



2019 IEEE AP-S Student Design Contest

Radar applications in everyday life

Travel to the 2020 IEEE AP-S USNC-URSI and win up to US \$1,500!

Join the 10th IEEE Antennas and Propagation Society (AP-S) Antenna Design Contest! Design and build a system to demonstrate the function and application of radar. The top 6 teams will receive travel funds to attend the IEEE Antennas and Propagation Symposium in Montreal, Canada, July 4-11, 2020 to demonstrate their working systems. 1st, 2nd and 3rd place winners will be announced at the 2020 IEEE AP-S Awards Presentation at the conference and will receive cash awards of US \$1,500, \$750 and \$250, respectively.

Important deadlines are **November 30, 2019** and **March 31, 2020**.

Goal: Propose a setup that demonstrates the properties of a radar system in a practical application and provide educational material to explain it.

Specifications

- The setup must be able to measure/demonstrate some properties and operation of a radar system for an application of your choice.
- The radar system can be active or passive. For active systems, you can choose the operating frequency as long as it is in an ISM band.
- Many new low-cost single-chip and chipset products for radars have become available in recent years. Teams may consider using commercial off the shelf technology in a clever way to realize a radar system.
- The results must be displayed in real time.
- The setup and procedure must be easy to understand for non-specialists.
- The setup must be easy to reproduce in a classroom.
- The teams have to explain the theory behind their demonstration setup in a simple way (so that it can be understood by non-engineers.)
- Step-by-step instructions to allow reproducing the system for anyone who wants to use it for teaching purposes have to be provided.
- Merit will be assigned to designs based on the following criteria, equally weighted:
 - Creativity and justification of the design and its application;
 - Capability of the system to show the properties of the radar system
 - Quality of the experimental setup and results;
 - Educational value and clarity of the DIY/demonstration instructions.
- Existing licensed software at the university (e.g., electromagnetic simulation software) or free software may be used. Any other commercial software used for the project should be included in the budget. The total production cost for the entire system must be less than US\$1,500.

Eligibility

The team should consist of 2 to 5 students, with at least 50% being undergraduate students. For a 5-year Bachelor-cum-Master degree program, students in years 1 to 3 are considered undergraduates. Each team should be advised by a

professional mentor who is a member of the IEEE AP-S, but the work needs to be done primarily by the students. No student or mentor should be involved in more than one team.

Application and Review Process

1. All applicants must submit a preliminary design by **November 30, 2019**. It must include:
 - a. A proposal limited to two pages and in 12-pt Times New Roman font that includes
 - i) A detailed description of the setup and the properties to be measured.
 - ii) A detailed description of the system to be built.
 - iii) A bill of materials (up to US \$1,500).
 - b. A letter from a professional mentor, such as a professor or engineer in industry indicating agreement to supervise the project (the students being mainly responsible for doing the work). The mentor must be an AP-S member (please provide IEEE membership number) and must verify that all team members are graduate or undergraduate students at a university, college, or technical school. The proposal and letter must be integrated into a single PDF file named *TeamName.pdf*.
2. The college of reviewers will assess each preliminary design based on likelihood of achieving the design goal and specifications, creativity, and quality of written materials. Six semi-finalist teams will be selected by **December 15, 2019** and will receive US\$1,500 each to build and test their designs.
3. Each of the six semi-finalist teams must submit their final design by **March 31, 2020** in the form of a video demonstration of the working system (≤ 5 minutes), step-by-step instructions to replicate the system (≤ 5 pages) in PDF format (≤ 5 MB file size), and a final report (≤ 5 pages) in PDF format (≤ 5 MB file size). Submission instructions for the video demonstration will be provided later (some videos from previous contests are available on YouTube – search for “AP-S Student Design Contest”). The report should follow the two-column format of the IEEE Transactions on Antennas and Propagation and include:
 - i) A detailed description of the system’s measurement capabilities
 - ii) An easy-to-understand of the theory behind the measurement system
 - iii) A list of parts and materials required, including where to obtain them and costs.
 - iv) Photos of the final system.
 - v) Measurement results obtained using the system.
 - vi) Biographies (100 words or less each) and photos of all design team members.
4. Several Design Contest Judges will be appointed to assess each semi-finalist’s design based on achieved performance, creativity, completeness of the description, functionality of the system as determined by the video, and quality of written materials. Six finalist teams will be selected by April 30, 2020 to receive stipends of up to US\$3,000 per team to travel to and attend the IEEE AP-S Symposium. The stipend is intended to cover equipment shipping costs and all expenses for one team representative; however, it may be divided among multiple team members. Additional funds may be available to support teams with large travel distances. Please contact the SDC coordinator for details.
5. The finalists will be expected to demonstrate their working systems during the Symposium and attend the Awards Banquet. Two celebratory dinner tickets will be reimbursed per team, for one team member and the team mentor. Each team should bring all necessary equipment for the demonstration. The Design Contest Judges will assess the final demonstrations and take into account the final reports to select the 1st, 2nd, and 3rd prize winners, who will receive certificates and cash prizes of US \$1,500, \$750 and \$250, respectively. The prize winners will be announced at the Awards Presentation.
6. After the Symposium, the 1st, 2nd, and 3rd prize winners may revise their final reports for possible submission and publication in the IEEE AP Magazine under the Education Column (the reports will be reviewed and must meet Magazine standards.) Team mentors may either be listed as a co-author or acknowledged in the paper.

How to Submit Materials

Send all questions and materials to designcontest2020@ieeeaps.org with the subject line “2020 IEEE AP-S Design Contest.” **Messages without this subject line may not be received.** All submitted materials must be in PDF format according to the guidelines above.