

**Within the framework of the Kelajak Muhandislari International Festival
“New Generation Car” Competition**

REGULATIONS

1. GENERAL PROVISIONS

1.1. Competition name and purpose

1.1.1. Competition name: “Next Generation Vehicle — Energy-Efficient Vehicles Competition”.

1.1.2. Purpose: to promote energy-efficient transport solutions; to enhance the practical design, aerodynamics, mechanics, and electrical engineering skills of students and young engineers; to test and compare prototypes under real track conditions; to develop a safety culture (technical inspection, pit culture, electrical safety).

1.2. Applicable category and energy type

1.2.1. Within the framework of these Regulations, only the following direction shall be conducted: Category: PROTOTYPE, Energy type: BATTERY-ELECTRIC (Battery-electric)

1.2.2. Other categories (Urban Concept and others) shall not be conducted within the framework of this document.

1.3. Compliance with the Regulations

1.3.1. The participating team, driver, and mentors are obliged to comply with all clauses of the Regulations.

1.3.2. Any modification made to the vehicle (electrical, mechanical, body) after passing technical inspection shall not be allowed onto the track until it is re-approved by the Organizers.

2. TERMS (GLOSSARY)

2.1. Prototype — an experimental vehicle oriented toward achieving maximum energy efficiency results. It is not required to resemble a real city automobile, but it must strictly comply with track safety and technical requirements.

2.2. Battery-Electric (BE) — an electric vehicle that uses a battery as the propulsion energy source.

2.3. Propulsion battery — the only permitted main battery pack in a BE vehicle.

2.4. BMS (Battery Management System) — a system that manages battery safety and operational stability. The BMS: balances the cells; monitors conditions such as over-voltage, under/over-discharge, over-current; must automatically disconnect the battery if a hazardous condition occurs.

2.5. Bulkhead (rigid separating wall) — a solid and sealed barrier separating the driver cabin from the energy compartment. Its function is to protect the driver in case of fire, smoke, liquid, or battery incident.

2.6. Scrutineering / Technical Inspection — the process of verifying the vehicle's compliance with the Regulations. A vehicle that has not passed inspection shall not enter the track.

2.7. Pit Zone — a designated area where teams perform technical servicing, prepare their vehicles, and where safety rules are strictly enforced.

2.8. Emergency Shutdown — a mechanism that quickly switches off the energy source and propulsion system in the event of an авария situation, thereby reducing risk.

2.9. Dead-man switch — a safety function that automatically disconnects traction/speed if the driver releases control.

Below is the exact and formal translation into English and Russian, without any omission, summarization, or alteration.

3. ORGANIZATIONAL STRUCTURE AND ROLES

3.1. Organizers — the organization conducting the competition and its representatives.

3.2. Technical Commission — carries out technical inspection, safety checks, re-inspection, and supervision.

3.3. Track Directorate — manages movement on the track and ensures safety through marshals.

3.4. Jury Panel — approves results and makes final decisions on disputes.

4. PARTICIPANTS, TEAM, AND DRIVER

4.1. Participants are students of colleges, technical schools, and higher educational institutions, with a recommended age limit of 16–40 years.

4.2. Team composition: recommended 5–10 participants (team manager, technical leader, driver, reserve driver, mechanic/electrician, etc.).

4.3. Team manager: the sole responsible person for organizational documentation and accountability; responsible for safety, discipline, and compliance with the Regulations.

4.3. Driver: must be officially registered; undergoes briefing and safety instruction; shall not enter the track without protective equipment.

4.4. All team members must have specially tailored team uniforms, and the driver must have special protective equipment and clothing.

5. TRACK REQUIREMENTS (FIRST SEASON STANDARD)

5.1. Track type: closed circuit (autodrome or safe closed road loop).

5.2. Surface: asphalt, smooth, without potholes or cracks.

5.3. Minimum safety zones: protective barriers at turns (tires, blocks, cones, tape) and marshals; start/finish, technical control, and medical point; the pit area must be separated from the track.

5.4. The distance and time requirement for each run shall be precisely determined by the Organizers in the Event regulations (Annex to the Regulations).

6. PIT ZONE RULES

6.1. The pit area is the main zone where technical work is performed.

6.2. Mandatory rules in the pit area: fire extinguisher (at least 1 unit) next to the team; when working with the battery: insulating gloves, goggles, orderly cable arrangement;

charging only in the permitted area and under supervision; open flame, spark-producing work, and smoking are strictly prohibited.

6.3. Movement in the pit area: the vehicle must move at very low speed, in accordance with marshals' instructions; children and unauthorized persons are restricted.

7. COMPETITION STAGES AND PROCESSES

7.1. Registration and documentation

team list, driver information; technical passport (drawing, scheme, battery/BMS information); safety checklist.

7.2. Briefing (mandatory)

drivers and team managers participate; track rules, flags/signals, and авария procedure are explained.

7.3. Technical Inspection (Scrutineering)

The team vehicle undergoes the following inspections: 1) Identification (numbers, team name), 2) Dimensions and mass, 3) Chassis/body strength, roll-bar, 4) Bulkhead and separation of the energy compartment, 5) Steering control and turning radius, 6) Braking system, 7) Wheel/tyre condition, 8) Electrical safety (60V, fuse, insulation), 9) Battery placement, BMS, charging requirements, 10) Emergency shutdown and dead-man

7.4. Practice run (Practice)

familiarization with the track; system testing; re-check may be conducted after inspection.

7.5. Official run (Competition Runs)

starting procedure; minimum average speed/task requirement is defined in the Event regulations; strict compliance with marshals' instructions.

7.6. Result confirmation

energy consumption is measured (joulemeter and official protocol); if time and distance requirements are met, the result is accepted; in case of violation, the run is cancelled.

8. TECHNICAL REGULATIONS — PROTOTYPE (GENERAL)

The following requirements are mandatory for the Prototype vehicle.

8.1. Body and general design

8.1.1. The vehicle must be fully covered (fully covered). Open-top configuration is prohibited.

8.1.2. The vehicle may not resemble an open construction such as a bicycle/tricycle/wheelchair — it must have a fully enclosed body.

8.1.3. Variable aerodynamic elements (appendages that change shape under wind influence or are adjustable) are prohibited.

8.1.4. There must be no hazardous external protrusions: if sharp edges exist, their radius must be increased or they must be covered with deformable material.

8.1.5. A minimum deformation zone (crumple zone) shall be provided at the front section up to the distance of the driver's feet.

8.2. Chassis/monocoque and strength

8.2.1. The chassis or monocoque must be capable of protecting the driver in frontal, side, and rollover situations.

8.2.2. The vehicle shall be equipped with a roll-bar (rollover protection hoop/frame) and must provide safe clearance around the driver's helmet.

8.2.3. Rotating components such as chain, gear transmission, belt, etc., must be covered with a protective guard.

8.3. Bulkhead — separation of the driver and energy compartment

8.3.1. A rigid bulkhead shall separate the driver cabin from the energy compartment.

8.3.2. Elements that may be located in the energy compartment (battery, motor controller, high-current cables, etc.) shall be positioned outside the driver cabin, behind the bulkhead.

8.3.3. The bulkhead must:
limit the passage of fire/smoke;

prevent the driver from reaching the energy compartment by hand;

if openings exist, they must be protected with grommets and sealed with fire-resistant material.

8.4. Dimensions and mass (Prototype)

8.4.1. Maximum height: < 1400 mm — The vertical distance from ground level to the highest point of the vehicle (roof or cover of the body). Wheel and tyre pressure are taken into account; the vehicle is measured in operating condition.

8.4.2. Track width (wheel track width): ≥ 500 mm — The distance between the centers of the left and right wheels on the same axle. This parameter ensures the vehicle's lateral stability without rollover.

8.4.3. Height / track width ratio: < 1.25 — Determined by dividing the overall vehicle height (8.4.1) by the smallest track width (8.4.2). Purpose: to restrict tall, narrow, and unstable constructions. Example: $900 \text{ mm} / 750 \text{ mm} = 1.2$ (permitted).

8.4.4. Wheelbase: ≥ 1000 mm — The distance between the centers of the front and rear wheel axles. A larger wheelbase increases straight-line stability of the vehicle.

8.4.5. Maximum overall width: ≤ 1300 mm — The greatest horizontal distance from the leftmost to the rightmost edge of the vehicle, including body panels and wheels.

8.4.6. Maximum overall length: ≤ 3500 mm — The distance from the foremost protruding point to the rearmost protruding point of the vehicle. Increasing this dimension with aerodynamic “artificial” additions is prohibited.

8.4.7. Maximum mass (without driver): ≤ 140 kg — The mass of the vehicle measured without the driver, but in full operating condition (with battery, motor, electronics, fluids).

8.4.8. Manipulating dimensions with “artificial” elements (attached protrusions or unusual cut-outs) is prohibited.

8.5. Wheels and tyres (Prototype)

8.5.1. Number of wheels: 3 or 4, all must be in constant contact with the road.**

8.5.2. Tyres: no cracks, cuts, or excessive wear; must not exceed the manufacturer's maximum pressure; the valve must be easily accessible for the Technical Commission.

8.5.3. Special historical Michelin SEM tyres of old (no longer available on the market) versions may be prohibited; the Organizers shall provide an exact list in the Event regulations.

8.5.4. If a self-fabricated wheel is used: strength calculation or test results; evidence regarding material properties and manufacturing quality; required documents must be presented during technical inspection.

8.6. Turning radius

8.6.1. The turning radius must be ≤ 8 meters.

8.6.2. The steering mechanism must prevent tyre-body/chassis friction during turning.

8.7. Braking system

8.7.1. The vehicle must be equipped with two independent hydraulic braking systems: one per axle.

8.7.2. Systems that brake by friction directly against the tyre are prohibited.

8.7.3. Front brake: controlled via a foot pedal.

8.7.4. Rear brake: via a lever located on the steering wheel or a separate pedal.

8.7.5. The braking mechanism must operate with a rigid mechanical linkage, not by wire/cable.

8.7.6. It must be possible to activate both brakes simultaneously without removing hands from the steering wheel.

8.7.7. Each braking system is tested separately during inspection and must meet the specified requirement.

8.7.8. Protection (anti-tamper) must be provided so that the driver cannot interfere with brake adjustments during the run.

9. TECHNICAL REGULATIONS — BATTERY-ELECTRIC (ELECTRICAL SAFETY)

9.1. Voltage

9.1.1. The maximum voltage at any point in the vehicle must not exceed 60V (design by max).

9.2. Battery concept and quantity

9.2.1. In a BE vehicle, only one battery (propulsion battery) is permitted.

9.2.2. An additional “accessory battery” is prohibited in a BE vehicle.

9.2.3. Battery definition: a single electrical source with two terminals. If modules are used, they must be contained within one physical package.

9.3. Battery placement and mounting

9.3.1. The battery must be securely mounted outside the driver cabin, behind the bulkhead.

9.3.2. Installation of the battery under the driver’s seat is prohibited.

9.4. BMS (Battery Management System) — mandatory

9.4.1. If a lithium-based battery is used, the BMS must be compatible with the battery chemistry.

9.4.2. The BMS must ensure cell balancing and over-voltage protection during off-track charging.

9.4.3. For BE, the BMS as an on-vehicle system must automatically disconnect the battery without operator intervention in cases of: cell-level over-discharge; cell-level over-current.

9.4.4. The BMS shall be located inside the battery pack and powered directly from that battery.

9.5. Battery capacity (first season limitation)

9.5.1. Maximum energy capacity for lithium-based batteries: 1000 Wh.

9.6. Charging requirements

9.6.1. Charging shall be performed only by: the charger supplied together with the battery; or a purpose-built charger compatible with the battery chemistry.

9.6.2. For self-built batteries, the team must demonstrate that the charger is integrated with the BMS.

9.7. Battery fire safety (tray/bag)

9.7.1. Lithium battery: must be placed on a solid metal tray; or inside a certified battery charging bag.

9.7.2. The tray/bag must prevent the battery from falling out or burning through the body in a rollover situation.

9.7.3. Velcro or melting fastening materials are prohibited.

9.8. Short-circuit protection (Fuse/Breaker)

9.8.1. Each battery must be protected against short circuit: fuse/fusible link/circuit breaker.

9.8.2. Automatic reclosing devices are prohibited.

9.9. Electrical insulation

9.9.1. For safety, the positive and negative circuits must be electrically insulated from the chassis/body metal parts.

10. EMERGENCY SHUTDOWN AND DEAD-MAN (MANDATORY)

10.1. The emergency shutdown system shall switch off the energy supply and propulsion system in an emergency situation.

10.2. The system must be fail-safe: in the event of interruption/“open circuit,” it must transition to a safe state.

10.3. In a BE vehicle, the emergency shutdown: must physically disconnect the propulsion battery; shall not be limited to “virtual” shutdown via logic/controller.

10.4. Dead-man switch: if the driver releases control, the propulsion system is automatically disconnected; a hand pedal or an electrical dead-man on the steering wheel may be used.

11. BODY MATERIALS AND CONSTRUCTION (PRACTICAL GUIDELINE)

The following clauses are provided as “mandatory” and “recommended.” Mandatory clauses are verified during technical inspection.

11.1. Mandatory material restrictions

11.1.1. Asbestos and asbestos-containing materials are strictly prohibited.

11.1.2. The body and chassis must be free from solutions that increase fire risk, produce brittle sharp fragments (shrapnel), and pose danger to the driver.

11.2. Recommended body/chassis solutions

11.2.1. Monocoque (composite): carbon fiber + epoxy; or fiberglass + epoxy. advantage: lightweight, aerodynamic, strong. attention: manufacturing quality and layer strength.

11.2.2. Tubular frame (space frame): aluminum or steel tubes. Advantage: easy manufacturing, convenient repair. attention: welding quality, roll-bar integration.

11.2.3. Body panels: fiberglass/carbon; lightweight aluminum; reliable technologies such as vacuum infusion/lamination are recommended.

11.2.4. Use of fire-resistant shields in the driver cabin (bulkhead, cable pass-through points) is recommended.

12. MANDATORY VIDEO MONITORING (ON-BOARD CAMERA) REQUIREMENT

12.1. General rule

12.1.1. Each PROTOTYPE (Battery-Electric) vehicle participating in the competition must be equipped with at least one (1 unit) mandatory on-board camera. An on-board camera is a camera installed on the vehicle itself and recording internal or external processes during movement.

12.1.2. During the competition, the camera shall be used for: safety monitoring; monitoring driver actions; analysis of emergency situations; clarification of jury decisions in disputed cases; detection of unauthorized modifications after technical inspection.

12.1.3. A vehicle without an installed camera shall not be allowed to participate in the official run.

12.2. Minimum technical requirements

12.2.1. The camera must meet the following minimum parameters: Minimum recording quality: Full HD (1080p); Minimum frame rate: 30 fps; Field of view (FOV): at least 120°; Continuous recording capability: at least 40 minutes (sufficient for one run); Automatic recording start or reliable manual control capability.

12.2.2. The camera recording must not stop during the official run.

12.2.3. Camera power source: internal battery; or from the vehicle's auxiliary circuit not exceeding 60V (in isolated configuration).

12.2.4. It is recommended that the camera not be powered directly from the main propulsion battery (for safety reasons).

12.3. Installation requirements

12.3.1. The camera must be installed in one of the following positions: Inside the driver cabin facing forward (for track visibility); Or in an internal position where the driver's head and hand movements are visible.

12.3.2. The camera: must be mounted on a vibration-resistant rigid bracket; must not detach in the event of an accident or rollover; must not obstruct the driver's field of vision.

12.3.3. Installation using double-sided tape or temporary fastening means is prohibited.

12.4. Permitted camera types (examples)

The following types of cameras are permitted:

1. Action cameras GoPro HERO series; DJI Osmo Action; Insta360 Action series; Akaso and similar sport cameras. Advantages: wide field of view, vibration-resistant and safe housing.

2. Dash cameras intended for automobiles: 70mai, Viofo, Nextbase, Xiaomi dash cam. Advantages: continuous recording, simple installation, stable operation.

12.5. Prohibited devices

12.5.1. The following are prohibited: Use of a mobile phone as a temporary camera; Systems connected to an external device via Wi-Fi and dependent on signal interruption;

Installation of 4K drone cameras inside the cabin without secure mounting;
Heavy professional cinema cameras.

12.6. Obligation to submit recording

12.6.1. After each official run, the team must retain the camera recording.

12.6.2. Upon request by the Jury Panel, the recording must be submitted within 30 minutes.

12.6.3. Failure to submit the recording may result in cancellation of the run.

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13. DETERMINATION OF THE WINNER AND RESULT CALCULATION

13.1. Official run and validity conditions

The winner shall be determined solely on the basis of official run results.

13.1.1. For an official run to be considered valid, the vehicle must: complete the designated distance of 8–12 km in full; meet the average speed requirement of 20–25 km/h; complete the run within 25–30 minutes; not violate technical and safety regulations.

13.1.2. If at least one of the above requirements is not fulfilled, the run shall not be counted.

13.2. Energy consumption measurement procedure

13.2.1. The electrical energy consumed by the vehicle shall be measured by a joulemeter approved by the Organizers.

13.2.2. Energy consumption shall be recorded only during the official run and shall include the propulsion system and all permitted electrical consumers.

13.3. Method of result calculation

13.3.1. The result of each team shall be calculated according to the following formula:

Result = Distance traveled (km) / Energy consumed (kWh)

13.3.2. The result shall be expressed in km/kWh and indicates energy efficiency.

13.4. Procedure for determining the winner

13.4.1. Among all valid official runs, the team that demonstrates the highest km/kWh result shall be declared the winner.

13.4.2. In determining the winner, neither speed nor motor power shall be considered; only energy efficiency is the primary criterion.

13.5. Tie results (tie-breaker)

13.5.1. If two or more teams have equal km/kWh results, priority shall be determined in the following order:

1. the team that consumed less energy;
2. the team that passed technical inspection without warnings;
3. the team with the higher result in the first official run.

13.6. Disqualification cases

13.6.1. In the following cases, the run shall be cancelled or the team shall be disqualified: if distance, time, or speed requirements are not met; if safety regulations are violated; if unauthorized modifications are made after technical inspection; if marshals' instructions are not followed.

14. VIOLATIONS, PENALTIES, DISQUALIFICATION

14.1. Violation of technical requirements — the run shall be cancelled or the vehicle shall not be allowed onto the track.

14.2. Violation of pit and track safety regulations — penalty or disqualification.

14.3. The decision of the Jury is final.

15. ANNEXES (TO BE COMPLETED BY THE ORGANIZER)

Annex A: Track layout, distance, number of runs, time requirement, starting procedure.

Annex B: Technical inspection checklist (printable).

Annex C: Charging and pit safety instructions.

Annex D: Flags/signals and emergency procedure.

Note!

Parameters such as the exact date, location, run distance, and time standards of the Event shall be approved in Annex A.

The competition regulations may be amended by the responsible persons up to 30 days prior to the competition day.

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