Electrical Bike

ELECTRIC BICYCLE

A Green Alternative to Urban Commuting

INTRODUCTION

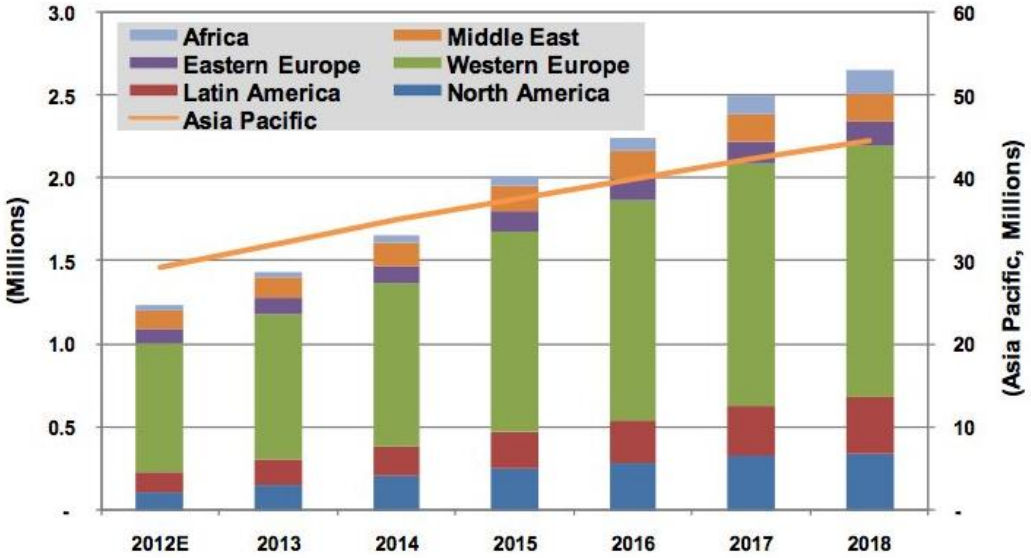
- An **electric bicycle**, also known as an **e-bike** or **booster bike**, is a bicycle with an integrated electric motor which can be used for propulsion. E-bikes use rechargeable batteries and can travel up to 45 km/h.

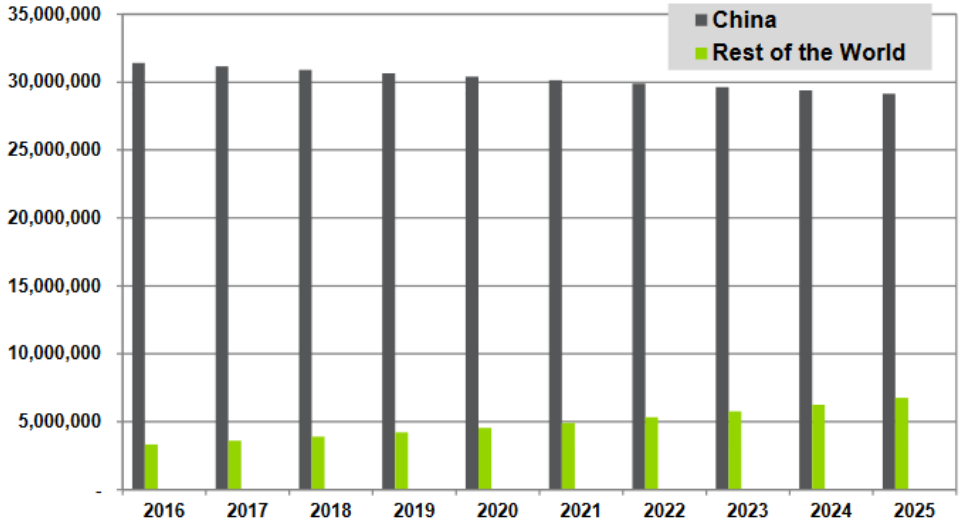
Building An Electric Bicycle For

- **Efficiency**
- **Long Distance Travel**
- **Power Requirements**

  Extra power for initial take off, climbing steep inclines, and maintaining a safe speed without impeding traffic to make it a stress free ride

E-BIKE MARKETING





E-BIKE CLASSIFICATION

- The classification of e-bikes is decided by whether the e-bike's motor assists the rider using a ***power-on-demand one*** or by a ***pedal-assist system.***

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Pedal-assist system

- The electric motor is regulated by pedaling.
- The pedal-assist augments the efforts of the rider when they are pedaling.
- PAS's usually works with a sensor mounted on the bottom bracket or pedal crank arm that senses your pedal cadence (the better ones sense pedal torque instead of cadence) and indicates to the controller that it's time to accelerate. These e-bikes – called **pedelecs** – have a sensor to detect the pedaling speed, the pedaling force, or both.
- Brake activation is sensed to disable the motor as well.

Power-on-demand or Hand throttle

- The motor is activated by a throttle, usually handlebar-mounted just like on most motorcycles or scooters.

- They are also useful when it would be helpful for the riders who more generally need some assistance.

Therefore, very broadly, e-bikes can be classed as:

1. ***E-bikes with pedal-assist only***
2. ***E-bikes with power-on-demand and pedal-assist***
3. ***E-bikes with power-on-demand only***

E-bikes with pedal-assist only

It can be classified into two legal E-bikes:

- ***Pedelecs***

  Pedelecs have pedal-assist only, motor assists only up to a decent but not excessive speed (usually 25 km/h), motor power up to 250 watts, often legally classed as bicycles

- ***S-Pedelecs***

  S-Pedelecs have pedal-assist only, motor power can be greater than 250 watts, can attain a higher speed (e.g., 45 km/h) before motor stops assisting, legally classed as a moped or motorcycle (**not** a bicycle)

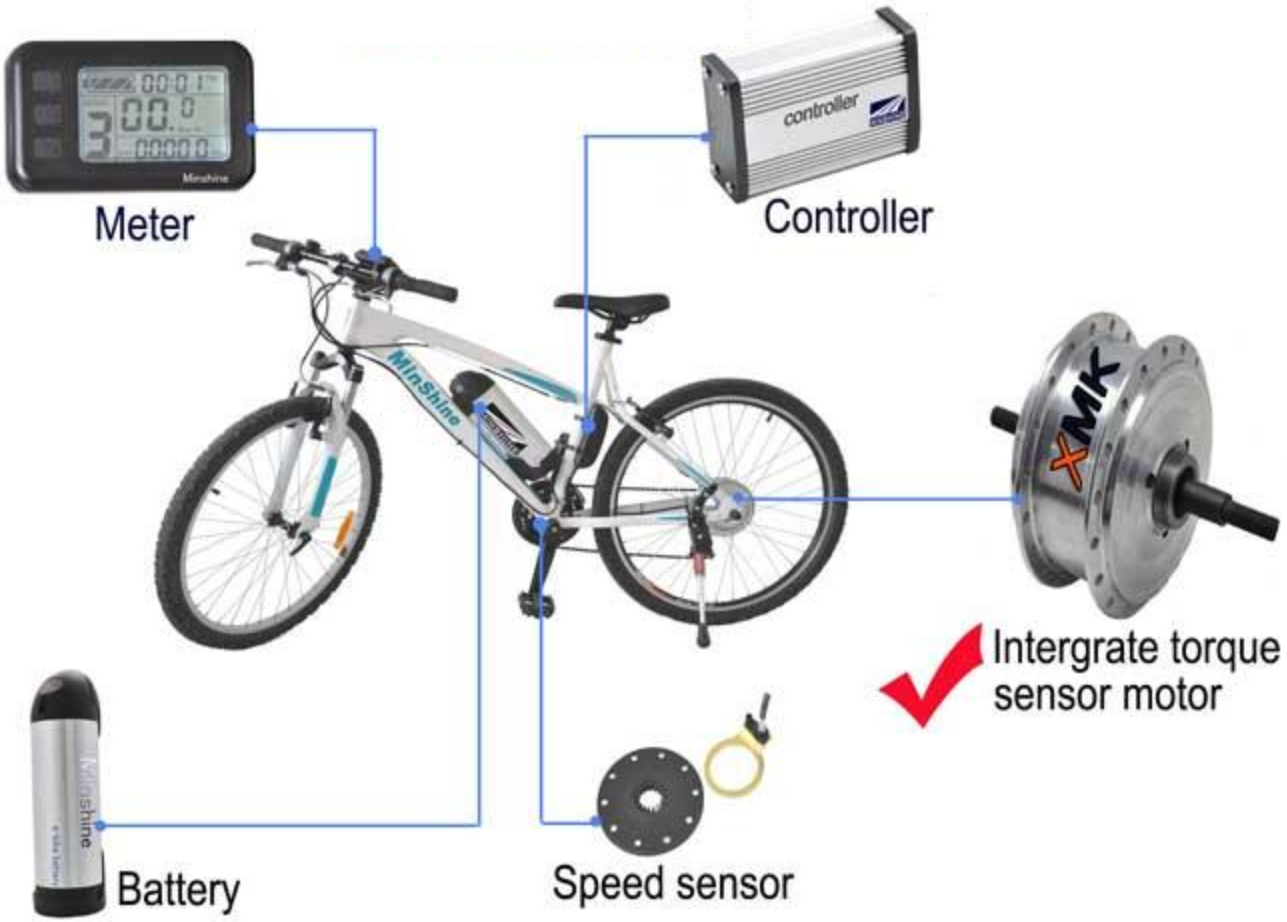
E-bikes with power-on-demand and pedal-assist

- Some e-bikes combine both pedal-assist sensors as well as a throttle

E-bikes with power-on-demand only

- Often have more powerful motors than pedelecs but not always, the more powerful of these are legally classed as mopeds or motorcycles.

E-BIKE KIT


Meter
controller
Controller
MinShine
XMK
Intergrate torque
sensor motor
Battery
Speed sensor

MOTORS AND DRIVETRAINS

- The two most common types of hub motors used in electric bicycles are **brushed** and **brushless**. direct-drive and geared motor units are both used.

- An electric power-assist system may be added to almost any pedal cycle using chain drive, belt drive, hub motors or friction drive.

- BLDC hub motors are a common modern design with the motor built into the wheel hub itself and the stator fixed solidly to the axle and the magnets attached to and rotating with the wheel.

BATTERY

- Battery systems in use include sealed lead-acid (SLA), nickel-cadmium (NiCad), nickel-metal hydride (NiMH) or lithium-ion polymer (Li-ion).
- Batteries vary according to the voltage, total charge capacity (amp hours), weight, the number of charging cycles and ability to handle over-voltage charging conditions.
- Some manufacturers have the option of using **regenerative braking**, the motor acts as a generator.
- Voltage rating (24V vs. 36V vs. 48V)
  - Higher voltage typically with higher power

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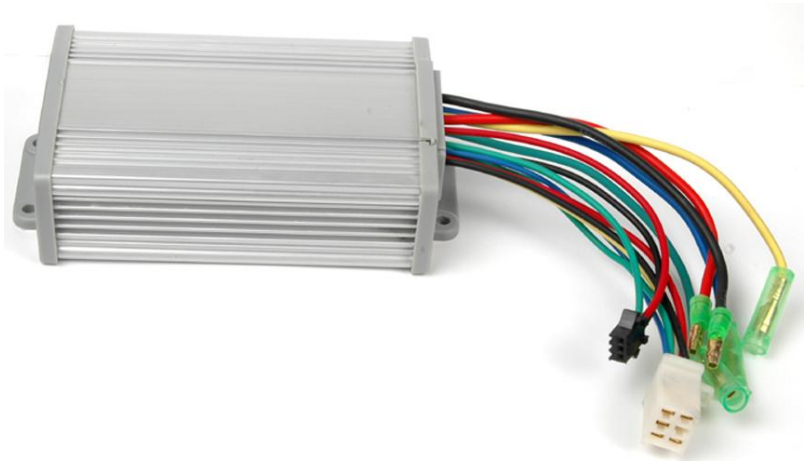
Solar charging system

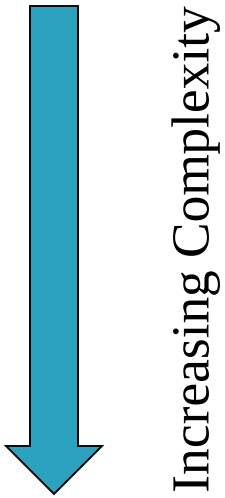
CONTROLLER

- Electronic module
- Between battery and motor
- Regulates motor speed
- Prevents excessive currents and overheating

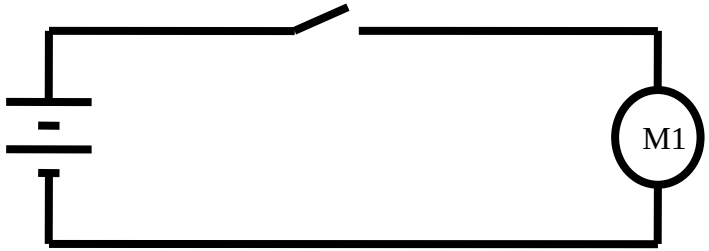


Controller complexity

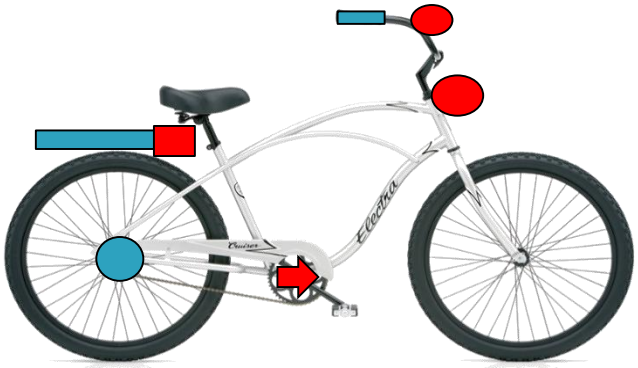
- Simplest: on/off switch for DC motor
- Variable speed DC motor + twist throttle
- Brushless motor with hall sensors
- Brushless motor without hall sensors
- Pedelec torque sensor
- Smart communication with battery
- Smart communication with display
- Built in diagnostics and programming

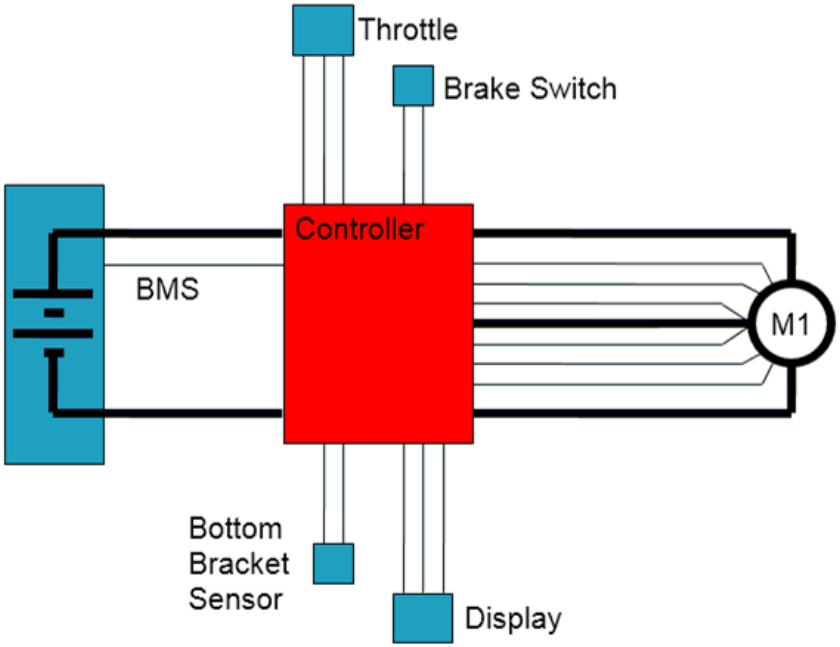


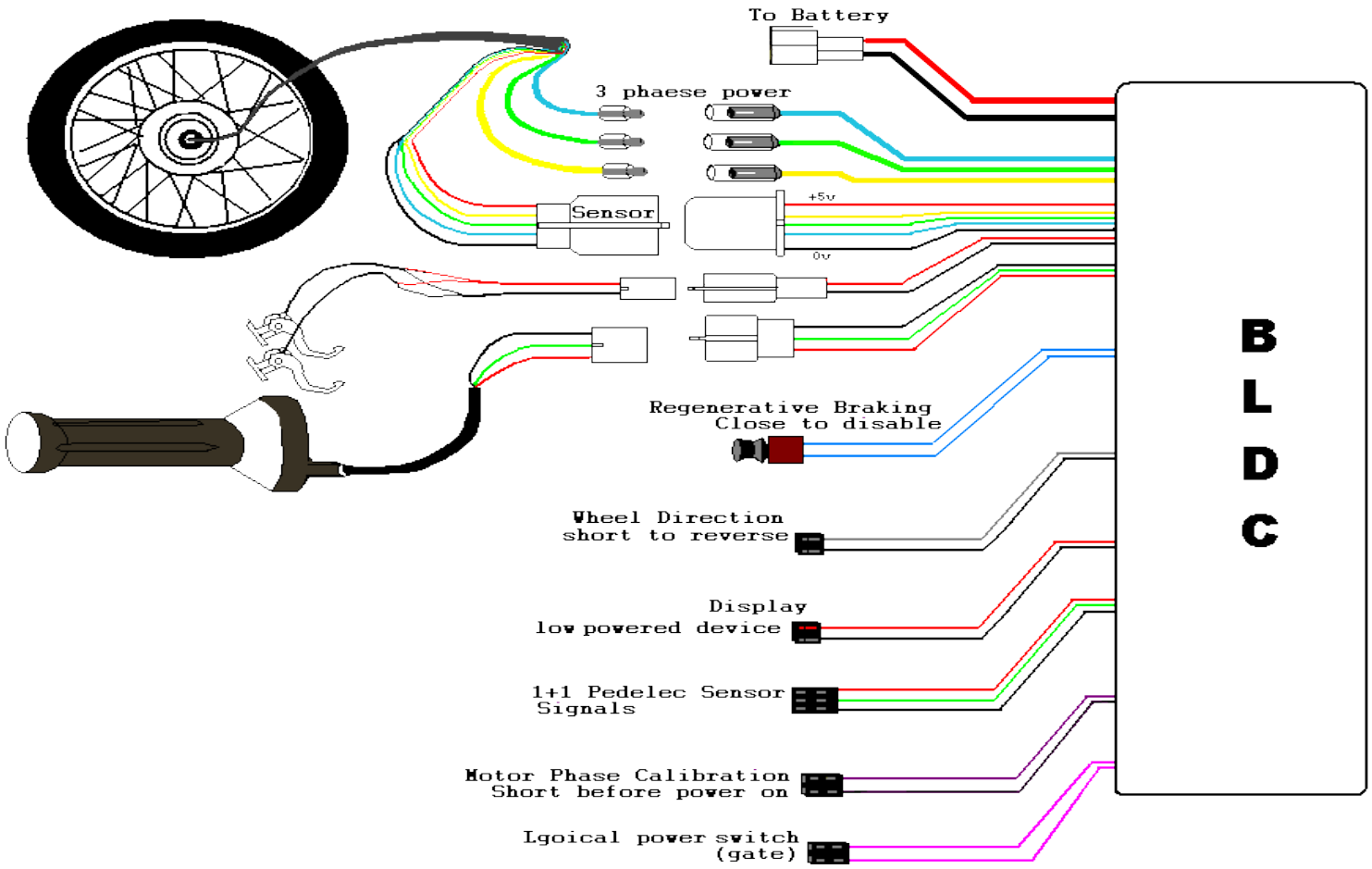
Simple DC System



More Complex System






To Battery
3 phaese power
Sensor
+5v
0v
Regenerative Braking
Close to disable
Wheel Direction
short to reverse
Display
low powered device
1+1 Pedelec Sensor
Signals
Motor Phase Calibration
Short before power on
Lgoical power switch
(gate)
B
L
D
C

DESIGN STEPS OF E-BIKE

- Dynamic calculations
- Motor and driver selection
- Battery selection
- Controller design
- Design of power transmission system such as planetary gearbox selection
- Structure design
- Ergonomic considerations
- Precise location of components

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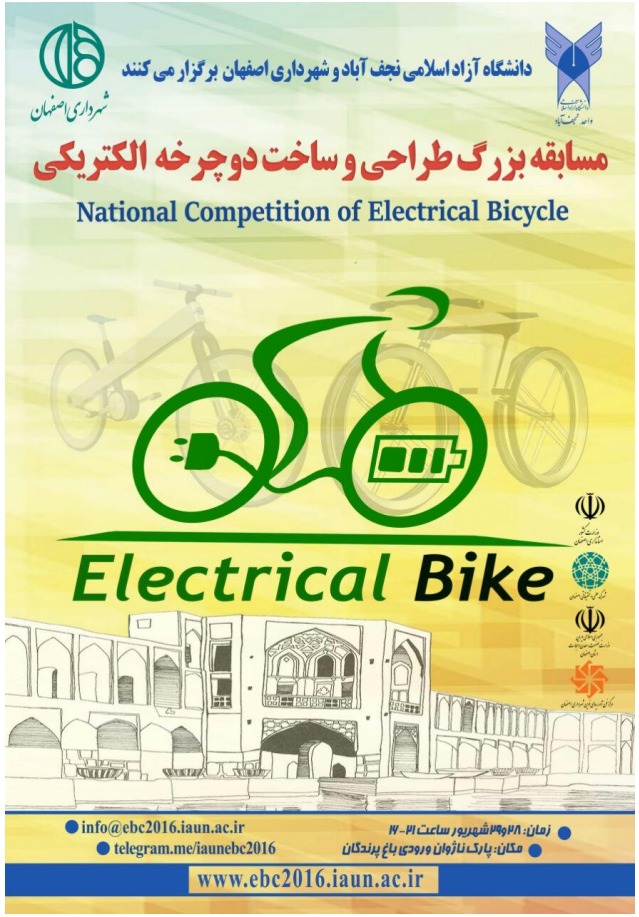
NATIONAL COMPETITION OF ELECTRICAL BICYCLE



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INTERNATIONAL COMPETITION OF ELECTRICAL BICYCLE

INTERNATIONAL COMPETITION OF ELECTRICAL BICYCLE

Process of holding the competition:

This competition consists of three phases: design, manufacturing and test.

In the design phase, the teams have to design the hybrid system according to the specifications of the system as outlined in the rules booklet.

In order to have the permission to participate in the manufacturing phase, taking part in the design phase is essential. In the design phase which takes place in 4th-6th of August 2017, the teams have to deliver the design booklet and its poster to the competitions office.

At the end of the design phase, the teams will get the permission to take part in the manufacturing phase according to the scores they have obtained in the design phase.

In case of achieving the required standards, the participants can reach the test phase which is the final phase of this competition.

The final phase of the competition takes place in 19th-21th of September 2017 .More details on the scheduling of each phase and the scoring procedures will be subsequently announced.

INTERNATIONAL COMPETITION OF ELECTRICAL BICYCLE

Conditions for participating in this competition:

1. *Safety of the bike.*
2. *Maximum weight of the bike must be 30 kg.*
3. *The batteries of the bike must have the capability to be separated by a public user. It should be noted that the teams do not have freedom to choose the type of batteries. The competitions office will provide the participants with 36 volt batteries.*
4. *The batteries must have the capability to be charged up using urban electricity without the need for cycling. The designed system cannot be connected to urban electricity during the competition.*
5. *The bike's pedal should have mechanical locking capabilities. Otherwise, the participant(s) will not get the permission to take part in the competition. In some phases of the competition, the referee locks the bike's pedal so that the bike will only use the existing batteries. The teams have to bring their own mechanical lock and deliver it to the competitions office.*
6. *The maximum power used for the electric motor is 300 watts.*
7. *The bike rider must necessarily be a member of the team.*

INTERNATIONAL COMPETITION OF ELECTRICAL BICYCLE

Scoring table in the design phase

Row	Section	Max. Score
1	Idea and innovation in the hybrid system	4
2	Dynamic design calculations	3
3	Designing power transfer system	3
4	Selecting engine and driver	3
5	Designing the main equipments of the hybrid structure	3
6	Designing the control system	3
7	Designing the energy storage system	3
8	Designing a parallel system for charging batteries using renewable energy such as solar energy	15
9	Arranging the Hybrid System Components(Taking the appearance, balance, safety and so on into account)	3
10	Industrial design (ergonomics, beauty etc.)	3
11	Aerodynamic design of the bike	3
12	2D and 3D plan (of all components and equipment, hybrid system etc.)	3
13	Report quality	6
Total		55

In addition to the scores in the above table, bonus points will be awarded to the teams. The minimum score which is necessary for taking part in the manufacturing phase is 25.

INTERNATIONAL COMPETITION OF ELECTRICAL BICYCLE

Scoring table in the manufacturing phase

Row	Section	Max. Score
1	The bike's and hybrid system's weight	25
2	Adaptation of the bike with the presented proposal	5
3	The beauty, ergonomics and appearance of the manufactured bike	15
4	Final price of the product	15
5	Innovation and idea	10
Total		70

Scoring table in the test phase

Row	Section	Max. Score
1	Covering the whole path successfully without cycling	50
2	Average speed throughout the competition path: Without cycling on the flat path Without cycling on the upward sloping path	20
3	Maximum distance traveled without cycling on the flat path	10
4	Maximum distance traveled without cycling on the upward sloping path	10
5	Maximum speed test without cycling on the short path	10
6	Observing the rules	
Total		100

The competition's path includes flat, sloping, sandy and water surfaces. Further details about the competition's path will be consequently announced. Failure to comply with the rules will result in a deduction of up to 40 points.

THANK YOU