

Request for Proposal

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INTRODUCTION

SAE International and General Motors are proud to announce the launch of the SAE AutoDrive Challenge™ II. The competition continues the strong partnership between GM and SAE in STEM education and will build on the ground-breaking success of the original four-year series, AutoDrive Challenge™. Our second series aims to have participating university teams develop and demonstrate an autonomous vehicle (AV) that can navigate urban driving courses as described by SAE Standard (J3016™) Level 4 automation. As part of SAE's Collegiate Design Series (CDS) this second series expands the ground-breaking SAE AutoDrive Challenge™, which began in 2017 and runs through the academic year 2021. The AutoDrive Challenge™ II competition recognizes the increased interest in Automated Driving Systems, Software, and Sensing technologies by Universities and students and is envisioned to increase the number of participating students.

SAE International has been committed to undergraduate engineering education for over 40 years with multi-disciplinary collegiate competitions that focus on hands-on engineering challenges including Formula SAE, Baja SAE and SAE Aero Design, and AeroConnect Challenge™. General Motors also has been a dedicated long-time sponsor, administrator, and advocate of various collegiate engineering programs. AutoDrive Challenge™ II will provide a platform to demonstrate to STEM university students the wide range of exciting and challenging opportunities in the rapidly expanding field of mobility.

This document will walk you through the procedure of submitting a Proposal for the new four-year competition beginning in the Fall 2021. We ask you to review this Request for Proposal document to get a better understanding of the competition, timeline, and the expectations of your university prior to submitting the required documentation online.

AUTODRIVE CHALLENGE™ II RFP SCHEDULE

May 14, 2020	Information WebEx Session for Universities interested to ask questions about the RFP
September 1, 2020	Website for online Registration and Proposal Submission Opens
September 25, 2020	Website for online Registration and Proposal Submission Closes
October 16, 2020	Communication with Stage 1 Selected Universities and Invitation to GM On-Site ADAS Technical Education Event and Faculty Q & A Session
October 19, 2020	Website Opens for Stage 2 Selected Universities to Submit Remaining Proposal Material
November 10, 2020	Website Closes for Stage 2 Selected Universities to Submit Remaining Proposal Material
Mid November 2020 – actual dates will be announced later	GM On-Site Event – ADAS Technical Education Event and Faculty Q & A Session
January 29, 2021	Communication to Universities regarding AutoDrive Challenge™ II Selection Decision
February 26, 2021	Deadline for Selected Universities to Accept
April 13 - 15, 2021	Announcement at WCX 2021 of Selected Universities into AutoDrive Challenge™ II Competition

COMPETITION OBJECTIVES

The AutoDrive Challenge™ II focuses on autonomous driving and the associated technologies. This competition provides a professional development experience for students from the selected universities into the second series. The overarching goals of the competition will include:

- Development of the next generation of Autonomous Vehicle Engineering Professionals through a keen focus on sensing and perception technologies, simulation, integration of AV compute platform, software development, deep learning, artificial intelligence, sensor fusion, navigation and mission planning, and autonomous vehicle controls.
- To build a competition that encourages student teams to demonstrate SAE J3016 Level 4 automated driving through a phased development approach.
- Provide a catalyst and opportunity for participating universities to build a curriculum and expertise supporting the continuing growth of the autonomous mobility industry.

TECHNICAL OBJECTIVES

AutoDrive Challenge™ II is a four -year collegiate competition where teams will be challenged to design, develop, and demonstrate an autonomous driving passenger vehicle. The teams will be guided through an industry style vehicle development process leading up to the demonstration of an SAE J3016 Level 4 design in a limited capacity in year 4. Below is an overview of what the teams will be challenged to accomplish during each year. The design progression will start with Architecture Selection/Simulation/Hardware in the Loop (HIL) Bench in the first year and be followed by the vehicle delivery for year 2 with the addition of dynamic driving challenges for the 3 remaining years of the competition.

	Yearly Technical Objectives
Year 1 2021 –2022	<p><u>Architecture Selection/Simulation/HIL Bench</u></p> <ul style="list-style-type: none"> • Develop a 4-year Project Plan and team structure definition • Design selection and Simulation • HIL Bench development • Vehicle control and interface software design and development
Year 2 2022 –2023	<p><u>Vehicle HW Integration/Initial Vehicle Control (teams receive competition vehicle)</u></p> <ul style="list-style-type: none"> • Integration of AV system hardware into competition Vehicle • SW interfacing to actual vehicle dynamic controls via AV compute platform • Confirmation of perception and classification of objects and traffic controls, lane detection with proper vehicle reactions, detection and avoidance of static objects through a demonstration with their vehicle, this is intended as follow up and linkage to year 1 HIL bench development work on this. • Demonstrate basic path planning and control • Simple dynamic missions: i.e. straight and curved road lane following • Introduction of basic GPS localization and Map utilization

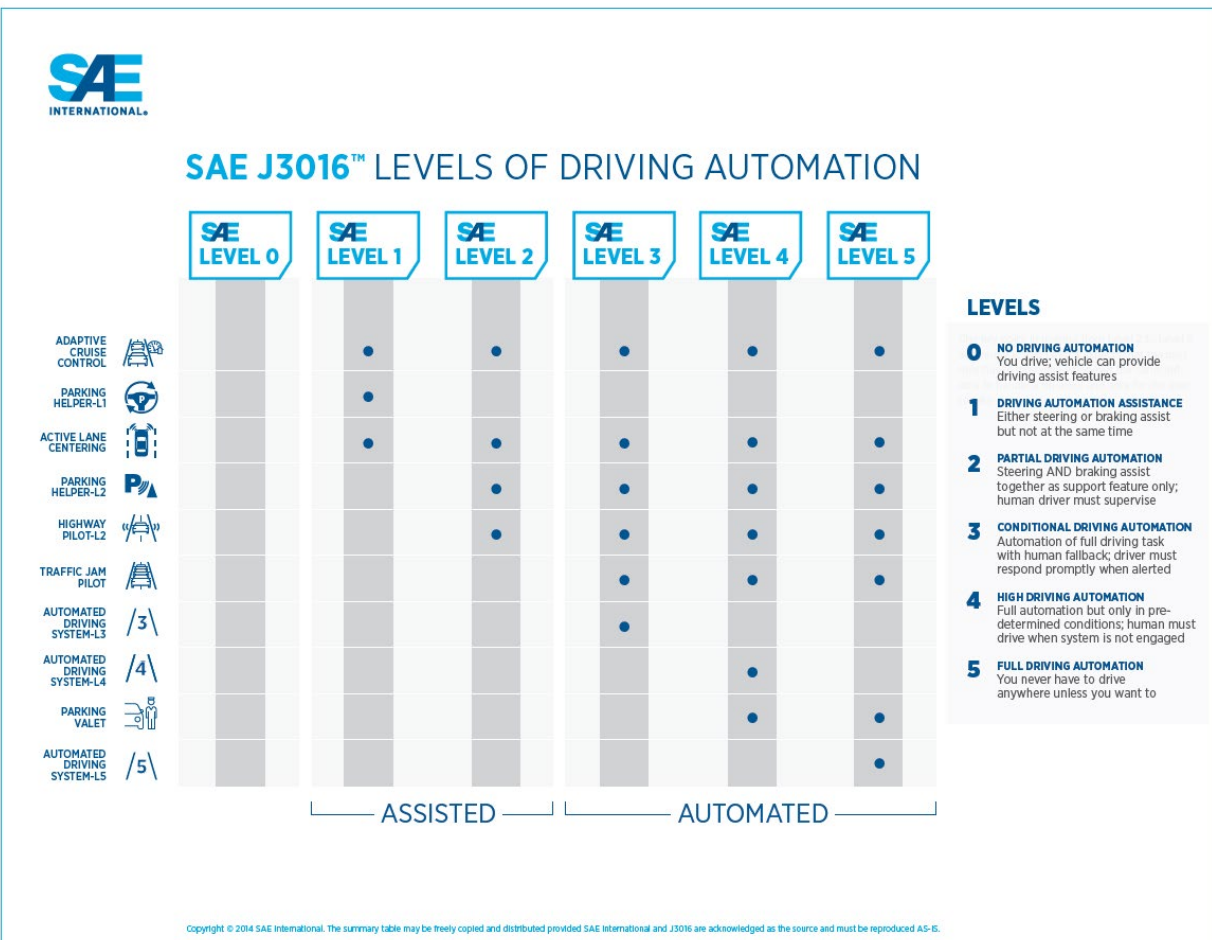
Year 3 2023 –2024	<u>Autonomous Algorithm Refinement</u> <ul style="list-style-type: none">• Increased complexity missions: i.e. lane changes, static and dynamic objects detection and avoidance, proper response to traffic control devices• Route planning and following using map data for competition venue
Year 4 2024 –2025	<u>Validate the Design/Level 4 Demonstration</u> <ul style="list-style-type: none">• Ride sharing route combining previous 2 years of learning and complexities• Level 4 proof of concept demonstration

Technical Design Elements will include the following;

- Autonomous Vehicle Compute Platform
- Sensing – LiDAR, RADAR, Camera, GPS
- Image processing
- Functional Safety
- Simulation
- Vehicle CAN Communications
- Map utilization for navigation
- Localization
- Mission and route planning
- Vehicle Control
- Project Planning

General Motors will provide a vehicle to each University team that will allow controls integration with the vehicles braking, steering, and propulsion systems. Teams will not be required or allowed to develop functionality within these systems.

There will be opportunity for each team to research, develop, and demonstrate significant technology advancements above what the Competition Rules require.



SUPPORT GIVEN TO ACCEPTED AUTODRIVE TEAMS

STARTUP & TRAVEL FUNDING

- The Organizing Committee will provide startup funding of \$30,000 USD in the first year to the accepted universities for the AutoDrive Challenge™ II Competition.
- Teams will also receive various product's related to autonomous driving from AutoDrive Challenge™ II sponsors for the competition.
- Teams will receive stipends to mandatory trainings sessions, workshops, or other types of competition related events throughout the year. Stipend amounts will be determined based on location of the event and the number of attendees permitted. Travel expenses above the provided stipend will need to be covered by your university.

VEHICLE DONATION FROM GENERAL MOTORS

- AutoDrive Challenge™ II teams will receive a donated General Motors vehicle and associated confidential technical information. The vehicle is intended for competition use only.
- A signed Vehicle Donation Agreement with General Motors is required prior to receiving the vehicle, the vehicle will be supplied with a State of Michigan Salvage title. If accepted into

AutoDrive Challenge™ II your university accepts full and complete responsibility to ensure compliance with federal, state and local laws regarding roadworthiness and/or any Rebuilt Title requirements.

GRADUATE ASSISTANT (GRA) FUNDING

- The Organizing Committee will provide \$36,000 USD each academic year over the four-year competition cycle to be used to offset costs associated with at least one dedicated full-time GRA for the AutoDrive Challenge™ II Competition.
- The full time GRA must be identified each year by the faculty advisor prior to receiving the funding.

GM MENTORS

- AutoDrive Challenge™ II teams will be assigned a General Motors employee as a team mentor. The mentor's role is to:
 - Support teams at competition events.
 - Mentor University teams with project management and engineering problem solving.
 - Acclimate teams to industry style product development processes.
 - Serve as a team advocate to the Organizing Committee and a counselor to the team
- Please note the GM Mentor is not a full-time team member but will serve in more of an advisory role, e.g. a Team Mentor.

UNIVERSITY SUPPORT THAT MUST BE GIVEN TO TEAMS

TRAVEL

- By being accepted into the AutoDrive Challenge™ II the university will be acknowledging that the students and faculty advisor(s) will need to travel multiple times during the academic year for competition events, including to workshops, professional development trainings sessions, and culminating competition event each year. The university, students, and faculty will need to make prior arrangements regarding their academic obligations in each absence.

ACADEMIC CREDIT & TEAM STRUCTURE

- The complexity of this hands-on engineering design competition will require many hours dedicated by students and faculty to the project. The Organizing Committee requires that universities provide various ways in which student team members (from the various academic disciplines) can be rewarded with academic credit for their participation and work on the AutoDrive Challenge™ II. **Note this can be a part of their senior design project, an independent study, or as electives towards their degree.**
- Universities accepted into this competition **MUST** be comprised of students from multiple academic years, (not only Seniors). Teams cannot be made up of only seniors and graduate students. The complex year over year nature of this competition requires undergraduate participation.
- Teams shall not be constructed only as clubs outside of regular academic hours, participation on the team is required to be integrated into the university's academics.

NON-DISCLOSURE & PARTICIPATION AGREEMENTS

- Each participating Team Member, Faculty Advisor and Graduate Research Assistant will be required to sign a Release of Liability, Non-Disclosure and Rules agreement with General Motors (and potentially other AutoDrive Challenge™ II Sponsors) prior to being added to the official roster of the AutoDrive Challenge™ II Team.

- Please note that Faculty Advisors must ensure that all members of their official team roster are NDA signers and eligible to sign based on all terms and conditions in the agreement.

PROPOSAL SUBMITTAL

The AutoDrive Challenge™ II team selection process will have multiple stages that prospective teams will need to go through to become selected for participation.

There are a limited number of openings that will be available on a first come first serve basis that will open on September 1, 2020 at 10:00 a.m. (EST) on the www.sae.org website. If your university is interested in participating please send an email to Jamie.Knauff@sae.org to be included in the upcoming FAQ WebEx for more instructions on registration.

For the first stage of the selection process Universities will need to submit answers to 6 questions on-line using the www.autodrivechallenge.com . There will be a size limit indicated in this document for your online answers for each of the questions.

A first stage selection will be made by the competition organization based on answers to these 6 questions. Universities selected at this stage will be invited to a multiple day on-site Automated Driving & Active Safety (ADAS) Technology Education event to be held at a General Motors facility in Michigan.

For the final stage of the selection process the Universities selected from the first stage will need to submit answers to 6 additional questions in a similar on-line fashion as was done previously. Additionally, a University Letter of Support signed by your University President or Dean of the primary college the program will be hosted in is to be submitted.

The Automated Driving & Active Safety (ADAS) Technology Education event will take place in mid-November 2020. This will be an opportunity to learn about and gain experience with the different sensing capabilities and ADAS features of real-world General Motors vehicles, understand different types of testing scenarios, collect & analyze data, and propose system and/or feature enhancements to General Motors engineering experts & leadership. Teams & Faculty are encouraged to select up to three students with interest and/or experience with sensing, integration, and controls in ADAS applications to attend this event. Forums and Q&A sessions will also be held for Faculty regarding the Series 2 competition.

The final University selection will be made based on the activities and answers from this final stage of the selection process, notifications to the selected Universities will be made per the schedule shown earlier in this document.

STAGE 1 QUESTIONS & DOCUMENT SUBMISSION

1. Executive Summary – Summarize your reasons why your university should be selected to participate in AutoDrive Challenge™ II. (3800-character count)
2. Who will be the team's primary Faculty Advisor? (1900-character count)
 - a. Please describe their academic credentials, current departmental responsibilities, experience mentoring other on-campus teams, and what department of the University will be home to this Competition?
 - b. Please address if the faculty advisor will be relieved of one or more normal course requirements to provide team support.

3. Describe how your University's team, in each year of the competition, will be comprised of a mixture of students in from all years of undergraduate education. Team members may also be Graduate Students. (1900-character count)
 - a. NOTE: Teams shall not be comprised of only Seniors and Graduate Students.
4. How will your University provide academic credit to each student team member participating in the competition? (1900-character count)
 - a. Specifically address students who may participate for more than one year.
5. How will your team recruit, select, maintain and support a Graduate Research Assistant(s)? (1900-character count)
6. AutoDrive Challenge™ II requires vehicle testing, evaluation and development of the Automated Driving System prior to the annual AutoDrive Challenge™ II competition event. (1900-character count)
 - a. Please describe in detail all the facilities your university agrees to provide for such vehicle testing, regardless of whether these facilities are owned, leased, rented, shared or dedicated.
 - b. If your University environment includes seasonal snow or significant periods of inclement weather during the academic year, please address that situation in your response.

STAGE 2 QUESTIONS & DOCUMENT SUBMISSIONS

If your team is accepted into the second stage, you will be required to submit the following documents and answers to questions to complete your proposal for acceptance into AutoDrive Challenge™ II.

1. Please upload a letter of support from the Dean of your Engineering School or University President indicating support for your proposal submission and potential selection to participate. (Limited to 2 pages in PDF)

The signer can be your dean or other high-level academic administrator. They must include their title in the letter's signature line. They must acknowledge that they are agreeing to meet the requirements as described in the section below, as well as the commitment from the university to the team/faculty advisor/project in the following areas:

- Acknowledgement of commitment for throughout the four-year competition.
 - Ability to provide legal assistance to aid in signing any Nondisclosure Agreements (per company participating) and a Vehicle Donation Agreement.
 - Ability to provide funds above what GM and SAE International have designated for the AutoDrive Challenge™ II (i.e. additional funding for the full time GRA, or travel funds).
 - Commitment to integrating this program into curriculum, classes, projects or other methods of awarding credit to students participating.
 - Acknowledgement of testing and facility usage of the team.
2. Please upload the prime faculty advisor's curriculum vitae / resume. (No page limit / one .pdf file)

3. Please describe your university's plan to provide workspace and controlled areas for the team to safely work on their Automated Driving System, software & controls, and competition vehicle? (two pages max limit; you may upload one .pdf file with layouts and/or photographs if desired)
4. Describe your university's safety plan and procedures for working with electric and autonomous vehicles. A generic lab safety plan will not meet this requirement. (one page .pdf file).
5. How will your team expand the reach of the competition into other academic areas outside of the home department to meet the needs of this multidisciplinary program? (1900-character count)
6. Is there any other information you would like the Selection Committee / Organizers to know in evaluating your proposal? (1900-character count)

NOTIFICATION

Any teams accepted into the competition who do not wish to participate must inform the organizing committee in writing no later than **February 26, 2021**.

Accepted teams will be invited to attend the official announcement event in April 2021.