



# The 2024 IEEE R10 Robotics Competition

## Terms of Reference

### DISCLAIMER

1. IEEE Region 10 and R10 Robotics Competition Organising Committee will not be responsible for the copyright or Intellectual Property violations by the participants. It is the sole responsibility of the participants to ensure that no copyright and Intellectual Property rights are violated in the material submitted for the competition.
2. IEEE Region 10 reserves the right to amend competition rules to remove any ambiguity. Any changes in the competition rules will be announced on the R10 website and it will be the responsibility of the participating teams to check the changes and abide by the rules.
3. R10 Director can at any time cancel the competition if the participation rate is very low or for any other reason deemed by the R10 Director as valid for the cancellation.
4. The material and information contained in this document is for general information only. You shall not rely upon the material or information as a basis for making any business, legal or any other decision. Neither IEEE Region 10 nor any of its members, directors, employees or other representatives will be liable for damages arising out of or in connection with the use of these information contained herein. IEEE Region 10 reserves the right to add to, change, or delete its content or any part thereof without notice."

## Executive Summary

This document outlines the R10 Robotics Competitions to be held in August 2024 at Tokyo, Japan in conjunction with the R10 SYWL Congress 2024. The document also points out potential benefits for the IEEE and its members in the Region.

The R10 Robotics Competition aims towards IEEE student members and Graduate members. The main objective of the competition is to create awareness amongst young IEEE members about the importance of technology in providing solutions to real-world problems by harnessing their creativity and capabilities. In addition to stimulating technical ingenuity, the competition also aims to help participants polish their professional and personal skills.

The competition will be held in the following three stages:

**Stage 1:** Section Level – Organized by local IEEE Sections to pick the best team(s) to go forward to Stage 2, which will be held at Region 10 level. For Stage 1, IEEE Sections will be encouraged to organize robotics activities such as workshops and technical talks, and arrange robotics competitions and hands-on workshops for school children to inspire younger people to STEM. Sections will also be urged to invite local industry leaders and Government officials to these events.

**Stage 2:** R10 Level online assessment process to select best ten teams for Stage 3, which will be the final round. In Stage 2 teams will be required to give a live demonstration of their robotics projects and answers questions. An R10 appointed Judges Panel will carryout the assessments. The members of the judging panel will be experts in robotics from across R10.

**Stage 3:** A mega-event with a Technology Exhibition and the Awards Ceremony in Tokyo, Japan. If the physical gathering is not possible for any reason, then the final stage will be held online.

R10 will provide funding to Sections to organize the local activities in Stage 1. All funding under the R10 Robotics Competition will strictly adhere to the R10 Matching Fund Policy. No funding will be provided for participating teams for robotics projects.

Currently R10 is the primary financial support of the IEEE R10 Robotics Competition. However, for the longer-term sustainability of the competition, it is imperative to find sponsorships and turn this competition into a self-sustainable prestigious R10 flagship program.

A timeline for the competition signposts the launch of the competition in the second half of December 2023 and aiming to complete the final round by August 2024.

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# **1. IEEE Region 10 Robotics Competition**

## **1.1 Introduction**

One of the most effective approaches to inspire young and old professionals alike is to offer them motivational opportunities to learn through experience, apply their skills and experiences to something they can proudly take ownership of, and kindle interest in others to follow them. Robotics is a multi-disciplinary field (hardware, coding, digital signal processing/image processing, artificial intelligence, etc.) that offers a hands-on opportunity to apply classroom theory to building a substantial piece of engineering that can serve a useful purpose. Thus, such pursuits allow a deep understanding of the problems and challenges of building robots for a practical solution.

Building robots is not only stimulating for engineers but also captivating for users and onlookers. Robotics demonstrations are inspirational for young minds to undertake STEM subjects. Owing to their exhilarating appeal, robotic competitions attract significant interest from many people, both technical and non-technical, and therefore gain significant exposure through news and social media channels. The IEEE Region 10 Robotics Competition serves as a great vehicle to ignite passions among young IEEE members, retain current members, attract new members and promote STEM education among the younger generation. It will also provide means to focus on problem-solving and raise IEEE visibility among the communities, local government departments, and industry.

The proposed robotics competition will be open to only IEEE student and Graduate members and will be held in three stages, starting from initial rounds at the local IEEE Sections' level and progressing towards two stages at the Region 10 level. The competition assessment criteria at all three stages will focus more on the demonstrated learning and personal development, usefulness, efficiency and affordability of the robots.

## **1.2 Competition Main Objectives**

The competition aims to create awareness amongst undergraduate students about the importance of technology in providing solutions to real-world problems by harnessing their creativity and capabilities. Therefore, the primary purposes of the competition include (a) realization of the development of robotics-based solutions and (b) encouraging entrepreneurship among younger IEEE members. More specifically, the competition aims to:

- Create opportunities for learning by applying classroom lessons and enabling methodologies to design a robot,
- Stimulate thought process for innovative ideas, and
- Develop students' abilities to:
  - Study and understand the problem,
  - Analyze and decompose requirements,
  - Conduct literature review and essential background research,
  - Avoid violation of copyright and intellectual property rights of other researchers,
  - Learn to use software tools to build robot models.

In addition to stimulating technical ingenuity, the competition also aims to help participants to:

- **Build teamwork spirits** – Learn to optimize team members’ abilities to achieve project goals.
- **Develop leadership skills** – (a) Ability to set goals and effectively communicate plans and strategies to the team members, (b) ability to listen to alternate views and make timely decisions.
- **Develop project management skills** – Participants are required to apply project management principles to (a) identify project goals, (b) prepare a work breakdown structure (WBS) with realistic timelines, (c) determine key milestones leading to the completion of the project, (d) manage time and resources.
- **Sound engineering practices** – Documentation and recording keeping for
  - (a) robot design features requirements,
  - (b) design decisions, i.e., different options contemplated and the reasons for selected options,
  - (c) ability to trace back the technical errors if any and troubleshooting, and
  - (d) proof of originality and ownership of the work for future developments.

Some added benefits of the competition are (1) highlighting the benefits of IEEE membership for members and non-members and (b) promoting STEM education among the younger generation. Furthermore, the R10 robotics competition provides an opportunity to IEEE members in the Region to compete against teams from other Sections and countries. It also facilitates networking to develop technical solutions for the benefit of humanity.

### **1.3 Main Contestants**

In 2024 the R10 Robotics Competition will be open to IEEE Student members and Graduate Student members belonging to educational institutes located within the geographical boundaries of the IEEE Region 10.

### **1.4 Competition Organisation**

The competition will be organized in the following three stages:

**Stage 1:** Section Level – Organized by local IEEE Sections to pick the best team(s) to go forward in the online R10 competition. For Stage 1, IEEE Sections will be encouraged to organize robotics activities such as workshops and technical talks and arrange robotics competitions and hands-on workshops for school children to inspire younger people to STEM. Sections will also be urged to invite local industry leaders and Government officials to these events. A limited R10 funding will be available to Sections to conduct Stage 1 activities. R10 funding will be approved after a strict scrutiny of the proposals submitted by the IEEE Sections in the Region.

**Stage 2:** Teams nominated by the Sections will undergo an online assessment process to select best ten teams for Stage 3, which be the final round. An R10 appointed Judges Panel will carryout the assessments. The members

of the judging panel will be experts in robotics from across R10. In Stage 2, teams will be required to give a live demonstration of their robotics projects and answers questions from the Judges.

**Stage 3:** This will be the final round of the competition where judges will examine the robotics projects and score the teams according to the assessment rubric given in Appendix A. The Stage 3 will be held in Tokyo along with the R10 SYWL Congress. It is expected to be mega-event with a Technology Exhibition and the Awards Ceremony. The exact dates and venue is expected to be announced at the R10 Annual General Meeting at Le Meridien Hotel, Kuala Lumpur, Malaysia on 2 – 3rd March 2024.

If the physical gathering is not possible for any reason, then the final stage will be held online.

The main features of all three stages of competition are briefly given below.

#### **1.4.1 Competition Stage 1**

- (1) In Stage 1, Sections will select the best two teams through a local competition or a selection process determined by the IEEE Section/Subsection. Sections must try to invite all Student Branches (SB) and Young Professional (YP) & Women-in-Engineering (WIE) Affinity Groups to participate in the local robotics activities. The main activities of Stage 1 will be:
  - (a) The selection of a maximum of two teams to represent the Section in the R10 Robotics Competition must be under the rules and categories defined below in section 2. A local Section level committee can specify the assessment and demonstration criteria of the projects to local judges for the selection. In cases where there are not enough teams requiring a selection process, the Section can nominate available team(s) for the R10 Robotics Competition after checking the fitness of the project.
  - (b) R10 funding for Sections to host local level competition (appropriate amount to be determined). which will be subject to Section's contribution in cash and kind according to the R10 Matching Funds Policy (Please see section 2.3 below). Sections will have to apply for the funding using the prescribed form available on the competition website.
  - (c) Local educational institutes, including primary and secondary school children should be invited to come and participate in simple competitions and robotics workshops for inspiring young students to STEM (small prizes and certificates).
  - (d) IEEE Sections must try to invite local industry leaders and Government officials and seek their local support and sponsorship.

#### **1.4.2 Competition Stage 2**

Stage 2 rounds will be organized by R10 by inviting Sections' nominated teams to give live demonstration of their robotics projects online.

Prior to the online assessments, the nominated teams will be required to submit:

- (1) A submission form with team details and endorsement by the Section Chair,
- (2) A 6-minute video (mp4 format) for demonstration of robot design and functionality, and

- (3) A Project Technical Report explaining (aims to polish participants technical report writing skills and allow judges to have a better understanding of the robot)
  - (a) Executive Summary
  - (b) Team members and their contributions (Team strength)
  - (c) Refinement of project ideas (Thought process)
  - (d) Background research about existing solutions (Literature review)
  - (e) Design considerations (Tradeoffs & key features including safety)
  - (f) Technical challenges resolved (Tackling technical difficulties)
  - (g) Key hardware options and Coding solutions (Technical details and optimization)
  - (h) Innovation and its social impact (What is new and how useful is the solution, including any adverse effects) and
  - (i) Conclusion including comments about the commercial viability of the project.

Besides demonstrating the robot's functionality, each team would be given an opportunity to present any additional information about their project, including the introduction of the team, the background research work, the development process of the robot and the cost. There would not be a pre-described format for presenting the additional information, but there will be a time limit of 3 minutes.

The judging panel may ask questions to clarify or understand the robot design and functionality. The top ten teams will be selected to advance to Stage 3.

### **1.4.3 Competition Stage 3**

Stage 3 will be the final round of the competition and will be held in conjunction with the R10 SYWL Congress in August 2024 at Tokyo, Japan. It will be a physical gathering of top ten teams from Stage 2 to compete against each other. The plans for Stage 3 include:

1. A two-day competition with invited keynote speakers from industry and robotics research academics.
2. International Judging Panel supported by local judges and referees/adjudicators.
3. Each team will be given a small booth to display their robot, a technical poster and a desk for video demonstration on their own computer screen. The booth will be open for the delegates of the SYWL Congress to visit and intermingle with the teams. This will provide an opportunity for the participants of both events to learn about the innovative ideas and networking.
4. The final round will also be open to all IEEE members in the vicinity of the event to attend.
5. Closing ceremony with chief guest and prizes distribution.
6. Exposure of talent in R10 through social media and IEEE news channels (R10 Newsletter, R10 YouTube channel and IEEE TV).
7. IEEE Sections are expected to provide partial financial support to their teams to participate in Stage 3.

## 1.5 Competition Categories

IEEE student member and graduate members are not required to design and build any robots specifically for the R10 Robotics Competition and can submit their current academic projects. However, the robotics project must not have been completed before June 2023 **or** participated in Stage 3 of any previous R10 Robotics Competition.

The robotics project must be innovative, suitable for practical proposes and with good potentials for commercially marketable. The eligible robotics projects can belong to any of the following broad categories:

1. Robots for healthcare,
2. Robots for humanitarian propose,
3. Robot for educational/research purposes,
4. Robots for community services or community awareness,
5. Robots for tackling the climate change challenges or assisting with climate sustainability,
6. Robots for industrial applications and
7. Robots for world peace, for example, prevention of human suffering by landmines detection and defuse, servailance and narcotics control etc.

The above list is not exhaustive and robots belonging to other categories may be accepted for their innovative and usefulness.

Airborne robots or drones will not be selected for the final round in Tokyo as Japanese laws do not allow of flying robots or drones in public places.

## 1.6 Eligibility Criteria

IEEE Student members and Graduate Student members are eligible to participate in the competition. IEEE Student members enrolled for a Bachelor's degree in electrical engineering, electronics engineering, computer science, or any other field of interest of an IEEE Society are classified as eligible undergraduate students (UG).

- Participants in the contest can be individual or a team as explained below:
  - Individual (must be an active IEEE student or Graduate member)
  - Team: A team will consist of no more than four members. All team members must be IEEE members. Non-member students must join IEEE to participate in the competition.
  - To qualify as a WIE team, the majority of team members must be female IEEE members and not just the majority of female members. The team can NOT have an equal or more number of males than female members.

## 1.7 Rules

- A team can submit only one project for the competition. Submissions from the same team for more than one project will not be accepted.
- The competition will be conducted in English, i.e., all submissions, including project documentation must be in English. However teams will be allowed to arrange the services of a translator to answer judges' questions at all three stages of the competition.



- Stage 1 will be arranged locally by the IEEE Sections with an overall guideline from R10. Each IEEE Section will be allowed to select upto two teams to represent the IEEE Section/Subsection in Stage 2.
- Robot projects must be original and must not contain plagiarized material, and must not violate any copyright or intellectual property rights.
- The contestants cannot use hardware developed for another project or use a commercially available robot for the competition. Similarly contestants cannot use predeveloped CAD models available on the Internet.
- The 6-minute video must be associated with a correctly completed submission form. Any submission that is more than 6 minutes long will be disqualified.
- Rough sketches and notes will NOT be accepted as proper engineering notes/reports. Instead, participants must properly document robot design features, modeled or used components with interconnections, and written codes.
- The judges' decision will be final in all three stages, and no appeal against the judges' decision will be entertained.
- IEEE Region 10 and R10 Robotics Competition Organising Committee will not be responsible for the copyright or Intellectual Property violations by the participants. Therefore, it is the sole responsibility of the participants to ensure that no copyright and Intellectual Property (IP) rights are violated in the material submitted for the competition. Any submitted project found of violating the copyright or IP will be immediately rejected and team members will not be allowed to participate in future R10 Robotics Competition.
- Before nominating a team for the competition, the parent IEEE Section/Subsection officials will make sure that the students' project is not in breach of any law, copyright or IP rights.
- IEEE Region 10 reserves the right to amend competition rules to remove any ambiguity. Any changes in the competition rules will be announced on the R10 website, and it will be the responsibility of the participating teams to check the changes and abide by the rules.
- R10 Director can at any time cancel the competition if the participation rate is very low or for any other reason deemed by the R10 Director as valid for the cancellation.

## **1.8 Assessment Process**

Generally, the assessment criteria will focus on the innovativeness, practical usefulness, efficiency, and affordability of the robots. The assessments will also give weight to develop members' soft skills like project planning and management, technical report writing, and presentation of complex subjects to both technical and nontechnical audiences.

For Stage 1, the local Section will organize the judging panel consisting of local experts and senior IEEE members if required. For Stage 2 and Stage 3, R10 will organize panels of international experts to examine the entries against the specified assessment criteria. The panel of judges will carry out the judging and mark according to a scoring rubric especially developed for the 2024 R10 Robotics Competition.

## **1.9 Prize Scheme**

The R10 Robotics Competition will offer prizes to encourage innovation and entrepreneurship, promote STEM and enhance IEEE visibility in the communities. Generally, the prize scheme will consist of:

**Stage 1 Prizes:** These will consist of certificates and maybe cash prizes depending on the sponsorship from the local industry and relevant government departments. Sections would also be encouraged to invite local school children to participate in the competition and offer them some prizes for encouragement and inspiring them to study STEM subjects.

**Stage 2 Prizes:** No prizes will be awarded in Stage 2. However, those teams who could not qualify for Stage 3 but demonstrated innovative/interesting ideas in Stage 2 may get a participation certificate acknowledging their project ingenuity.

**Stage 3 Prizes:** The prize scheme for Stage 3 will consist of

1. One Grand Prize of the competition
2. Project prizes for:
  - a. A cash prize for the first position and a certificate,
  - b. The second position cash prize equivalent to 70% of the first cash prize plus certificate, and
  - c. The third position cash prize equivalent to 50% of the first cash prize plus certificate,
3. There will be one special prize for IEEE Women-in-Engineering members for the encouragement of young women studying engineering-related courses or working in engineering professions. This is expected to inspire young females to study STEM courses.

It will be up to team members to decide how to split the cash prize among team members who are IEEE members. Cash prizes are not for non-IEEE members but they can receive participation certificates.

R10 Director can approve a different cash prize arrangement instead of above mentioned scheme.

## **2 Competition Administration**

The R10 Robotics Competition will be a joint endeavor of several R10 committees including R10 Students Activities Committee (SAC), R10 YP Committee, R10 WIE Committee, R10 Humanitarian Technology Activities (HTA) Committee and R10 Industry Relations Committee (IRC). The Chairs of these core committees will be responsible to (1) make policy decisions and (2) assist in successful conduct of the competition. All policy decisions will be reviewed by an Advisory Committee and approved by the R10 Director.

R10 Director will approve a R10 Robotics Competition Organizing Committee and will appoint the Chair of the committee. The Organizing Committee Chair shall be responsible to recruit appropriate volunteers to undertake required tasks for the competition.

## **2.1 Timeline**

The 2024 R10 Robotics Competition will be held with the following milestones deadlines:

- Competition launch date: No later than 25th December 2023
- Call for R10 Funding: 3rd January 2024 (closing date 30 January 2024)
- Stage 1 Activities (conducted by Sections): January to April 2024
- Nomination by Sections of students team: 1st May 2024
- Teams to submit required material (video, poster and technical report): 10th May 2024
- R10 processing of all nominated teams: 1 – 15th May 2024
- Stage 2 Assessments: 15 May to 15 June 2024
- Announcement of selected teams for the Stage 3 (Final Round): 30 June 2024
- Teams to complete Stage 3 Registration form: 10<sup>th</sup> July 2024
- Invitation letters for visa application issued: 15<sup>th</sup> July 2024
- Stage 3 Final Rounds: August 2024 at Tokyo, Japan – Exact date and venue to be announced at the 2024 R10 AGM in Malaysia.

## **2.2 Dissemination of Information**

The R10 Robotics Organizing Committee will maintain a website where all relevant documents/information shall be available for the participants. The website will also have links to submit enquiries and upload submissions for the competition.

## **2.3 R10 Funding Policy**

All funding under the R10 Robotics Competition will strictly adhere to the R10 Matching Fund Policy as explained below.

- For Large Section, R10 can support up to 50% of total expenses but no more than the maximum limit set for funding.
- For the Medium Section, R10 can support up to 75% of total expenses but no more than the maximum limit set for funding.
- For the Small Section, R10 will support 100% of total expenses but no more than the maximum limit set for funding.

For example, R10 funding with a maximum amount of US\$ 400 would mean that if an activity expenses are US\$ 600, then in case of a large Section the R10 contribution would be US\$ 300 (50%) and for a Medium Section it will be US\$ 400 (maximum limit) and not US\$ 450 (75%). Similarly, in the case of a small Section R10 will fund no more than US\$400 (maximum limit) even if the expenses are US\$ 401. The residual funds will have to be supported by the Section and/or from any other source of funding.

IEEE Sections are classified as Large, Medium or Small as follows:

- Large Section: 1,501 or more members (including Students) as of 31 December of the prior year.

- Medium Section: 501-1,500 members (including Students) as of 31 December of the prior year.
- Small Section: 500 or fewer members (including Students) as of 31 December of the prior year.

#### **2.4 Disclaimers for Competition Projects**

All documents describing the competition projects will display following disclaimers on the front page:

1. IEEE Region 10 and R10 Robotics Competition Organising Committee will not be responsible for the copyright or Intellectual Property violations by the participants. It is the sole responsibility of the participants to ensure that no copyright and Intellectual Property rights are violated in the material submitted for the competition.
2. IEEE Region 10 reserves the right to amend competition rules to remove any ambiguity. Any changes in the competition rules will be announced on the R10 website and it will be the responsibility of the participating teams to check the changes and abide by the rules.
3. R10 Director can at any time cancel the competition if the participation rate is very low or for any other reason deemed by the R10 Director as valid for the cancellation.
4. The material and information contained in this document is for general information only. You shall not rely upon the material or information as a basis for making any business, legal or any other decision. Neither IEEE Region 10 nor any of its members, directors, employees or other representatives will be liable for damages arising out of or in connection with the use of these information contained herein. IEEE Region 10 reserves the right to add to, change, or delete its content or any part thereof without notice."

## Appendix A

**Assessment Rubric** (for scoring based on the material presented & Judges' Q&A)

	<b>0 - 4</b> <i>None or Limited</i>	<b>5 - 6</b> <i>Reasonable</i>	<b>7 - 8</b> <i>Good - Very Good</i>	<b>9 - 10</b> <i>Excellent - Outstanding</i>
<b>#1 Project Usefulness</b> Application of the project to healthcare, humanitarian or climate change challenges.	0 - 4 Limited application in real world	5 - 6 <i>Reasonable application in real world</i>	7 - 8 <i>Good - Very Good applications in real world</i>	9 - 10 <i>Excellent - Outstanding applications</i>
<b>#2 Design Innovation</b> Originality and Innovative solution/product/process to meet the stated objectives	0 - 4 <i>Limited or None</i> no innovative design features.	5 - 6 <i>Reasonable</i> Marginal level of innovative design features. (at least 1 feature either in hardware or software design).	7 - 8 <i>Good - Very Good</i> Moderate level of innovative design features. (at least 2 features either in hardware or software design).	9 - 10 <i>Excellent - Outstanding</i> <i>The project has a significant level of innovative design features (at least 3 features either in hardware or software design).</i>
<b>#3 Engineering Practices</b> Sound technical approach and implementation	1 - 4 <i>Limited</i>	5 - 6 <i>Reasonable</i>	7 - 8 <i>Good - Very Good</i>	9 - 10 <i>Excellent - Outstanding</i>
<b>#4 Engineer Precision</b> Factual and technical accuracy	1 - 4 <i>Limited</i>	5 - 6 <i>Reasonable</i>	7 - 8 <i>Good - Very Good</i>	9 - 10 <i>Excellent - Outstanding</i>
<b>#5 Safety Features</b>	0 (zero) No functional safety features.	1 - 2 Only one functional safety feature.	3 - 4 At least two safety features both in hardware and in software and not all are fully functional	5 (full marks) At least three safety features both in hardware and in software and all are fully functional

<b>#6 Performance</b> (Hardware & Software)	Cannot perform the task either smoothly or accurately.	Performs tasks with marginal accuracy	Performs tasks with moderate accuracy under few different conditions	Performs the task smoothly and accurately under a variety of conditions
<b>#7 Experimental Validation &amp; Verification</b>	1 - 4 No or little evidence of experimental validation	5 - 6 Functionalities individually validated	7 - 8 Full system validated in controlled settings	9 - 10 Full system validated in realistic set up
<b>#8 Commercialization Projects</b> Business model based on market survey and analysis	Poorly articulated business value model and commercialization potential	Marginally articulated business value model and commercialization potential	Moderately articulated business value model and commercialization potential	Well articulated business value model and commercialization potential

<b>Video Presentation</b>	<b>Below Average 0 - 4</b>	<b>Great Starting Point 5 - 6</b>	<b>High Quality 7 - 8</b>	<b>Very High Quality 9 - 10</b>
<b>#9 Project Presentation</b>	1 - 4 Poor description of the project including technical aspects, design methodology, innovative features. Poor Q&A performance.	5 - 6 A fair description of the project including technical aspects, design methodology, innovative features. With a fair Q&A with the judges	7 - 8 Moderate description of the project including technical aspects, design methodology, innovative features. With a moderate Q&A with the judges.	9 - 10 Excellent description of the project including technical aspects, design methodology, innovative features. With a successful Q&A with the judges.
<b>#10 Project Planning</b> Project Planning & budget, identification of potential risks, and risk mitigation strategies	1 - 4 <i>Limited</i>	5 - 6 <i>Reasonable</i>	7 - 8 <i>Good - Very Good</i>	9 - 10 <i>Excellent - Outstanding</i>

<b>#11 Project Demonstration</b>	0 - 4 No or Inadequate demonstration of the working	5 - 6 <b>Reasonable</b> Project (Hardware & software) seems to be working but needs improvements.	7 - 8 <b>Good - Very Good</b> Project (Hardware & software) working and achieving it goals.	9 - 10 <b>Excellent - Outstanding</b> Demonstration of fully functional project
<b>#12 Team Work</b> Coordination and workload sharing	1 - 4 <b>Disjoint or Limited</b> <i>Poor Team management.</i>	5 - 6 <b>Reasonable</b> Moderate team management and not equivalent participation from all the members.	7 - 8 <b>Good - Very Good</b> Moderate team management and not equivalent participation from all the members.	9 - 10 <b>Excellent - Outstanding</b> Excellent team management with adequate participation from all the members.

<b>Poster Presenter</b>	<b>Below Average</b> 1 - 4	<b>Great Starting Point</b> 5 - 6	<b>High Quality</b> 7 - 8	<b>Very High Quality</b> 9 - 10
<b>#13 Abstract</b> Concise & informative	<b>None - Little</b> Lack of understanding of what an abstract is or how to structure one	<b>Fair</b> Does not provide good project insights.	<b>Good - Very Good</b> Abstract is informative and well structured	<b>Excellent - Outstanding</b> Abstract is informative and well structured and I want to know about the project!
<b>#14 Flow of Information</b> Description of (a) key technical aspects, (b) implementation methodology (engineering) and (c) accomplishments	Inadequate to understand the key features and engineering work	Fair description giving some insights, technical information is understood by people with highly specialized knowledge.	Easy to understand the project and its usefulness, technical information is understood by people with general technical knowledge.	Well structured and very clear to understand the project and its benefits, adequate level of technical information (understandable by most of the people)

<b>#15 Adequacy of the conclusion</b>	No indication of project status	Unclear if project has successfully completed	Clear indications of successful project completion but no plans for future.	Clear indication of project outcomes with future plans
<b>#16 Grammar, spelling, style, and choice of words and diagrams</b>	<b>0 (Zero marks)</b> Difficult to make meaning of sentences. In need of substantial proof reading	<b>1 - 2 Marks</b> Great use of the English language with occasional mistakes and correct structure used throughout	<b>3 - 4 Marks</b> Excellent use of the English language and correct structure used throughout	<b>5 (Full Marks)</b> Flawless use of the English language and correct structure used throughout