle at any time during the competition must hold a valid, government issued two wheeler driver's license. Driver must be above 18 years of age.
- ✓ Individual medical/health insurance coverage is mandatory for drivers and is the sole responsibility of the participants. No medical insurance will be provided by EBDC organizers.
- ✓ Teams will be asked to submit these documents at the time of event during on-site registration.
- ✓ No claim by participants will be entertained in this regard at any stage of the event.

Permission from Institute

- ✓ Submission of permission letter of Institute is the sole responsibility of the participating team, if not followed this may lead penalizing or disqualification of the team from the competition.
- ✓ Teams should take prior permission from the institute /university to allow them to attend the event for 4 days and a copy of the same is to be submitted to EBDC organizing committee.
- ✓ College ID card is mandatory for all the team members and it will be asked for verification at any time of the event.

Note: Multiple Teams can participate from a single college/ University by applying the following rules:

- ✓ Every Team should have a different Team Name and Team Logo.
- ✓ No team member of one team can be part of other team.
- ✓ The Faculty Advisor must be different for both the teams.
- ✓ If one team's reports or designs or any other contents match with the other team, it may lead to disqualification of both the teams.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



Design Phase

- ✓ The participant's first design an Electrical Bike on the various designing software's available in the market.
- ✓ They then asses their designs on the analysis software's, Simulation and check for their practicability, reducing the chances of failure and ensuring a good and safe design.
- ✓ The design should be documented by the way of a complete manufacturing drawing of all the parts and assemblies, with individual costing along with engineering material, accompanied by a project report which can be used to convince a company to invest in manufacturing an optimized variant of this product after certification by the homologation authority of the country of manufacture.
- ✓ The external appearance of the vehicle should not overlap with any product in the market which may otherwise have legal implications by way of design-registrations; however, participants are encouraged to incorporate innovations, which if found patent worthy shall be supported for IP protection.
- ✓ The design will be competing against many other designs received from other institutions from all over India.

Build Phase

- ✓ The teams proceed to turn their imagination into reality, focusing on all the systems separately and then combining them to certify a formidable E-BIKE that is ready to become a part of the EBDC legacy.
- ✓ The student team may use any literature or references related to vehicle design and information from professionals or from academics.
- ✓ Vehicles entering for SIEP must be conceived, designed, fabricated and maintained by the team members without direct involvement from professional engineers, automotive engineers, racers, machinists or related professionals.



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



SECTION 5

REGISTRATION PROCESS

Registration process

Registration for a National Level Electric Bike Design Challenge is a threefold process which consists of following stages:

- ✓ Online Registration
- ✓ Registration fee payment
- ✓ Team details submission

5.1 Online Registration

Every team should register their details through online registration portal available in the official website of Mechatron Motors (www.mechatronmotors.com) or in our college website (www.srit.org). No team will be eligible for further process without registration. Individual team ID will be given after the registration.

5.2 Registration fee payment

After receiving confirmation mail from organizing committee, teams should pay/deposit a non-refundable amount of ₹25000 towards registration fee for the event into the below mentioned account. Registrations of EBDC will be open from 05th May to 30th August 2024. The fees details for those who will register during Early Bird Registration is,

- ✓ Entry Fees for Teams: INR 25,000/- (INR 500 extra per member if members exceeds more than 25)
- ✓ For Girls team: If the team is completely formed by girls only, the rebate is 50%. The Registration amount: INR 12,500/-

Mode of Payment:

Online:

- ✓ Money transfer through internet banking as per account details given below:
- ✓ UPI ID: 9688472728@ybl
- ✓ GPay / Phonepay / Paytm: 9688472728 (Veerakumar Sengottaiyan)



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



Offline:

Teams can deposit fees by following modes:

- ✓ NEFT through any bank
- ✓ Cash deposit through challan

| BANK ACCOUNT DETAILS | |
|----------------------|-------------------------|
| Account Name | VEERAKUMAR SENGOTTAIYAN |
| Account Type | Savings Account |
| Account No | 924010000255369 |
| Bank Name | Axis Bank |
| IFSC Code | UTIB0003301 |
| Branch Name | Ganapathy, Coimbatore. |

If a team is paying offline, they need to send a payment proof to mechatronmotors@gmail.com.

Registration Fees confirmation

- ✓ Registration fees will be confirmed within 24 hours of payment.
- ✓ If the payment is followed by a Bank Holiday then confirmation will be done after 48 hours.

Registration fee deadline and refund:

Registration fees must be paid before the deadline or within 15 working days after the registration.

Registration fees are non-refundable and will not be transferred to any subsequent year's competition.

5.3 Team details submission

After the team registration and fees payment, organizing committee will send the team registration form to the team mail id. The team should take printout of the registration form and fill all the team members' details. The scanned copy of filled registration form should be send to the event official mail mechatronmotors@gmail.com which is duly signed by team captain, mentor and HOD/Principal of the institution/university.



SECTION 6

VEHICLE DESIGN REQUIREMENTS

EBDC 2024 intends to strengthen the design competence of participants by encouraging engineers to indulge in core engineering design activities that has potential intellectual property value. A design log sheet shall be maintained for completion of activities as mentioned in points table. The entire vehicle must be designed and documented by the students without taking direct help from professional engineers or any company employees. The student team may use any literature or references related to vehicle design and information from professionals or from academics.

The Event will be in two classes:

- 1. **Retrofitting Class** – The inclusion of this segment of retrofitted bike is to encourage innovation in conversion technologies, pushing the boundaries of efficiency and accessibility in transforming traditional motorcycles into electric-powered ones. Promotes sustainability by extending the lifespan of traditional motorcycles through electrification.*
- 2. **Self-Manufactured Class** – The purpose of this segment is to manufacture an electric motorbike which in future meets the commercial requirements that can help the society to incline towards the E- Mobility. By encouraging participants to design and fabricate their electric bikes from scratch, the challenge fosters a spirit of entrepreneurship, creativity, and self-reliance.*

The idea of integrating both segments in the EBDC embodies a comprehensive approach to innovation, sustainability, and inclusivity. Together, these segments foster a vibrant ecosystem of diverse solutions, ranging from grassroots DIY projects to cutting-edge innovations, all contributing to the advancement of electric mobility. This can fulfil the needs and aspiration of young generation, who are willing to contribute and use eco-friendly green mobility solutions for the greater good of the society and the environment.

6.1 General Design Requirements

Retrofitting Class

- ✓ It's mandatory to keep the dimensions of the bike same as they were before retrofitting. The battery pack, motor and any other innovative conclusions should not change the length, width and height of the bike.
- ✓ Maximum width of the bike will be measured from end to end points of handle.
- ✓ All parts of the bike including the driver should lie within the end to the end points of the handle.
- ✓ The maximum weight of the retrofitted bike must not exceed 150kg.

Self-Manufactured Class

Vehicle Dimensions

| S.NO | PARAMETER | DIMENSIONS (in mm) |
|------|------------------|-----------------------|
| 1. | Overall Length | 2100 (Max.) |
| 2. | Overall Height | 1200 (Max.) |
| 3. | Overall Width | 970 (Max.) |
| 4. | Wheel Base | 1550 (Max.) |
| 5. | Ground Clearance | 150 (Min.) |
| 6. | Handlebar Height | 800 (Min.) |

***It is compulsory to have a paddock stand for both classes.**

6.2 Frame Restrictions

Retrofitted class:

- ✓ Teams are instructed to use the same frame as availed from the bike.
- ✓ All welding points in the frame should be intact and damaged frames will be disqualified onspot.
- ✓ The frame will be strictly inspected in the technical inspection.
- ✓ Bodyworks can be of any material and ensure good aesthetics.

Self-Manufactured class:

- ✓ Teams are free to use any type material for design of AISI or ASTM standard seamless pipe for fabrication
- ✓ Teams are required to design their own chassis with double cradle frame only.
- ✓ Tubular frame must be used with minimum outer diameter of 25mm and minimum thickness of 2mm.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



- ✓ The frame must contain the motor mounting location, steering head location, battery mounting space, rear suspension linkage.
- ✓ The footrest should not be lower than the bottom-most frame part.
- ✓ There must be either a side stand or a center stand.

6.3 Frame Material Specifications

Retrofitted class:

- ✓ Teams must maintain the structural integrity of the original frame while accommodating electric components.
- ✓ Certificates should have the date of testing and it should be after the purchasing date. Testing should be conducted from certified laboratory only (NABL Accredited Lab)
- ✓ Failing to produce the certificate at the time of inspection, Technical Inspector's judgment will be the final judgment whether to pass the vehicle with or without Penalty.

Self-Manufactured class:

- ✓ Teams can use any material – steel/aluminum/carbon fiber for the frame.
- ✓ In the case of steel, minimum carbon percentage should be 0.1%.
- ✓ Teams need to produce the material composition and strength test certificate from certified labs (NABL Accredited Lab) with the GST purchase bills.
- ✓ Failing of producing the certificate at the time of inspection, Technical Inspector judgment will be the final judgment whether to pass the vehicle with Penalty or disqualify.

6.4 Suspension and Steering

Retrofitting Class:

- ✓ Teams are allowed to use the same suspension system of the bike.
- ✓ The mounting of the front suspension should be done according to the rake/caster angle of the bike.
- ✓ Teams are allowed to use either mono-shock or twin shock suspension at the rear as acquired from already purchased bike.



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- ✓ If any team wishes to change the front or the rear or both suspensions, they have to mention the same in the design report which will include the suspension design, CAD Model, Dynamic simulations and how it differs from bikes original system.

Self-Manufactured Class:

- ✓ Teams are allowed to use a pre-fabricated suspension system of any bike at front as well as at the rear.
- ✓ The mounting of the front suspension should be done according to the rake/caster angle of the bike.
- ✓ Teams can customize both the suspension system.
- ✓ Front: In the Front, there should be double shock telescopic hydraulic Suspension.
- ✓ Rear: Swing arm with mono suspension or dual swing arm suspension can be used.
- ✓ If Teams customize the suspension system, they have to mention entire suspension design report and all calculations including CAD model and dynamic simulations.

6.5 Brakes

- ✓ The braking system must be installed on both the wheels (Front and Rear).
- ✓ Teams are allowed to use any braking system like drum brake or disc brake on rear wheel.
- ✓ The brake should not be wire actuated. It can be actuated through mechanical linkage.
- ✓ There should be minimum 1 disc brake in the vehicle.
- ✓ One brake should be hand operated and other should be foot operated as in normal bikes.
- ✓ Disc brake should be of hydraulic actuation. Wired actuation is strictly prohibited.
- ✓ The brake light (Red colour) must be used for showing the brake's actuation for both front and rear.

6.6 Bike Seat

- ✓ Self-Manufactured class must use pre- manufactured seat and its mounting should be according to the seat.
- ✓ Retrofitting class must use same seat. In case if the seat is damaged in Retrofitting Class they can alter the seat but it should be of same bike



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6.7 Dashboard System

- ✓ Team have to modify the dashboard and it should be rigidly mounted.
- ✓ Dashboard should display reading of the speed, Battery level indicator and Battery Temperature.
- ✓ Teams are allowed to use a Tablet, Mobile or any other Digital Integrated Dashboard in the Bike.
- ✓ Maximum dimensions of the dashboard: * Length – 8 inch, * Width – 6 inch.
- ✓ Teams should take care the dashboard should not exceed beyond headlight.
- ✓ The dashboard should be visible and accessible to the rider easily.

6.8 Tyres & Wheels

- ✓ The minimum diameter of the rim size is 17 inches.
- ✓ Teams are allowed to use alloy wheels as well as spoke rims.
- ✓ The maximum allowed tire width is 7 inches.
- ✓ If proper tyres are not used, team shall have the penalties.

6.9 Others

- ✓ Teams must use two mirrors attached to the handle bar so that the rear view can be clearly visible to the driver.
- ✓ There should be indicator lights on front and rear for turning left or right. The light emitting must be of orange colour.
- ✓ An audible warning horn must be fitted permanently to the bike. It must be capable of giving sufficient audible warning of the presence of vehicle.
- ✓ Head light and tail light should be connected to the battery
- ✓ The vehicle should be equipped with the main stand or side stand for the support.
- ✓ The brake light (red colour) must be used for showing the brakes actuation.
- ✓ Innovation can be attempted in the following areas of suspension, brake, electrical drive, frame, handle.
- ✓ All the drive train rotating parts like belts, shafts, chains etc., must be covered with chain guards and wheels must be properly covered with the mudguards.
- ✓ Fasteners (grade M6 or M8) used in the vehicle must have three to five threads visible past the nut.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



- ✓ Teams are required to use the lock nuts at every joint of the vehicle where the nuts are required. Team fails to do so will not be allowed to pass TI (Technical Inspection) or penalty will be given.
- ✓ Use of lock-nuts in full vehicle is mandatory. Riveting is not allowed.

6.10 Electrical System

General Electrical System Overview:

- ✓ The electrical system must include: Battery pack, Motor, Controller, Brake light, indicator and all other equipment should use this power source.
- ✓ The brake light (red colour) must be used for showing the brakes actuation.
- ✓ For electrical innovations, the power supply must be taken from the battery Pack.

6.11 Battery

- ✓ Teams can choose any kind of lithium ion cell chemistry (NMC, LFP etc.)
- ✓ Allowed Nominal Voltage will be from 48V to 72V
- ✓ Energy Allowed: Minimum Energy: 1.5 KWh Maximum Energy: 2.5 KWh
- ✓ Battery must be able to provide power to all safety items (Brake Light, Indicator Lights, Horn) for the duration of entire event.
- ✓ Batteries must be properly insulated with the insulating Material.

Considerable Factors for Battery:

- ✓ Lithium ion battery pack must have a BMS by default and the same rated for EV (Electric Vehicle) application providing proper cell balancing voltage protection, over current protection, short circuit protection.
- ✓ The technical details along with data sheets of lithium ion cells and BMS used in the battery packs must be submitted along with design report.
- ✓ The battery cover should be made up of rigid plastic/ glass fiber/ sheet metal, with an insulating coating.
- ✓ The cover material of battery pack must be fire and electric proof and properly insulated.
- ✓ The casing of the battery should be fixed with the chassis. Team can use cooling fan or hoses for this purpose.
- ✓ The casing of the battery should be fixed/ welded/ fastened (using lock nuts) with the chassis.

6.12 Charging System

- ✓ Team can have their own charging system design but charger input voltage is fixed at 230V 50Hz AC
- ✓ Charging current can be set according to design needs (6A – 15A allowed).
- ✓ A charging system/charger should be rated for the battery pack according to engineering specifications and should be rated for the battery and insulated.
- ✓ The vehicle /charger should indicate user if any charging operation is underway through LED light.
- ✓ The charger should have over voltage protection, over current protection, short circuit protection, reverse protection.
- ✓ Proper plugs should be used for connecting the Li-ion battery charger to the battery pack there should not be loose running wires.
- ✓ No on board charging systems are allowed.

6.13 Motor

- ✓ Teams can use BLDC motor of any type. No constrains on RPM and Torque
- ✓ Allowed Nominal voltage will be from 48 V to 72 V
- ✓ Maximum motor power should not exceed 2000 watts
- ✓ The motor and drive train should be mounted properly (use bolts and nuts)
- ✓ On the original bill the wattage and voltage of motor must be clearly mentioned.
- ✓ Controller: Teams are free to use any type of controller suited for the motor but have to show the specification sheet of the controller.
- ✓ Transmission: Teams are free to use any type of transmission
- ✓ The transmission must be clearly visible at the time of engineering design presentation event.
- ✓ The transmission can be chain drive, belt drive or gears
- ✓ Teams are allowed to use BLDC Hub motors also.

6.14 Transmission

- ✓ It is mandatory for the teams to use a rear wheel drive.
- ✓ Any transmission and drive train may be used. Either of chain or belt drive can be installed.
- ✓ There is no limitation with the sprocket ratio installed in the bike. Teams are allowed to make changes to the sprocket ratio.

6.15 Kill Switch

- ✓ Teams must install two kill switches. Both the kill switches should be red in colour.
- ✓ One switch must be located in such a way that it is easily accessible to the rider.
- ✓ The other should be at one side of the vehicle and must be clearly visible from the outside.
- ✓ The kill switches must disconnect all the power sources except the head light and the brake light.
- ✓ The head light and the brake light must be operated regardless of the kill switch setting.
- ✓ The kill switches must be mounted rigidly. Small stickers indicating “KILL SWITCH” must be attached near the kill switches.

6.16 Throttle

- ✓ The throttle installed in the bike must be retractable.
- ✓ The throttle must be covered with a proper grip comfortable enough for the rider's actuation.

6.17 Fusing

- ✓ Since the battery has very low internal impedance, instantaneous high currents can flow which can seriously damage the battery.
- ✓ The battery pack must have a proper short circuit protection. Teams should use good quality working Mini circuit breakers (MCB) for protecting it from high loads.
- ✓ The current rating of MCB should not be greater than the cable current carrying capacity. It should be greater than or equal to the maximum current that the system is carrying. **Do not use a MCB lower than the total current of the circuit.**
- ✓ The current rating of the MCB should be equal to or greater than the Motor Controller rating.
- ✓ Teams should mandatorily use an MCB (mini circuit breaker).

6.18 Wiring

- ✓ Wiring should not go below the chassis. Wiring should not be going through metallic pipes.
- ✓ It should be properly covered with insulated plastic pipe.
- ✓ Proper insulation must be there on both the terminals of the battery.

6.19 Safety

- ✓ Teams should have a fire extinguisher of minimum 2kgs at event site out of which 1 kg must be rigidly mounted on the Vehicle.
- ✓ It should be of ABC type and very easily accessible by both driver and outsider also.

SECTION 7

RIDERS SAFETY GEAR

The following are the minimum requirements and restrictions that will be inspected thoroughly at the technical inspection, at any stage of competition. All the parts of Rider's Safety Gear must meet the required rating (specified). No rider would be allowed to drive the vehicle without the complete rider's safetygear in any of the dynamic event. The complete rider's gear will consist of the following items:

7.1. Rider'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 one of the following standards and be labelled as such
 - ❖ SFI 3-2A/1 (or higher)
 - ❖ FIA Standard 1986

7.2. 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 acceptable and should cover the rider body completely from neck down to ankles and wrists.

7.3. 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
 - ❖ SFI 31.2A, SFI 31.1/2005
 - ❖ FIA 8860-2004, FIA 8860-2010
- ✓ Open faced helmets are not allowed. **Meanwhile the DOT certified helmets are allowed.**
- ✓ All helmets to be used in the competition must be presented during Technical Inspection where approved helmets will be stickered.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



7.4. Balaclava

- ✓ A balaclava which covers the rider's head, hair and neck, made from acceptable fire resistant material or a full helmet skirt of acceptable fire resistant material.
- ✓ The balaclava requirement applies to riders of either gender, with any hair length.

7.5. Neck Support

- ✓ Neck Support- The neck support must be a full circle (360°) and SFI rated.

7.6. Knee Pads and Elbow Pads

- ✓ Proper knee and elbow pads must be used.

7.7. Gloves

- ✓ Leather gloves with extra foam are acceptable. Teams can use the good quality of bike gloves.

7.8. Shoes

- ✓ Fire resistant shoes made from acceptable fire resistant material shoes must be certified to the standard and labelled as such
 - ❖ SFI 3.3 1.4.8.2
 - ❖ FIA 8856-2000

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

7.9. Socks

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

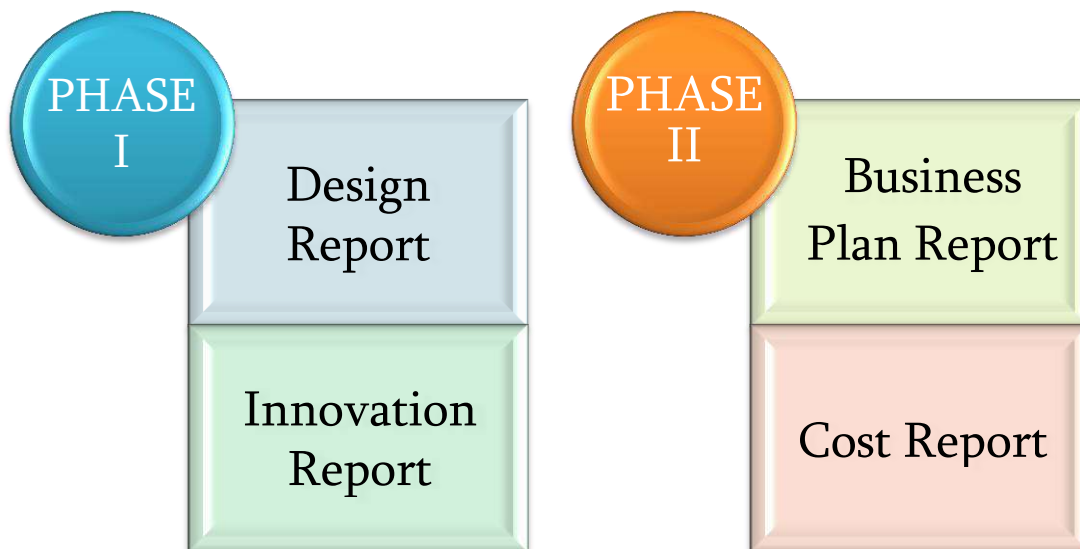
Note: No exchange of safety gear is allowed during any dynamic category.

SECTION 8

STATIC ROUND -PHASE I REPORT SUBMISSIONS

Overview

During report submission, all the research and development activities carried out about the vehicle are to be submitted online. All the details should be sent to the official mail id that has been provided. The prime objective is to design, analyze and prepare documentation of the Electric Bike. The design should be complete in all aspects to the extent of being considered ready for manufacturing. The teams will be evaluated based on their knowledge of the basic automotive design, analysis, and documentation about the Electric Bike design requirements. Further details/guidelines about the report submission will be sent to the official mail id of the team. The report submission round will comprise of two phases.



Note:

All the reports should be mailed through only mechatronmotors@gmail.com in PDF format before the deadline.

The submission of reports should be named as **EBDC_TEAM ID_REPORT TYPE**
(Report Types: DR/IR/BR/CR)



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



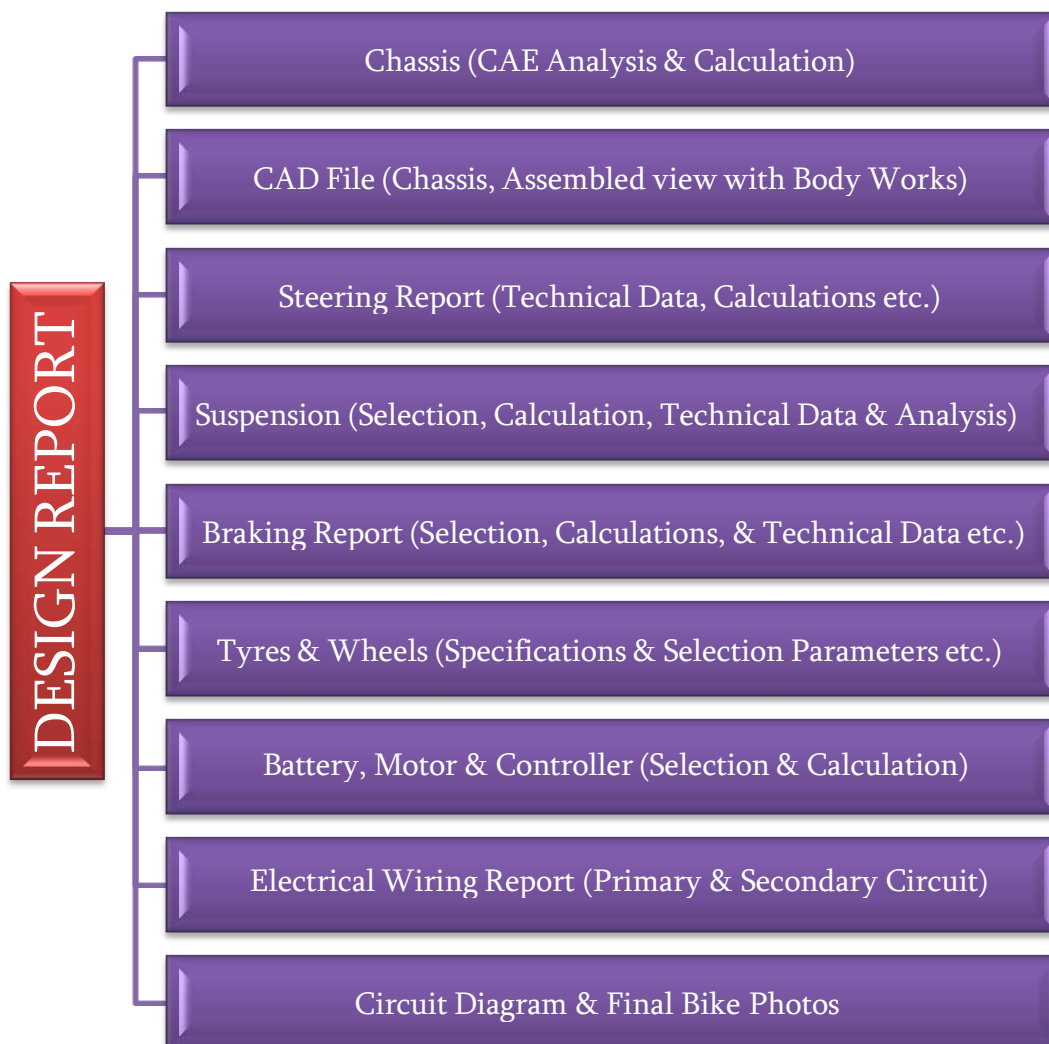
8.1 Design Report (100 Pts.)

The objectives of the Engineering Design report are to assess the detailed documentation of the design process, showcasing the innovation, creativity, and technical expertise of participants in the EBDC. The report outlines technical specifications, including dimensions, materials, components, and performance metrics, allowing judges to assess the feasibility and viability of the electric bike designs. Participants use the design report to demonstrate their problem-solving approach, highlighting challenges encountered during the design process and innovative solutions implemented to address them. Students will be judged on their ability to create design specifications and meet them such as their skills in computer aided drafting, analysis, testing and development, as well as manufacturability, serviceability, system integration, and how the vehicle functions as a whole. The vehicle 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.

- ✓ The design report should contain design and details of all the components used in the bike and the reason for selection of that particular component/system.
- ✓ Team should include the master layout of the electric bike in 2D and 3D. All pages must be of A4 size.
- ✓ Design report will be verified with the rulebook, so that the design must be done carefully.
- ✓ The design report must not exceed forty (40) pages including the table of contents and cover page.
- ✓ Soft copy of the design report must be submitted on or before the dates mentioned on the Event Schedule (Refer Section 1).
- ✓ The design drafts should show the basic design views of the major components.
- ✓ 20% deviation is allowed in the final report from that of reports submitted for first time. If the deviation is more than the allowed 20%, then the team points will be reduced.
- ✓ The reports must be submitted in the PDF format. The documents must be in a single file.
- ✓ The file name should be in the format **"EBDC_TEAM ID_DR"**.
- ✓ If any team fails to submit the reports in given time there will be a penalty of 10 points per day to the team for 5 days. If the team fails to submit further then the team will not be allowed for final design presentation.
- ✓ It is the responsibility of judges to deduct point if the team fails to adequately explain the engineering concepts and construction of the Bike.

- ✓ Teams may bring any supporting material with them for design presentation like photographs, drawings, plans, charts, or any other material that may support the presentation of E-Bikes and discuss about their development process.
- ✓ In design presentation, teams will be evaluated on the basis of their design and questionnaire. The top scorer team will be given **“Best Engineering Design Award”**.
- ✓ The design judges will evaluate the engineering effort based on the team’s design report and responses to the questions followed by inspection of the designed Bike.

The design report should include following contents





8.2 Innovation Report (100 Pts.)

The innovation report serves as a platform for participants to highlight the novel and pioneering aspects of their electric bike designs, showcasing unique features, functionalities, and technological advancements. It allows participants to articulate the innovative solutions implemented to address specific challenges or to enhance the performance, safety, sustainability, or user experience of their electric bike designs. The report enables judges to evaluate the level of innovation demonstrated by participants, considering factors such as originality, creativity, and potential impact on the electric bike industry. Participants use the innovation report to differentiate their designs from competitors, positioning their electric bikes as cutting-edge solutions that push the boundaries of conventional design and technology. By providing a detailed analysis of the innovative aspects of their designs, the report facilitates informed decision-making by judges and sponsors, recognizing and rewarding groundbreaking contributions to the Electric Bike Design Challenge. Mechatron Motors strongly believe in smart technology and innovation towards electric bikes. Hence we recommend all the teams to develop some innovation in their vehicle. Teams need to come up with entirely new and unique idea of innovation which is to be easily installed in electric bikes.

- ✓ The innovation report should contain all the details of components used for innovation and the reason for selection of that particular component/system.
- ✓ The design report must not exceed twenty (20) pages including the table of contents and cover page.
- ✓ All pages must be of A4 size.
- ✓ Soft copy of the innovation report must be submitted on or before the dates mentioned on the Event Schedule (Section 1).
- ✓ The report must be submitted in the PDF format as a single file.
- ✓ The file name should be in the format **"EBDC_TEAM ID_IR"**.
- ✓ In innovation presentation, teams will be evaluated on the basis of their novelty and questionnaire.
- ✓ The top scorer team will be given **"Best Innovation Award"**.

The parameters on which the Judging will be done are as Follows:

- ✓ Cost vs. Utility
- ✓ Eco-Friendly
- ✓ Integration of Innovation
- ✓ Future Scope
- ✓ Real world Application

8.3 Business Plan Report (50 Pts.)

The business plan report serves as a strategic roadmap for participants to articulate the commercial viability and market potential of their electric bike designs, outlining key business objectives, strategies, and financial projections. It provides participants with an opportunity to demonstrate their understanding of market dynamics, customer segments, competitive landscape, and sales channels, supporting informed decision-making in the commercialization of their electric bike designs. The report enables judges to evaluate the feasibility and scalability of participants' business models, considering factors such as revenue streams, pricing strategies, distribution networks, and marketing plans. Participants use the business plan report to justify investment opportunities, attracting potential investors, partners, or sponsors by showcasing the profitability and growth potential of their electric bike designs. By presenting a comprehensive business plan, participants can effectively communicate their vision, goals, and strategies for bringing their electric bike designs to market, contributing to the overall success and sustainability of the Electric Bike Design Challenge. The report must be submitted in the PDF format as a single file (max 25 pages) and named as “EBDC_TEAM ID_BR”. Teams are expected to work upon the following points and prepare both the report and the presentation accordingly;





8.4 Cost Report (50 Pts.)

The cost report serves as a detailed analysis of the manufacturing and operational expenses associated with the production and maintenance of electric bike designs, aiding participants in optimizing cost efficiency and profitability. It provides participants with insights into the cost breakdown of various components, materials, manufacturing processes, and operational expenses, enabling informed decision-making in budget allocation and resource management. The report allows judges to evaluate the cost-effectiveness and affordability of participants' electric bike designs, considering factors such as material selection, manufacturing processes, material costs, and overhead expenses. Participants use the cost report to demonstrate their ability to balance performance, quality, and cost considerations in the design and production of electric bikes, ensuring competitiveness in the market.

By presenting a comprehensive cost analysis, participants can identify opportunities for cost optimization, risk mitigation, and value engineering, ultimately enhancing the overall economic feasibility and success of their electric bike designs in the Electric Bike Design Challenge. Teams have to present a brief overview of design features or fabrication processes that are innovative or are expected to result in significant cost savings. Teams may also use the overview to explain items or processes that might appear to be discrepancies within the report. In short teams have to explain the ways in which they have reduced the total cost of fabricating the vehicle. Cost documentation must mention in full retail Indian prices. The report is expected to be comprehensive, well documented, truthful and accurate. The report must be submitted in the PDF format as a single file (max 6 pages) and named as **“EBDC_TEAM ID_CR”**.

Note:

- * All the reports should be submitted on or before due date (Refer section 1)
- * Reports should be in pdf format and mailed only to (mechatronmotors@gmail.com)
- * Late submission will lead to penalty of marks
- * Presentation Guidelines of all reports will be shared prior to the event dates



SECTION 9

STAIC ROUNDS - PHASE II TEAM PRESENTATION

9.1 Design Presentation (100 Pts.)

- ✓ The objective of this design presentation is to evaluate the engineering efforts that went into the design of the E-Bike and how the engineering meets the intent of the market.
- ✓ Students will be judged on the creation of design specifications and the ability to meet those specifications, computer aided drafting, analysis, testing and development, manufacturability, serviceability, system integration and how the vehicle works together as a whole.
- ✓ The vehicle design will be verified with the design report and deviations from the design report should not be allowed until and unless completely justify with documented reasons.
- ✓ Same way, EBDC understands the student's difficulties during the manufacturing process of the E- Bike. For the benefit of the student's deviation up to 20% from the design report is acceptable. Further, it will lead to penalized accordingly. The best CAD design will be awarded **"Best Engineering Design Award"**.
- ✓ Team should submit the Master layout of the electrical 2-wheeler showing all key dimensions drawing. The decision of judges will be final one.

9.2 Innovation Presentation (100 Pts.)

- ✓ Mechatron Motors strongly believe in smart technology and innovation. So, we recommend to all the teams to develop some unique innovation in their vehicle and present in the event.
- ✓ An innovation is considered performed if it is introduced to the market (product innovation) or implemented in the production process (process innovation). Innovation includes many researches, technological, organizational, financial and commercial activities.
- ✓ The innovation installed/integrated in the E-Bike is to be presented in any round of technical inspection.
- ✓ The presented concepts will be discussed with the team and its working will be examined by the judges during technical inspection.
- ✓ The team needs to present innovation report and PPT's at the time of explaining the innovation.
- ✓ The innovation should be working and not just for the concept.



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



9.3 Business Plan and Cost Presentation (150 Pts.)

- ✓ **Business plan Presentation** aim is to provide an opportunity for the engineering students to prepare a strategic business model of establishing a firm which can produce their own design at a certain rate (say 10,000 vehicles per year) and market it.
- ✓ For the purpose of the presentation, teams are to assume that the judges are to be a mixed group of corporate executives who may have experience in marketing, production and finance as well as engineering.
- ✓ The business plan must relate to the specific prototype race vehicle entered in the competition. The quality of the actual prototype will not be considered as part of the B-Plan judging.
- ✓ Teams are advised to prepare the business model by working out on the following points in the presentation:
 - ❖ Unique Selling Proposition (USP)
 - ❖ Market/Customer Survey (to analyze the product demand)
 - ❖ Different concepts & variants
 - ❖ Plant layout for mass production
 - ❖ Cost of product in mass production
 - ❖ Break-Even Analysis (in terms of time & quantity)
 - ❖ Return on Investment (in terms of time & money)
 - ❖ Marketing strategies (sales & after sales)
- ✓ To convince the potential investors or partners that the team's presentation is worthy of their time, it is required that an executive summary is submitted before the competition. The executive summary should contain a brief description of the team's business plan.
- ✓ The executive summary must not exceed one page. The vehicle number and university (or college) name must be written in the top right corner.
- ✓ **For cost presentation**, teams have to present the amount spent for their respective electric bikes (either self-manufacturing or retrofitted vehicle) during presentation.
- ✓ Also, teams have to submit copies of receipts, invoices, price tags, catalogue pages, on-line prices, or other documentation, to substantiate the costs of the parts and materials of any item costing more than Rs. 200.
- ✓ Cost documentation must be at full retail Indian prices.
- ✓ The report is expected to be comprehensive, well documented, truthful and accurate.



9.4 On-Site Design Evaluation (75 Pts.)

- ✓ The design judges will evaluate the engineering effort based on the team’s design report and responses to the question and inspection of the bike.
- ✓ It is the responsibility of judges to deduct point if the team cannot adequately explain the engineering and construction of the Bike.
- ✓ Teams may bring any support material with them for Design Inspection like any photographs, drawings, plans, charts, or any other material that support the presentation of E-Bike and discussion of their development process. Use of laptops, posters, notebooks and binders are allowed.
- ✓ The vehicle will be examined and evaluated by the judges at the any time of the 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.
- ✓ The top scorer team will be awarded **“Best Build Quality Award”**.
- ✓ Based on the bike visual look, usability, functionality and comfort, the team will be awarded as **“Best Ergonomics and Aesthetics”**.

9.5 Weight Test (75 Pts.)

- ✓ The E-Bike must be kept on the Platform using the Centre Stand.
- ✓ Only one driver and the captain are allowed into the Weight Test Arena.
- ✓ If any parts are removed from E-Bike before coming to weight test that may lead to the penalty.
- ✓ The E-Bike that has the lowest weight will be awarded **“Light Weight Award”**.

9.6 Presentation Scoring

The presentation event will be judged based on certain Categories like:

- ✓ Content of Presentation
- ✓ Presentation Quality
- ✓ The Speaker’s delivery
- ✓ The effectiveness of Visual aids.
- ✓ The Team’s response to the judge’s questions.
- ✓ **The teams score will be the average of the individual judge’s scores.**
- ✓ Number of judges will be vary for each static presentation rounds.

For example, if four judges are available in design presentation round means, then scoring criteria is as follows:

| Team Name | Judge 1 (100) | Judge 2 (100) | Judge 3 (100) | Judge 4 (100) | Total (400) | Team Score (100) (Average of 4) |
|-----------|------------------|------------------|------------------|------------------|----------------|------------------------------------|
| XXXX | 50 | 60 | 70 | 80 | 260 | 65 |



SECTION 10

DYNAMIC ROUNDS

In the Dynamic Events there will be some qualifying rounds. The teams that had cleared the qualifying rounds will be allowed into the Other Rounds.

10.1 Self-Certification Check Sheet- Pre-inspection Required

- ✓ Before bringing their vehicle to technical inspection each team must
 - (1) Pre inspect the vehicle for compliance with the rules
 - (2) Complete the official Self Certification Check Sheet (Download from mechatronmotors.com & also sent to team mail)
 - (3) Completed check sheet must be signed by the faculty advisor and team captain.

NOTE: Teams presenting Self Certification Check Sheets that are

- ✓ *Incomplete*
- ✓ *Inaccurate (i.e. do not correspond to the actual condition of the vehicle)*
- ✓ *Are found to have the items not in accordance with the rules, or*
- ✓ *Do not represent a serious effort at pre-inspection will be denied inspection at that time and sent back to the end of the inspection line.*

10.2 Technical Inspection

- ✓ The Technical Inspection is a Qualifying Round.
- ✓ Every team will be given three (3) chances to clear the TI.
- ✓ **If any team fails to clear TI in given chances, it leads to disqualification of the team from the Event.**
- ✓ Only 4 team members (Captain & 3 other members) and drivers will be allowed to Technical Inspection Arena.
- ✓ The Technical Inspection consists of three (3) separate parts as follows:
 - (1) *Rulebook Inspection*
 - (2) *Safety Inspection*
 - (3) *Electrical Inspection*



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ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



10.2.1 Rulebook Inspection

In this the Technical Inspection team will check whether the vehicle was manufactured by following the Rules and Regulations in the Rulebook or not. Any deviation from rulebook may lead to the point reduction.

10.2.2 Safety Inspection

- ✓ In this the examination, driver safety is mainly concerned.
- ✓ One of the drivers must come to TI by wearing all the driver gear and will be thoroughly inspected.
- ✓ It is responsibility of driver to bring all the driver gears that he use for race to the TI arena and get them stickered.
- ✓ The Fire extinguisher's mounting and location will also be checked. Proper bills should be submitted.

10.2.3 Electrical Inspection:

- ✓ Electrical & electronics used in the vehicle will be inspected.
- ✓ All the wirings should be safe and high current circuits must be isolated from driver.
- ✓ Batteries must be mounted with sound engineering practice and not come loose during any part of event.
- ✓ Battery terminals must be insulated properly. Failing this, the technical inspectors may debar the team from the dynamic events.
- ✓ Battery pack should be mounted/connected in such a way, that it can be removed/ disconnected. Use of mechanical fixings such as nut bolts to hold the batteries are recommended.
- ✓ Battery terminals should be tight and should not generate a spark during the race.
- ✓ Proper Functioning of Brake Light, Kill Switches, Horn, Side Indicator Lights and side & centre stand will be checked.

NOTE: "As Approved" Condition

- ✓ Once a vehicle has passed technical inspection its configuration should not be modified.
- ✓ Non-identical parts not approved will be subject to an appropriate performance penalty.
- ✓ Any repairs of a part that is not identical as the broken part must be approved prior to the repair by judges or organizers.
- ✓ Minor adjustments permitted by the rules and normal vehicle maintenance are not considered modifications.

NOTE: Driving Off-Site is absolutely prohibited. Teams found to have driven their E-Bike at any off-site location may lead to disqualification from the Event.



10.3 Brake Test:

- ✓ Brake test does not have any points but it is mandatory for a vehicle to pass the brake test to participate in further dynamic events.
- ✓ The vehicle must stop within a straight line after the brake is applied on the vehicle and the wheels on which the brake mechanism is acting must get locked immediately after the pedal is pressed.
- ✓ Each vehicle will be given only 2 attempts to clear the brake test.
- ✓ After the successful brake test attempt, the vehicle will not be allowed to avail the remaining tests.
- ✓ Vehicle dynamic stability will also be checked during this test, vehicle possessing abnormal behavior will be checked again.
- ✓ The TI can be cancelled if the vehicle is found dynamically unstable or unsafe in the Brake Test.
- ✓ If these issues found in the bike during the inspection, Technical Inspection will be cancelled and chance will be provided to the team to rectify it.

10.4 Acceleration Test (100 Pts.)

- ✓ After the successful completion of brake test, vehicle will be allowed for the acceleration test.
- ✓ In this test, the vehicle is asked to accelerate from the starting line till the end and the points will be awarded according to the time taken by the vehicle to reach the end line from the starting line.
- ✓ The vehicle has to brake at the end line and the vehicle should not drift.
- ✓ The vehicle has to accelerate at its maximum along a 50m track and then apply brake and stop the vehicle in the next length of track i.e. 5 m.
- ✓ The time taken by the vehicle for covering 50m length will be considered to determine the acceleration of vehicle.
- ✓ If the vehicle did not stop within the specified distance, the brake & acceleration test will not be cleared and team has to attempt again.
- ✓ If the team has cleared the brake test, they may still take remaining attempts to improve their acceleration time.

$$\text{Acceleration Score} = 100 \times (T_{\text{longest}} - T_{\text{yours}}) / (T_{\text{longest}} - T_{\text{shortest}})$$

Where:

T_{shortest} = fastest time by any vehicle

T_{yours} = time for the vehicle to be scored

T_{longest} = Slowest time by any vehicle

NOTE: Rules can be changed at any time of the event based on the situation (distance for acceleration or braking) might be changed if required.

10.5 Autocross Test (100 Pts.)

- ✓ The objective of the autocross event is to evaluate how well electric bikes respond to quick changes in direction, demonstrating their agility and responsiveness in navigating tight corners and obstacles.
- ✓ The track layout often includes sections that require rapid acceleration and precise braking, allowing participants to showcase the performance capabilities of their e-bikes in terms of speed and control.
- ✓ E-bikes must demonstrate stability and balance while navigating through the autocross course, especially during high-speed maneuvers and sudden changes in direction.
- ✓ Autocross tests not only assess the capabilities of the e-bike but also the skill and technique of the rider in effectively controlling the bike through the track. Autocross events are often spectator-friendly, offering an exciting and dynamic showcase of speed, skill, and precision as riders navigate the challenging course.
- ✓ The vehicle should not come out of the track and the driver should not place his leg on the ground while performing the test. Only one attempt will be allotted to every team.
- ✓ Timings will be checked out using electronic system or stop watches. Track details will be given at the time of event.

$$\text{Autocross Score} = 100 \times (T_{\text{longest}} - T_{\text{yours}}) / (T_{\text{longest}} - T_{\text{shortest}})$$

Where:

T_s = smallest time taken by any vehicle

T_y = time for the vehicle to be scored

T_L = maximum time taken by any vehicle

****The penalty criteria in the Autocross round will be revealed during the event time**

10.6 Off Road Test (100 Pts.)

- ✓ The purpose of an off-road test in an EBDC is to evaluate the bike's performance and durability in challenging off-road conditions. Unlike traditional road races, off-road tests focus on assessing the bike's ability to handle rough terrain, steep inclines, obstacles, and adverse weather conditions
- ✓ Off-road tests evaluate how well the e-bike adapts to different types of terrain, such as gravel, mud, rocks, roots, and uneven surfaces, demonstrating its versatility and capability to handle varied riding conditions.
- ✓ The test allows riders to assess the effectiveness of the bike's suspension system in absorbing impacts and vibrations encountered on rough terrain, ensuring a comfortable and controlled ride over long distances.

- ✓ Off-road tests require riders to demonstrate advanced riding skills, technique, and strategy in navigating technical terrain, choosing optimal lines, and maintaining momentum and control over obstacles and challenging features.
- ✓ Team vehicle will start from starting line and it should travel along the track traversing all the obstacles in-between the track. Only one attempt will be allotted to every team.
- ✓ Additional obstacles could be there subject to final track preparation at the event.
- ✓ Timings will be checked out using electronic system or stop watches. Track Details will be given at the time of event.

$$\text{Off Road Score} = 100 \times (T_{\text{longest}} - T_{\text{yours}}) / (T_{\text{longest}} - T_{\text{shortest}})$$

Where:

T_s = smallest time taken by any vehicle

T_Y = time for the vehicle to be scored

T_L = maximum time taken by any vehicle

Penalties:

- ✓ If the vehicle stops or gets stuck for more than 10sec at any instant during this round than a penalty of 5 second will be added to overall time taken by the vehicle to complete.
- ✓ If the vehicle stops or gets stuck for more than 30sec at any instant during this round than vehicle will be considered as DNF (Did not finish) and 0 points will be awarded for the off road round.

10.7 Hill Climb Test (100 Pts.)

- ✓ The aim of a hill climb test in an EBDC is to evaluate the bike's climbing ability, power output, and efficiency when ascending steep inclines.
- ✓ This test simulates real-world riding scenarios where e-bikes may encounter challenging uphill terrain, such as mountainous trails or steep road gradients.
- ✓ Hill climb tests assess the e-bike's ability to ascend steep inclines with efficiency and power, showcasing its climbing capabilities and performance under load.
- ✓ The test allows riders to evaluate the performance of the e-bike's motor, including torque output, responsiveness, and ability to maintain consistent power delivery while climbing steep gradients.
- ✓ E-bikes with throttle systems can showcase their ability to provide additional power and support to riders during uphill climbs, enhancing their climbing performance and reducing rider fatigue.

- ✓ This test is intended to evaluate the gradient travelling ability of the bike.
- ✓ This round judges that the design consideration made by team during the designing phase meets the actual scenario of the vehicle dynamics.
- ✓ Total inclination of 40 degree will be given and time taken to complete the track will be noted.

$$\text{Hill Climb Score} = 100 \times (T_{\text{longest}} - T_{\text{yours}}) / (T_{\text{longest}} - T_{\text{shortest}})$$

Where:

T_s = smallest time taken by any vehicle

T_Y = time for the vehicle to be scored

T_L = maximum time taken by any vehicle

****The penalty criteria in the Autocross round will be revealed during the event time**

10.8 Maneuverability Test (100 Pts.)

- ✓ The purpose of a maneuverability test in an e-bike race is to evaluate the bike's ability to navigate through tight spaces, obstacles, and challenging terrain with precision and control.
- ✓ This test assesses the bike's agility, handling, and responsiveness in real-world riding scenarios, which are crucial factors in determining its overall performance and suitability for various riding conditions.
- ✓ Maneuverability tests typically involve navigating through a series of tight turns, slaloms, and obstacles, simulating real-world urban riding environments where space is limited.
- ✓ The vehicle should not come out of the track and the driver should not place his leg on the ground while performing the test. Only one attempt will be allotted to every team.
- ✓ Timings will be checked out using electronic system or stop watches. Track details will be given at the time of event.

$$\text{Maneuverability Score} = 100 \times (T_{\text{longest}} - T_{\text{yours}}) / (T_{\text{longest}} - T_{\text{shortest}})$$

Where:

T_s = smallest time taken by any vehicle

T_Y = time for the vehicle to be scored

T_L = maximum time taken by any vehicle

****The penalty criteria in the Autocross round will be revealed during the event time**



10.9 Endurance Test (200 Pts.)

- ✓ In the dynamic round, the durability & performance of the vehicle will be checked. The track provided will be 1.5kms and the teams have to run their vehicle for 1 hour. (Run time may be changed)
- ✓ The vehicle that covers the maximum distance will be considered as the winner of endurance round.

Rules of Endurance:

- ✓ The vehicle will not be allowed into the Pit arena once it entered the race track.
- ✓ Changing of batteries or charging of batteries after entering into endurance is strictly restricted.
- ✓ If a vehicle hits other's vehicle then the team that hit the E-Bike will be disqualified.
- ✓ Overcrossing in the no-overcrossing zones lead to penalty.
- ✓ If any vehicle stops on the track they can take their E-Bike to a side of track and can repair there only under the observation of a volunteer.

Endurance Test Penalties:

1. **Mechanical breakdown:** If a vehicle stops due to any mechanical damage, that may be of non-functioning of brakes, slippage of chain over sprocket, tyre puncture, changes in wheel alignment etc., then these mechanical damages will be considered as Mechanical breakdown.
 - ✓ A 50 points penalty will be added to durability test round if the team manages to rectify the mechanical breakdown within 5 Minute of given time.
 - ✓ Any team that is unable to rectify mechanical breakdown more than 5 minutes will be eliminated from the round, such case would be called as **MECHANICAL FAILURE**
 - ✓ Their vehicle will be pulled away from the track if track marshal announce for mechanical Failure
 - ✓ Total laps covered till that time will be counted.
2. **Electrical breakdown:** If vehicle halts suddenly due to non-functioning of the electrical system such as Fusing problem, Motor over heating due to excessive load, over heating of accumulator, wire burnout, motor controller issues etc., then such condition will be called as electrical breakdown.
 - ✓ A 50 points penalty will be added to endurance round if the team manages to rectify electrical breakdown within 5 Minutes of given time.
 - ✓ Team unable to rectify the electrical breakdown more than 5 minutes will be eliminated from Endurance Round, such case would be called as **ELECTRICAL FAILURE**.
 - ✓ Their vehicle will be pulled away from the track if track marshal announce for Electrical Failure.
 - ✓ Total laps covered till that time will be counted.



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



3. **Over-taking:** Track marshal will guide the team drivers of overtaking and non-overtaking zones during formation lap. A 50 points penalty will be awarded to the team if their vehicle over takes other vehicle in non-overtaking zone.
4. **Cone touch:** Cones will be place at the border of the track. If any vehicle touches a cone will face a penalty of 20 points.
5. **Cone Down:** If vehicle hits the cone then 20 point penalty per cone down will be added.
6. **Tyre out of track:** If any tyre found to be out of track then teams have to face a penalty of 30 Points.
7. **Vehicle out of track:** If the whole vehicle is out of track, then the teams have to face a penalty of 50 points.

8. Rash or Aggressive Driving:

Any rash or aggressive driving behavior (such as forcing another bike off the track, refusal to allow passing or close driving that would cause the likelihood of bike 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 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.

9. Inexperienced Driver:

The EBDC organizing team 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.

NOTE: Rules can be changed at any time of the event based on the situation (distance and time for endurance) might be changed if required.



SECTION 11

SCORE POINTS - STATIC ROUNDS

| S.NO | DESCRIPTION | DATE | POINTS |
|-------|----------------------------|--|--------|
| 1 | Design Report | 26 th August 2024 | 100 |
| 2 | Innovation Report | | 100 |
| 3 | Business Plan Report | 10 th September 2024 | 50 |
| 4 | Cost Report | | 50 |
| 5 | Design Presentation | 24 th – 25 th September 2024 | 100 |
| 6 | Innovation Presentation | | 100 |
| 7 | Business Plan Presentation | 24 th – 25 th September 2024 | 75 |
| 8 | Cost Presentation | | 75 |
| 9 | On-Site Design Evaluation | 25 th September 2024 | 75 |
| 10 | Weight Test | | 75 |
| Total | | | 800 |



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



SECTION 12

POINTS DISTRIBUTION - DYNAMIC ROUNDS

| S.NO | DESCRIPTION | DATE | POINTS |
|--------------|----------------------|---------------------------------|------------------|
| 1 | Brake Test | 26 th September 2024 | Qualifying Round |
| 2 | Acceleration Test | 26 th September 2024 | 100 |
| 3 | Auto Cross Test | 26 th September 2024 | 100 |
| 4 | Maneuverability Test | 26 th September 2024 | 100 |
| 5 | Hill Climb Test | 26 th September 2024 | 100 |
| 6 | Off Road Test | 27 th September 2024 | 100 |
| 7 | Surprise Test | 27 th September 2024 | 100 |
| 8 | Endurance Test | 27 th September 2024 | 200 |
| Total | | | 800 |

| National Level Electric Bike Design Challenge (EBDC'24) | STATIC ROUNDS | DYNAMICS ROUNDS | TOTAL POINTS |
|---|---------------|-----------------|--------------|
| | 800 | 800 | 1600 |

***Based on the total marks obtained from the team, winners and runners will be announced**



SECTION 13

AWARD CATEGORIES

| S.No. | Award Categories | Prize Money |
|-------|---------------------------------|---------------------|
| 1. | Overall Champions | INR 50,000 + Trophy |
| 2. | Overall Runner Up | INR 25,000 + Trophy |
| 3. | Second Runner Up | INR 10,000 + Trophy |
| 4. | Best Engineering Design | INR 5,000 + Trophy |
| 5. | Best Innovation | INR 5,000 + Trophy |
| 6. | Best B-Plan & Cost Presentation | INR 5,000 + Trophy |
| 7. | Best Acceleration | INR 5,000 + Trophy |
| 8. | Runner Up Acceleration | Trophy |
| 9. | Best Off-Road Test | INR 5,000 + Trophy |
| 10. | Runner Up Off-Road Test | Trophy |
| 11. | Best Autocross Test | INR 5,000 + Trophy |
| 12. | Runner Up Autocross Test | Trophy |
| 13. | Best Hill Climb Test | INR 5,000 + Trophy |
| 14. | Runner Up Hill Climb Test | Trophy |
| 15. | Best Maneuverability Test | INR 5,000 + Trophy |

**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**

| | | |
|-----|--------------------------------|--------------------------------|
| 16. | Runner Up Maneuverability Test | Trophy |
| 17. | Surprise Event Winner | Trophy |
| 18. | Best Endurance Test | INR 5,000 + Trophy |
| 19. | Runner-Up Endurance | Trophy |
| 20. | Best Faculty Advisor Award | Trophy |
| 21. | Best Driver (Men & Women) | Trophy |
| 22. | Best Captain (Men & Women) | Trophy |
| 23. | Best Women Participant Award | Trophy |
| 24. | Fair Play Award | Trophy |
| 25 | Light Weight Award | Trophy |
| 26 | Best Build Quality Award | Trophy |
| 27 | Best Ergonomics and Aesthetics | Trophy |
| 28 | Best Commercial Bike | Trophy |
| 29 | Selfie Contest | Trophy |
| 30 | People Choice Award | Trophy |
| | Total | INR 1,30,000 + Trophies |

****Home Team (Mechatrons) will be participated only but not eligible for the above mentioned awards and rewards.**



SECTION 14

ORGANIZING COMMITTEE

1. Chief Patron – Shri.D.Lakshminarayanawamy, Managing Trustee, SNR Trust
2. Patron – Shri.R.Sundar, Joint Managing Trustee, SNR Trust
3. Co-Patron – Dr.M.Paulraj, Principal, SRIT
4. Convener – Dr.B.Chokkalingam, HOD/MECH, SRIT

5. Co-Convener – Mr.S.Veerakumar, AP, MECH, SRIT

6. Event Coordinators – Mr.B.Varun, AP (Sl.Gr)/ MECH

Mr.R.Tamil Selvan, AP/MECH

Mr.R.Sudharsan, AP/MECH

7. Student Coordinators – S. Kabilesh (IV – MECH)

G. Akshath Rao (IV – MECH)

N. Ashwanth (III – MECH)

T. Lakshay raaj (III – MECH)

S.Gokul (III – MECH)



A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0



SECTION 15
EBDC OFFICIAL HEAD'S

| S.NO | NAME | DESIGNATION | ORGANIZATION |
|----------------------------|----------------------|-------------------------------------|---|
| CHAIRPERSON | | | |
| 1. | Mr. Veerakumar S | Founder & Managing Director | Mechatron Motors LLP, Coimbatore |
| BOARD OF DIRECTORS | | | |
| 1 | Mr. Subhash Pilla | Founder & CEO | Imagine to Innovate, Visakhapatnam |
| 2 | Mr. Jacob Thekkekara | Co-Founder & CEO | Sugrah Mobility Pvt. Ltd, Kerala |
| 3 | Mr. Mathankumar T | Deputy Manager | Ashok Leyland Ltd, Hosur |
| 4 | Mr. Naveenkumar | Senior Design Engineer | Larsen & Toubro Limited, Bangalore |
| 5 | Mr. Ramkumar K | Design Engineer | National Innovative Technology, Egypt |
| TECHNICAL DIRECTORS | | | |
| 1 | Mr.B.Ragu | R&D Engineer (Electrical Design) | Ingo Electric Pvt Ltd, Bangalore |
| 2 | Mr.Y.Vigneshwaran | R&D Engineer (Mechanical Design) | Ingo Electric Pvt Ltd, Bangalore |
| STATIC DIRECTORS | | | |
| 1 | Mr.R.Ruman | Design Engineer | Renault Nissan Technology Pvt Ltd, Chennai |
| 2 | Mr.K.Kedhar Nadh | Technical Assistant Engineer | Vishishta Innovators Pvt Ltd, Andhra Pradesh |
| RACE DIRECTORS | | | |
| 1 | Mr.R.Vibesh | Telecommunication Engineer | Al-Futtaim LLC, Dubai |
| 2 | Mr.S.Buvaneswaran | Product Director | Mechatron Motors LLP, Coimbatore |
| TRACK MARSHALLS | | | |
| 1 | Mr.K.Askar | Design Engineer | National Innovative Technology, Egypt |
| 2 | Mr.J.Kabilan | R&D Engineer (Mechanical) | Mechatron Motors LLP, Coimbatore |



**A NATIONAL LEVEL
ELECTRIC BIKE DESIGN CHALLENGE (EBDC'24) SEASON 4.0**



SECTION 16

CONTACT DETAILS

Please feel free to contact us in case of any queries.

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Get Ready Teams

EBDC'24

A comprehensive rulebook ensures fairness and consistency in the national level electric bike design challenge. Clear guidelines within the rulebook help participants understand expectations and criteria for evaluation. The rulebook serves as a blueprint for innovation, setting boundaries while fostering creativity. Adherence to the rulebook promotes safety standards, prioritizing the well-being of both participants and spectators. Consistent enforcement of rules maintains the integrity and credibility of the competition. The event serves as a valuable networking opportunity for participants, industry professionals, and stakeholders to forge partnerships and collaborations. Overall, the national level electric bike design challenge event not only celebrates ingenuity and creativity but also promotes a sustainable future for urban mobility.

Call Now.

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