18th INTERNATIONAL MEB ROBOT COMPETITION

DESIGN-BUILD BASIC LEVEL CATEGORY GUIDE

INTERNATIONAL MEB ROBOT COMPETITION

TÜBİTAK | TİKA

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DESIGN-BUILD BASIC LEVEL CATEGORY COMPETITION RULES

1. GENERAL INFORMATION ABOUT THE COMPETITION

1.1. Objective

This competition category is based on students competing with their own professional knowledge, skills, abilities, and programming experience. Competing teams will obtain the products, materials, and hand tools they will use in robot construction, as announced by the organisation in the specifications, in the provinces where their schools are located prior to the competition and will have them ready with them. Prior to the competition, a sealed envelope containing information about the course on which the robot will compete and the competition rules, along with materials provided by the organisation, will be delivered to the teams. Students will be required to design, operate, and compete with their robots in the competition area.

1.2. Theme

The competition theme will be provided to teams that pass the qualification exam and are eligible to participate in the Design-Build section prior to the competition.

1.3. Participant Requirements and Team Structure

This category is for secondary school participants, and institutions may only enter the competition with one team. Each team must consist of two students and one supervisor. Both students must be present during the qualification exam and the competition itself.

1.4. The Critical Importance of Reading the Guidelines

The International MEB Robot Competition is a contest that brings together the technical knowledge, engineering skills, and creativity of young talents. The Design-Build Basic Level category expects competing teams to design a robot that is capable of moving on a specially prepared course provided to them before the competition and that can successfully complete the competition tasks.

However, reaching the top in this exciting competition does not depend solely on the robot's physical strength or coding complexity. The real success of the competition lies in the robot's technical competence and the ability to carefully read and understand the guidelines covering rules and procedures.

The Application and Category Guidelines are more than just a technical guide; they are an integral part of the competition itself. Careful reading should be considered a fundamental skill of vital importance in modern engineering projects.

For this reason:

The guidelines clearly define the technical constraints specific to the Design-Build Basic Level category, such as the robot's dimensions, weight, propulsion motor, and electronic system limits. Failure to comply with these rules means disqualification from the competition, regardless of how well the robot performs.

The scoring systems in the guidelines detail the order and precision with which tasks must be performed. Teams that read the guidelines thoroughly can optimise their robots according to the task strategy that will yield maximum points and gain an advantage over their competitors.

As the competition process is dynamic, last-minute changes to the rules or applications may occur. Therefore, it is critical that competitors do not rely solely on their initial reading but regularly follow the announcements on the International MEB Robot Competition website and the content in the Desıgn-Build Basic Level category.

All teams applying to the Desıgn-Build Basic Level category of the 18th International MEB Robot Competition must read the Application Guide (accessible from the "Organisation" menu at https://robot.meb.gov.tr), which contains the competition applications and general rules related to the category.

Understanding the guidelines is as challenging and important an engineering task as designing the robot. Meticulousness in this task is the first step towards success.

2. TECHNICAL SPECIFICATIONS AND CONSTRAINTS OF THE ROBOT

2.1. Dimension and Weight Constraints

The maximum/minimum dimensions and weight limits that the robot must have during the competition will be provided to the teams at the time of the competition.

2.2. Materials and Components That Can Be Used

Some of the materials will be provided by the organisation. Competitors will bring the other materials with them. Teams may bring up to twice the specified quantity of materials other than those in the Team Bag and Hand Tools.

(For example, if 1 Line Sensor (8-pack) is specified, a maximum of 2 can be brought if desired.)

2.2.1. Materials Provided by the Organisation

Motors;

DC Reducer Motor 6V	2 units	*(Provided by the organisation)*

Other Materials;

DC Motor Mount	2	*(To be provided by the organisation)*
Wheel	2	*(To be provided by the organisation)*
Robot Body	1	*(To be provided by the organisation)*
Caster(Drunk) Wheel	1 Unit	*(Provided by the organisation)*

2.2.2. Materials that Competitor Teams Must Bring with Them

Main boards:

Open-source microcontroller-based control board
DC Motor Driver Shield (Dual Motor Driver Board)

Sensors:

Line sensor (8-pack)	1	Analogue Signal
4-Line Tracking Sensor	1	
Object Detection Sensor	3	2-450cm Ultrasonic Distance Sensor

Batteries;

LI-PO Battery	1	7.4V
LI-PO Charger	1	

Other Materials;

Object Detection Sensor Holder	3

Toolbox and Hand Tools:

The toolbox will contain the following items.

Toolbox	1	15"
Breadboard	1	
Jumper Cable	2 pieces	Male-Male, Female-Male 40-pin 100mm
Mini Pliers	1	
Watchmaker's Screwdriver Set	1	
Screw – Nut Set	1	(M2 YHB Screw, Nut and Washer in sufficient quantity)
USB Cable (1 metre)	1	Compatible with the card to be used
Double-sided tape	1	

2.3. Software and Control Requirements

The robot will operate/run autonomously.

2.4. Detailed Description of the Robot

No modules other than those announced by the organisation during the robot design phase will be used.

Wireless communication, Bluetooth communication, etc. modules will definitely not be present on the robot.

Power unit: No energy source other than the LI-PO battery unit announced by the organisation will be used on the robot.

3. COMPETITION AREA AND TASKS

3.1. Shape and Dimensions of the Competition Area/Track

The physical shape, general dimensions, and technical drawings of the course, track, or area will be announced to the teams and provided in writing immediately before the competition begins.

3.2. Definition of Task Objects and Components

The physical characteristics and standards of the components found on the course (lines, walls, target boards, obstacles, objects, etc.) will be announced to the teams and provided in writing immediately before the competition begins.

3.3. Object Placement Procedure and Tolerance

The standards for placing objects on the course relative to reference points and the acceptable margin of error will be announced to the teams immediately before the competition begins and provided in writing.

3.4. Task Description and Implementation Conditions

The sequence, method of execution, and completion conditions of the tasks expected from the robot during the competition will be announced to the teams and provided in writing immediately before the competition begins.

4. COMPETITION FORMAT AND EVALUATION CRITERIA

4.1. Application Process

Competition applications are made in accordance with the process and principles specified in the Application Guide. Competitors who meet the conditions specified in the Application Guide may participate in the competitions.

4.2. Competition Stages

The competition will last three days, and teams will consist of two competitors. On the first day, all teams will take the proficiency test at the same time. Teams that pass the proficiency test will take their places at the tables assigned by drawing on the morning of the second day and will have the time to design and program their robots. Teams will program their robots using computers provided by the organisation in the afternoon of the same day within the specified time and test them on the test track to prepare them for the competition. At the end of the time limit, the working robots will be handed over to the referees, and the final ranking will be determined on the third day through final competitions held in front of audience.

4.2.1. Task Descriptions and Success Criteria

The game principles, competition rules, how the competition will be conducted, and how it will be scored will be announced to the teams and provided in writing immediately before the competition begins. The prepared robots will compete on the competition track in the order of the draw.

4.2.2. Qualification Exam

On the first day of the competition, all participating teams will be subject to a qualification exam. Team members will take the exam simultaneously and together. **Participation in the exam with only one team member is not permitted.**

The examination will cover the following subjects and will be conducted as a multiple-choice test.

- Basic Electrical-Electronics,
- Basic Digital Electronics,
- Arduino,
- Basic Arduino Programming.

  *** Sample questions for the proficiency exam are provided in Appendix 2.*

Teams will be ranked according to their scores in the proficiency exam. If teams have equal scores, the team that submitted their exam papers earlier, based on the exam start time, will be ranked higher. If the tie still cannot be broken, the team with the lower average age will be ranked higher. The top 40 teams in the ranking will qualify to participate in the "design" section of the competition.

4.2.3. Design

Teams that pass the qualification exam will be assigned to work tables in the order of the draw. Teams will be present at the tables with all the materials they have brought with them. The characteristics of the course/platform where the competition will take place, the tasks of the robot, and the materials provided by the organisation will be delivered to the competing teams immediately before the competition begins. The competing teams will design and programme their robots in the designated work areas within the specified time.

4.2.4.Run

Teams will program the robots they have designed within the specified time using the computer provided by the organisation and run them on the test track to prepare them for the competition. At the end of the time limit, the judging panel will collect the robots from the competitors and return them on the third day during the final competition. The ranking list will be announced by the judging panel at the end of the competition.

4.2.5.Race

The final races will be held in a closed hall in front of audience, following the order determined by a draw.

4.3 Scoring System and Evaluation

The evaluation criteria will be announced to the teams immediately before the competition begins and provided in writing.

4.4 Competition Duration and Break Usage

The maximum time allowed for each round, the rules for removing the robot from the course, and break/technical support rights will be announced to the teams immediately before the competition begins and provided in writing.

5.   ETHICS AND OTHER RULES

5.1. Disqualification and Penalty Situations

Failure to comply with the rules, unethical behaviour and technical specification violations will result in disqualification or penalty points, which will be announced to teams immediately before the competition begins and provided in writing.

5.2. Appeal Procedure

The procedure for teams to appeal competition results or referee decisions is outlined in the application guidelines.

5.3. Warnings and Ethical Rules for Competitors

General courtesy rules, restrictions on access to the competition area, and specific warnings regarding robot safety will be announced to teams and provided in writing immediately before the competition begins.

5.4. Safety Measures

Category-specific safety measures that must be followed will be announced to teams and provided in writing immediately before the competition begins.

5.5. Authority of the Competition Organising Committee

The Competion Committee reserves the right to make changes to the rules, alter or renovate the track, without providing a reason when necessary.

5.6. Other Rules

The computers to be used in the competition will be of the same specifications and will be formatted, reinstalled, and brought to the competition venue in working order by the school(s) assigned by the Antalya Provincial Directorate of National Education.

The computers provided to participants by the competition organisers will have the operating system, office application programme, PDF reader programme, and the Arduino IDE programme downloaded from https://www.arduino.cc/en/Main/Software and the necessary libraries installed. Programming will only be done using this programme. No other applications or programmes will be present. Computers will be inspected by the judging panel prior to the competition.

Before the competition begins, the products and materials to be used in robot construction will be kept ready on the work tables, and the robot will be constructed using the product groups specified in the list.

Competitors shall not carry any electronic devices such as computers, mobile phones, tablets, USB drives, external hard drives, smartwatches, etc.

6. COMMUNICATION

6.1 Question and Announcement Tracking Channel

Competition applications and general rules regarding the Desıgn-Build Basic Level Category are included in the "Application Guide". The Application Guide must be read before applying.

Competitors should ask their questions after logging into the robot.meb.gov.tr system and selecting their category from the information menu. Questions received outside of the category messages will not be answered, and no responsibility will be accepted.

6.2 Competition Coordination Information

The necessary email, telephone, and responsible unit information for communication is provided in the Application Guide.

7. ATTACHMENTS

7.1 Competition Card

The competition cards to be used in the competition will be prepared in accordance with the competition regulations prior to the competition and will be announced to the teams and provided in writing immediately before the competition begins.

7.2 Sample Questions

1. What is the value of the resistor with the colours red – green – yellow – silver?

    a) 2 kΩ   b) 200 KΩ   c) 250 KΩ   d) 2 MΩ

2. Which of the following is the symbol for a diode?

    a)   b)   c)   d)

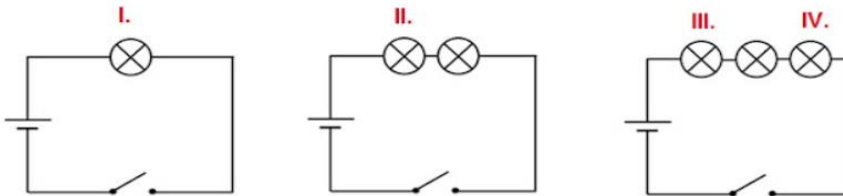3. Which of the following elements is not found in a simple electrical circuit?

    a) Battery   b) Cable   c) Bulb   d) Fuse

4. Which of the following circuit components has the incorrect function?

    a) The battery generates electrical energy.

    b) The connecting cable prevents the flow of electrical energy.

    c) The bulb converts electrical energy into light energy.

    d) The switch controls the flow of electrical energy.

5. Below are simple electrical circuits constructed with identical batteries and bulbs.

    When the switch is turned off, which of these bulbs emits the brightest light?

    a) I   b) II   c) III   d) IV

6. Which code is required to activate Arduino's pin 3?

   a) digitalWrite(3, LOW);   b) digitalWrite(3, SET);

   c) digitalWrite(3, HIGH);   d) digitalWrite(3, HIGH);

7. Which lines define all pins between pins 3 and 9 as outputs?

   a) for(int i=0;i<10;i++)   b) for(int i=0;i<10;i++)

      pinMode(i, OUTPUT);   pinMode(i, OUTPUT);

   c) for(int i=3;i<10;i++)   d) for(int i=3;i<10;i++)

      pinMode(i, output);   pinMode(i, OUTPUT);