STEM education
ORGANIZATION OF EDUCATIONAL ROBOTICS, SCIENCE, TECHNOLOGY & MATHEMATICS

STEMATHLON 2026
From Human to Artificial Intelligence
Open Category Middle School

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Summary

This competition is for Middle school students and the aim is to **create innovative robotic structures** that solve modern problems, drawing inspiration from four key areas: **Primary Sector, Energy, Transport and Culture**.
Teams (2-6 students with a coach) are asked to:

- Choose one (or more) of the above areas.
- Identify and study a **modern challenge** in the chosen field.
- Design, build, and program their own robotic assemblies that exchange information using wireless technologies.
- Complete and present their work in an appropriate environment(**e.g. functional model**).

Key Points:

- **Materials:** There are no restrictions on construction materials.
- **Programming:** Any language, as long as the code runs autonomously.
- **Model surface dimensions:** Maximum 150 x 150 cm.
- **Deliverables (15 days before the competition)**: Report (up to 10 pages),technical report (up to 10 pages + code annex), video (up to 2 minutes).
- **Evaluation:** Based on criteria such as idea, innovation, robotic solution,presentation and team spirit. The maximum score is 200.
- **Ranking:** The teams are classified into Gold (20%), Silver (30%) and Bronze(50%).

Category of competition: Open category Middle School

Competition title: Primary Sector, Energy, Transport and Culture

Version: 2.1

Category Supervisor: Panos Verras

A. Description

The category is aimed at middle school students, and its main objective is to create and present innovative robotic constructions that solve contemporary problems, drawing inspiration from fundamental pillars of human activity. Competing teams are invited to design, build, and program their own robotic assemblies, highlighting the exciting transition from traditional technologies to the smart applications of the future.

The 21st century is characterized by rapid development and a gradual transition from human ingenuity to automated "smart" systems that mimic aspects of human thought and activity. Students are invited to explore this journey, understanding how the basic principles of mechanics, programming, and logic lay the foundations for the technologies of tomorrow.

The pillars that teams are invited to address in order to provide solutions to contemporary challenges are:

Primary Sector: The primary sector, which includes agriculture, livestock, and fisheries, faces enormous challenges such as climate change and the need for sustainable production. Technology and robotics can offer revolutionary solutions by increasing efficiency and making the sector more resilient and sustainable.
Energy: Ensuring clean, affordable, and reliable energy is one of the greatest challenges of our time. Robotics plays a critical role in this transition and is an ally in developing new, clean energy sources and creating a more efficient and resilient energy future.

Transportation: Transportation is the connecting link in modern societies, but it faces serious challenges such as traffic congestion, safety, and environmental impact. Robotics and technology offer the potential for a real revolution in this sector, leading to smarter, faster, and, above all, more sustainable solutions for moving people and goods.

Culture: Culture is our heritage, and technology offers unprecedented opportunities to protect and promote it. Robotics can solve important challenges, such as the promotion, deterioration, and accessibility of monuments, while at the same time making our cultural heritage accessible to all.

B. The challenge

Teams are invited to choose one (or more) of the four pillars – **Primary Sector, Energy, Transport, Culture** – and embark on a journey of research and discovery. First, they will need to identify and study contemporary challenges in their chosen sector, understanding their causes and consequences.

Then, they will design and suggest an innovative solution, based on modern technologies, to deal with the problem(s) they've found. This solution should be implemented as a combination of two or three distinct systems that interact with each other using wireless technologies. These systems must include a base station and an autonomous robotic structure.

In addition, the integration of a second autonomous robotic structure is acceptable, but not an additional base station.

- The base station is responsible for processing, analyzing, storing, and displaying the information it receives from the autonomous robotic system in real time. Depending on the solution chosen by the team, the base station can feed back new data and information to the other system.
- The autonomous system is responsible for collecting and transmitting environmental data to the base station, as well as performing tasks depending on the challenge that the specific solution faces. For example, it can incorporate sensors for collecting environmental measurements, mapping the area, or locating minerals or other materials.

The final step is the completion and presentation of the project. Students should fully develop their robotic assembly and integrate it into a suitable presentation environment (such as a functional model) so that they can demonstrate the operation and effectiveness of their solution.

C. Participants and Teams

Each team can consist of 2 to 6 students led by a coach. Students can participate in only one team, regardless of competition and/or age category.
This competition category is for middle school students, and the age categories are as follows:

Students born between 2011 and 2015.
The team coach must be 21 years of age or older during the year of the competition.

D. Materials and Equipment

The systems and models can be constructed using any materials available to the team, and there are no restrictions on the number of passive and mechanical components that can be incorporated. It is recommended that teams have additional repair materials at their disposal, in case they are needed both during preparation and on the day of the competition.

The systems included in the robotic solution can be programmed in any language, as long as their code runs autonomously within the respective system.
The base station may consist of a computer or other system capable of receiving, processing, and displaying information, ideally in the form of real-time graphs. The program on this system should run smoothly and autonomously, without external intervention. If cloud services are used for data analysis and standardization, the base station can be used as an intermediary, but the display must be done by it.

The autonomous system should have all the subsystems that allow it to collect data and act autonomously and without external interconnection or manipulation. The only external communication it can have is with the base station via wireless technology. If the implementation includes a second autonomous system that needs to communicate with the first, this can only be achieved via the base station.

Restrictions:

- The maximum number of different types of measurements that can be received at the base station from the autonomous system cannot exceed six. After processing and analysis, there is no restriction on the number of measurement types displayed.
- The autonomous system(s) must be powered by portable power source(s) with a maximum total capacity of 10,000mAh.

E. Specifications

The maximum dimensions of the model cannot exceed 150 x 150 cm, with the robotic assembly necessarily included in this space. Even during operation and demonstration, all individual components of the system must remain within these dimensions. Any system required to operate outside these limits is considered non-compliant.

The use of any component that may endanger the health and safety of students and judges is strictly prohibited. Power to electronic components must be supplied safely, eliminating any possibility of short-circuiting due to mishandling or other causes. In the case of liquid components, only water is permitted, with a maximum total quantity of 1 liter.

F. Deliverables

Each team must submit a portfolio no later than 15 days before the competition date, which will include:

1. A general report in PDF format containing information about the team, a description of the research, the main principles behind the robotic system, and the solutions it offers. The report should not exceed 10 pages in total, and references and corresponding citations are required.

2. A technical report in PDF format that includes technical information about the systems. This includes materials (e.g., Lego-type bricks), electronic parts (microcontroller, sensors, etc.), and the program that runs the system as an appendix. The technical report should not exceed 10 pages (not including the appendix).

3. A video of up to 2 minutes in total duration, presenting the students' project in operation and the team explaining its individual functions.

G. Evaluation

Each team is evaluated on its work in order to determine the final ranking and to receive feedback for further improvement. This evaluation is based on specific criteria, as shown in the table below.

Criteria		Max. Score
Project &Innovation	Idea, Quality & Creativity	**25**
	Deliverables	**25**
	Research	**20**
	Innovation	**10**
	Total	80
Robotic Solution	Coherence and operation of all systems	**25**
	Substantial use of mechanics and programming	**25**
	Integration of modern technologies	**15**
	Data collection, processing, and analysis	**15**
	Total	80
Presentation, Understanding & Team Spirit	Presentation & model	**15**
	Technical understanding	**15**
	Team spirit	**10**
	Total	40
	Maximum score	**200**

** Although it is not desirable to impose penalties on teams, failure to comply with the rules and regulations of the competition may result in the deduction of points or even the exclusion of the team from the competition.*

H. Ranking of Teams

The final ranking of the teams, which will be based on their average score, will determine the gold, silver, and bronze teams, according to the table below, per age category.

Gold teams	20% of the teams with the highest scores
Silver teams	30% of the teams with the next highest scores
Bronze teams	50% of the teams with the next highest scores

Example: *In a nypothetical scenario of 100 teams participating, the top 20 teams will be awarded gold, the next 30 (positions 21 to 50) silver, and the remaining 50 (positions 51 to 100) bronze.*

At the end of the competition, the teams will be announced as above, and the organizer's website will post a detailed ranking based on the score each team has accumulated.

Our goal

As organizers and judges, we are interested not only in the final result but also in the team's progress towards it.

We look forward to seeing the students' enthusiasm and passion, their joy of creation, and their ability to turn ideas into action.

Particular importance is given to both the technical excellence and innovation of the solution, as well as a substantive understanding of knowledge.

Above all, we want students to understand and demonstrate how new technologies can play a meaningful role in their lives and contribute to solving current and future challenges.


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