REQUEST FOR PROPOSAL

EcoCAR Innovation Challenge: *Driving the Future*

RFP Issue date: September 30, 2025
Applications due: December 18, 2025
Teams selected: Spring 2026
Challenge begins: Fall 2026

HEADLINE SPONSORS

U.S. DEPARTMENT of ENERGY · gm · STELLANTIS · MathWorks

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Revision A – September 30, 2025

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ECOCAR INNOVATION CHALLENGE

RFP Questions? Email: AVTC@anl.gov

For more information visit avtcseries.org

EXECUTIVE SUMMARY

Item	Description
Request for Proposals Issue Date	September 30, 2025
Submission Deadline for Proposals	December 18, 2025
Anticipated Teams Accepted	Up to 20 teams
Eligibility	Four-year universities located in the continental United States that are accredited by the Accreditation Board for Engineering Technology (ABET). Four-year universities located in Canada that are accredited by the Canadian Engineering Accreditation Board (CEAB).
Multiple Submissions and University Collaborations	A university may collaborate unofficially with another university, vocational institution or between multiple campuses as long as no proprietary information is disclosed. However, proposals will only be accepted from one accredited university and if selected, will be considered the official "team" unless otherwise indicated by program organizers.
Non-Disclosure/IP Agreement	All participating universities will be required to agree to and adhere to the terms defined in non-disclosure (NDA) and intellectual property (IP) agreements from program-level sponsors. Other program-level sponsors who donate products which require sharing confidential data with the universities may also require separate NDA and/or IP agreements.
Target Window for Team Notification	March 2026
Target Window for Launch Workshop	April 2026
Target Kick Off Workshop Date (In person)	Late September or early October, 2026

CHANGE LOG

Revision	Section	Date	Notes
A	All	9/30/2025	Initial release

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A ABOUT THE CHALLENGE

A-1 Program Overview & Vision

EcoCAR Innovation Challenge: Driving the Future (EcoCAR), is a public-private consortium uniting multiple automakers, including General Motors and Stellantis, with tech partner MathWorks and supported by the U.S. Department of Energy (DOE) to deliver the 15th installment of the Advanced Vehicle Technology Competitions (AVTC) series. Managed and executed by Argonne National Laboratory (Argonne), this collegiate mobility challenge brings multiple automotive OEM partners together to build a next-generation workforce that is future-ready to drive innovation across the mobility and tech sectors.

Twenty North American Universities will be selected through this Request for Proposal (RFP) process, where they will be challenged over the four-year series to develop next-generation energy-efficient and intelligent mobility solutions and innovative products from concept to potential commercialization, utilizing emerging technologies, such as artificial intelligence for engineering tools, machine learning and exascale computing. Whether they are developing advanced driving automation and connectivity features, exploring new ways for AI to accelerate software development and data analysis, or pitching novel product concepts to future industry partners, EcoCAR students will be at the forefront of mobility innovation.

The competition will involve a vehicle track sponsored by General Motors and a vehicle track sponsored by Stellantis. The tracks provide distinct engineering challenges and vehicle platforms that reflect choices in mobility offered to customers in North America. Teams will select one of these two vehicle tracks. This multiple OEM model creates a unique platform for collaboration and a forward-thinking response to the industry's most pressing technological needs.

Subject to additional development over the next year, a general description of the two vehicle tracks is below.

In the GM Vehicle Track, teams will take on the challenge of transforming mobility by integrating advanced propulsion systems, pioneering automated vehicle technologies, and deploying wireless vehicle-to-everything (V2X) connectivity for seamless interaction with surrounding vehicles and infrastructure.

As part of this initiative, teams will re-architect an all-wheel-drive battery electric vehicle (AWD BEV) platform by designing and replacing the rear drive unit and propulsion supervisory control module. This effort will include robust cybersecurity integration and be supported by custom mechanical mounts, thermal management solutions, and comprehensive high- and low-voltage wiring systems.

Additionally, teams will implement an autonomous driving system using a high-performance compute platform, a refined sensor suite, and state-of-the-art software and algorithms to enable fully autonomous maneuvering. Connectivity will add additional communication from sources such as vehicles, infrastructure, and cloud-based data to improve automated system performance and energy-aware operations. These innovations will accelerate vehicle automation and ensure safe, energy-efficient performance across diverse, future-ready environments.

The Stellantis Vehicle Track will challenge teams to architect, design, and integrate a high-voltage energy storage system and an electric drive unit into a Hybrid Electric Vehicle (HEV) platform enabling teams to explore various propulsion and battery system architectures. Teams will target optimizing their vehicle's overall efficiency and off-road capabilities by iteratively simulating various modifications, integrating new propulsion components, and designing / calibrating advanced controls algorithms. Teams will also design an additional innovative Human Machine Interface (HMI) to add to their vehicle's consumer appeal and serviceability.

A Product Innovation track will expose student participants to innovation methods and entrepreneurial frameworks as they develop innovative products, processes, or methodologies that directly support their vehicle development. Students will also work with cutting-edge technologies to prepare them for a rapidly evolving technological landscape and equip them to adapt to emerging challenges across a broad spectrum of industries.

Kicking off in Fall 2026, selected teams will have four years to complete the technical objectives of the challenge following a vehicle development process (VDP) that mimics auto industry standard practices. Each university will receive funding, software, hardware, technical support, and mentoring from challenge sponsors to equip students to turn innovative ideas into successful solutions and build industry-aligned skillsets into a future-ready workforce equipped to accelerate North American innovation and ingenuity. Anchored in adult-learning best practices, with a focus on experiential, self-directed, hands-on learning, EcoCAR will be embedded in cutting-edge Learning & Development that aligns with the dynamic, high-growth culture of successful startups.

Successful teams will be highly interdisciplinary, bringing together students and faculty from various academic disciplines in engineering, computer science, business, entrepreneurship, project management, marketing and communications. Operating as mock automotive startups, teams will follow industry product development and engineering processes to deliver products that meet real-world customer needs.

By participating in EcoCAR, universities, administrators and faculty will have a powerful opportunity to reinforce their role in shaping students' futures in the automotive industry. Together, we can forge a path where government, education, and industry collaborate to unlock groundbreaking solutions that address the most pressing challenges in modern mobility.

AVTC Background

Advanced Vehicle Technology Competitions are North America's premier collegiate automotive engineering competitions, providing an unparalleled, hands-on educational experience that transforms the traditional classroom environment into a hub for automotive innovation. The U.S. Department of Energy, in partnership with Argonne and the automotive industry, established the AVTC program in 1988.

For 36 years, the AVTC program has embodied the heart of American automotive ingenuity and provided the ultimate training ground for future automotive engineers and innovators. More than 32,000 students from 111 unique educational institutions have participated, seeding the industry with engineers who have helped redefine mobility over the last three decades.

By engaging university students in advanced vehicle technology engineering, AVTCs also support national efforts to encourage students to pursue careers in science, technology, engineering, and math (STEM) and enable the U.S. to develop the workforce needed to be competitive in the global marketplace. For more information about the AVTC Program, please visit our website: https://avtcseries.org/about-avtc/

A-2 Challenge Overview

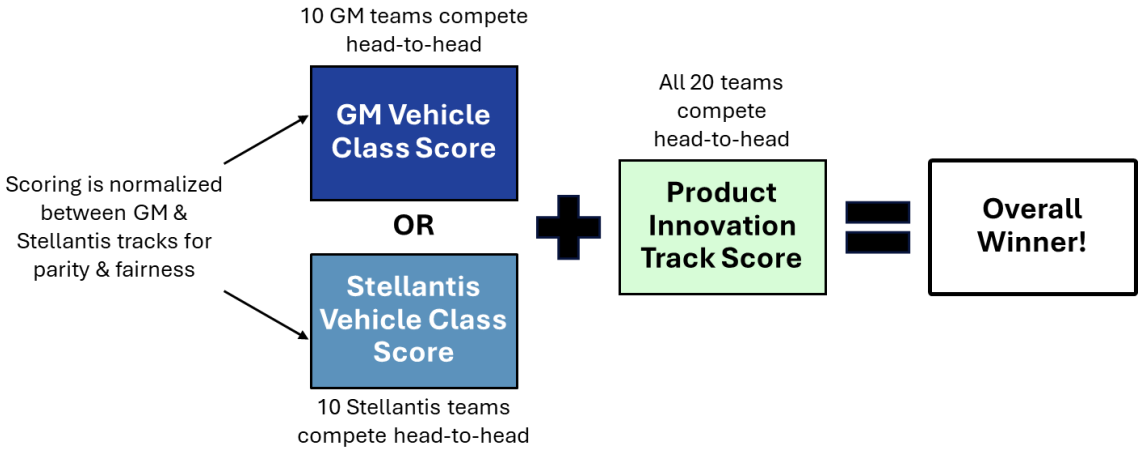
A-2.1 Challenge Structure & Scoring

The EcoCAR Innovation Challenge is organized as a four-year series with multiple tracks, each containing unique elements and domain areas. The challenge features two tracks focused on vehicle engineering: one sponsored by GM and another sponsored by Stellantis (see Sections A-4 & A-5 for more details). Universities will also compete in a Product Innovation track that will challenge teams to conceive, develop, and validate innovative products (see Section A-2.7 for more details).

All selected universities (up to 20 teams) will participate in the Product Innovation track where they will be evaluated head-to-head with all other teams. Each selected university will also compete in ***one*** of the two vehicle tracks (up to 10 teams per vehicle track). The GM Vehicle Track and the Stellantis Vehicle Track will each feature a distinct vehicle platform and a unique set of technical challenges based in differing technical domain areas but are intended to require a similar workload and year-over-year progression, to ensure parity between participating teams.

Because each vehicle track features a fundamentally different set of technical challenges, vehicles competing in one track will not be scored directly against vehicles in the other track. The 10 teams within each vehicle track will only compete head-to-head against each other. To ensure fairness across the two tracks, all scores from the GM vehicle track and the Stellantis vehicle track will be normalized after all events are completed (e.g., the 1st place team in each vehicle track is guaranteed to earn 100% of points allocated for the vehicle track). After vehicle track scores are normalized, they will be added to the team's Product Innovation track score to crown an overall winner for the challenge, as illustrated in Figure 1. Scores will reset to zero after the conclusion of each year.

FIGURE 1: ECOCAR INNOVATION CHALLENGE STRUCTURE & SCORING



Together, the Product Innovation, the GM vehicle track, and the Stellantis vehicle track form an interdependent framework for a single unified challenge. Approximately $150,000 in cash prizes will be awarded to teams across several different subcategories representing deliverables and activities from each track and the overall program. Awards will be presented at the awards ceremony during the annual competition finale.

A-2.2 Annual In-Person Events

Teams can expect three in-person events per year, as summarized in Table 1. At least one faculty member must accompany student team members to official events to provide technical guidance and serve as the official university representative. Faculty Advisors are required to work with the university administration and other faculty to make arrangements that ensure students who travel to events are not penalized for their absence from campus/class.

TABLE 1: ANNUAL ECOCAR INNOVATION CHALLENGE EVENTS AND EXPECTED UNIVERSITY PARTICIPATION

Event	Description	Attendees	Timeframe
Fall Workshop	Teams will gather for in-person, interactive training sessions on a variety of topics relevant to challenge domain areas intended to equip students to execute the activities and deliverables for the upcoming academic year. Content will be designed and delivered by subject matter experts from EcoCAR industry sponsors. Each workshop will also include networking and recruiting opportunities with sponsors.	Estimate 1-2 faculty advisors and 6-9 students	Held annually in October
Tech Week	Each year, each vehicle track will hold a Tech Week to assess the performance of vehicles and/or individual components via a suite of organizer-defined test events. Tech Weeks for GM and Stellantis vehicle tracks will be hosted separately: GM teams will gather at a GM proving ground and Stellantis vehicle track teams will gather at a Stellantis proving ground.	Estimate 1-2 faculty advisors and 7-10 students	Held annually in April or May
Year-end Competition	The Year-End Competition Finale will include student presentations covering various domain areas including dedicated events to judge the Product Innovation track. These presentations will be scored by panels of industry experts from challenge sponsors. The event will also include networking and recruiting opportunities and the Awards Ceremony where winners are announced.	Estimate 1-2 faculty advisors and 10-12 students	Held annually in May or June

A-2.3 Emphasis on Artificial Intelligence

Artificial Intelligence will be a key focus area in every track of the challenge, especially given the rapid advancements in **Large Language Models (LLMs)** and **AI Agents** that are transforming industries worldwide, including automotive. While **Machine Learning (ML)** algorithms and Neural Networks have been in use for decades, the surge in AI-driven research, development, and integration across industry, academia, and government has soared in response to pressing needs, ranging from more efficient workflows to robust workforce development.

This challenge will therefore aim to serve as a dynamic platform to encourage students to explore new AI methodologies, foster collaboration among stakeholders, and develop professionals who can meet the rising demand for AI expertise. Consequently, teams will be encouraged to incorporate AI tools, systems, and algorithms into their technical solutions; these efforts will be pivotal to their success throughout all tracks. AI integration is intended to be in all areas of the program and is expected to accelerate the iteration and development of innovative solutions throughout the challenge.

A-2.4 Design for Safety

Safety is a core principle of the EcoCAR Innovation Challenge, embedded into every stage of the challenge. All teams will be required to follow safety requirements that address vehicle design, development, and operation. These requirements are aligned with recognized industry standards to ensure that participants gain experience working under the same expectations they will encounter in professional engineering environments. This overarching safety framework provides the foundation for the EcoCARs system-level safety design approach and structured safety inspection process described in the following subsections.

System-Level Safety Approach to Vehicle Design

EcoCAR will emphasize a system-level safety philosophy by providing training on system safety processes and requirements that build redundancy and safety into all aspects of system design. Teams will be required to

- Conduct industry-standard safety analyses to demonstrate proactive hazard identification and mitigation strategies, including: Failure Mode and Effects Analysis (FMEA), Hazard Analysis and Risk Assessment (HARA), and functional safety assessments.
- Utilize portions of ISO 26262 to develop safety requirements at the hardware and software levels.
- Incorporate (track-specific) redundant protective measures (e.g., fusing, thermal management, BMS monitoring, isolation monitoring, etc.) into their system designs
- Design and demonstrate (track-specific) emergency stop (E-Stop) functionality that can override all systems of concern (e.g. propulsion systems, automated driving systems)

Vehicle and Component Safety Inspections

All team-developed or team-modified vehicle systems or vehicle components must pass safety inspections before being allowed to participate in testing events. Teams will also be expected to learn to complete their own safety inspections by utilizing EcoCAR-provided processes and resources to teach their team members how to perform thorough safety inspections of their vehicles and systems.

A-2.5 Learning & Development Approach

The EcoCAR Innovation Challenge prepares the next generation of engineers and innovators through a rigorous, hands-on learning environment. Students will apply knowledge in engineering, mathematics, computer science, etc. to address complex, real-world challenges in multi-disciplinary team settings. The program emphasizes systematic problem-solving, data-driven decision-making, and innovation, enabling participants to develop the adaptability and resilience required for success in the evolving automotive, mobility, and technology industries.

To support this learning, EcoCAR will implement a modern Learning & Development (L&D) model that combines high-impact in-person training with ongoing digital learning. Each fall, EcoCAR will host an in-person workshop designed to deliver intensive technical and professional training (see Table 1). Throughout the year, students will access the EcoCAR Learning Management System (LMS), which will provide both synchronous and self-paced training opportunities.

Training materials will be developed by organizers, industry and government sponsors, and co-developed with participating universities. Members of the student leadership team (see Section A-6.2) will be required to contribute to the development of training content for the EcoCAR LMS, ensuring that institutional expertise is shared broadly across the program. This collective approach enhances team engagement, accelerates problem-solving, and fosters knowledge transfer, allowing students to learn from multiple perspectives and apply training directly to their deliverables. By integrating structured workshops with flexible, on-demand resources, EcoCAR equips students with the immediate, practical skills and long-term professional capabilities to thrive in modern environments that require innovation and entrepreneurship.

A-2.6 Student Competencies

Students participating in the EcoCAR Innovation Challenge can expect to develop a broad array of skills and competencies that will prepare them for their future career. In the GM and Stellantis vehicle tracks, students will develop expertise in advanced vehicle technologies, proficiency with industry-standard tools and software, and specialized competencies in automotive systems (examples: vehicle design, energy systems, and software integration).

The Product Innovation track will expose student participants to innovation methods and entrepreneurial frameworks as they develop innovative products, processes, or methodologies that directly support their vehicle development (see Section A-2.7 for more details). Students will also work with cutting-edge technologies to prepare them for a rapidly evolving technological landscape and equip them to adapt to emerging challenges across a broad spectrum of industries.

Through this experiential learning environment, the challenge will bridge ABET and NACE (National Association of Colleges and Employers) competencies for career readiness by integrating technical expertise with broader professional skills like teamwork, communication, problem-solving, and project management. Student participants will develop foundational personal effectiveness competencies, aligning with Department of Labor baseline working competencies (examples: interpersonal skills, adaptability, professionalism, and initiative). Table 2 outlines an overview of some of the core competencies students can expect to develop through participation in the challenge. Appendix A: Detailed Student Competencies

TABLE 2: OVERVIEW OF ECOCAR STUDENT COMPETENCIES OVERVIEW AND CAREER PATHWAYS

Activity	Competencies	Example Career Pathways
Artificial Intelligence	ML model development, data pipelines, generative AI, AI workflows/agents, AI-enabled software development (reference Table 16)	AI/ML Engineer • Data Engineer • Data Scientist • AI Product Engineer • Software Developer • Automation Engineer
Leadership & Management	Strategic planning, project management, cross-functional leadership, sponsor engagement, knowledge transfer, team mentorship (reference Table 17)	Program Manager • Engineering Manager • Project Lead • Operations Manager • Technical Program Manager (TPM)
Connected & Automated Vehicles (CAV)	Energy-aware design, perception algorithms, connectivity (V2X), sensor integration/fusion, safety validation (reference Table 18)	CAV Systems Engineer • Perception/Controls Engineer • V2X Communications Engineer • ADAS Test Engineer • Safety & Validation Engineer • Calibrator
Battery Systems	Module design, HV architecture, modeling, BMS design, validation (reference Table 19)	Battery Systems Engineer • Energy Storage Engineer • Thermal Systems Engineer • BMS Software Engineer • EV Safety Engineer • Calibration Engineer
Propulsion Systems	Simulations (MiL/HiL/ViL), CAD packaging, FEA, eRAD integration, calibration, testing (reference Table 20)	Propulsion/Powertrain Engineer • Vehicle Integration Engineer • Controls Engineer • NVH Engineer • Systems Modeling Engineer • Calibrator
Product Innovation	AI-enabled product development, entrepreneurship, MarCom, innovation project management, commercialization awareness (reference Table 21)	Product Manager • Innovation Strategist • Business Development Manager • Entrepreneur/Startup Founder • Technical Marketing Specialist
	ML: machine learning HV: high voltage MiL/HiL/ViL: model/hardware/vehicle in the loop eRAD: electric Rear-Axle Drive CAD: computer-aided design	ADAS: automated driver assistance systems BMS: battery management system EV: electric vehicle NVH: noise, vibration, & harshness FEA: finite element analysis

A-2.7 Confidentiality, Intellectual Property, and Donation Agreements

Donation Agreements

Each team will receive a vehicle, donated by either GM or Stellantis. Teams will be required to sign a donation agreement before receiving their vehicle. Teams may also be required to sign donation agreements before receiving other donated components from other sponsors.

Non-Disclosure Agreements

Participating universities will be provided with a vast amount of confidential technical data on the donated vehicle to support their work in the challenge (e.g., component packaging, structural analysis, controls interfacing, cybersecurity, etc.). Teams will be required to sign nondisclosure agreement(s) with GM or Stellantis before receiving any confidential data. Teams may also be required to sign an NDA with other sponsors. Teams may also be required to adhere to data storage security provisions for all shared and produced data and documents as a part of the competition.

Teams will be strictly prohibited from sharing any proprietary information about their vehicle outside of their vehicle track including in events and presentations for the Product Innovation Track where all teams will be competing head-to-head.

A-2.8 Eligibility Requirements for Participating Universities

Four-year universities located in the continental United States that are accredited by the Accreditation Board for Engineering Technology (ABET) are eligible to submit applications. Universities located in Canada that are accredited by the Canadian Engineering Accreditation Board (CEAB) are also eligible to apply. Up to 20 North American universities will be selected for the four-year competition.

A-3 Product Innovation Track

A-3.1 Overview and Emphasis

The Product Innovation Track will expose students to innovation methods and entrepreneurial frameworks, preparing them to accelerate the future of the automotive industry as skilled engineers and business leaders with an entrepreneurial mindset.

Within this track, teams will conceive, develop, and validate an innovative product(s), process(es), or methodology (henceforth referred to as a "product") related to their vehicle. Teams will follow an iterative process to develop their product concept from prototype to a minimum viable product (MVP), focusing on customer validation, defensible technical design (including safety, explainability, and data governance), business model development, and go-to-market planning. Teams will shape their technical prototypes based on real customer wants & needs and commercial viability, utilizing automotive engineering, product marketing, and project management principles throughout the process. Throughout the phases of product development, teams will be encouraged to utilize Applied Artificial Intelligence and Large Language Models (LLMs) and other tools to accelerate development and rapid prototyping.

A-3.2 Goals & Objectives

The Product Innovation track aims to create graduates who are not only industry-ready engineers but also "IP engines" capable of driving innovation pipelines, assessing commercial impact, and positioning companies at the forefront of the mobility sector. The track will emphasize innovation, entrepreneurship/intrapreneurship, commercialization, and marketing & communications (MarCom). Teams will assume roles similar to an early-stage startup or internal innovation department by applying lean start up methods while maintaining the rigor of industry-

grade engineering practices. Teams will seek to develop an innovative product closely related to the scope of work for the GM or Stellantis vehicle track with a real potential market application in mind.

By engaging in this track, students will build a portfolio of experiences that reflect both technical depth and entrepreneurial breadth. They will hone their capabilities in entrepreneurship/intrapreneurship, applied AI, and product development and will learn to test and validate innovative concepts. Students will also learn to communicate persuasively to a range of stakeholders and manage interdisciplinary teams operating under uncertainty. For universities, participation provides a unique opportunity to immerse students in an innovative, startup-like environment while reinforcing the engineering rigor of the automotive industry. For sponsors, the track delivers unparalleled access to the next generation of talent and insight into novel ideas, prototypes, and applications of AI and other emerging technologies that could shape the future of the automotive and technology sectors.

A-3.3 Development Process & Expected Annual Activities

Over the course of the four-year challenge, teams will progress through a structured but flexible development cycle. In the first year, teams will receive training and resources in lean start up and innovation methods, MarCom practices, business fundamentals, and Applied AI. This "priming year" is intended to provide a common foundation for all teams before entering the gated product development process in Year 2 through Year 4. During these years, teams will advance through phase gates aligned with standard product lifecycles: concept development and pitching, prototyping, validation, and market-readiness assessment. Each team's progress will be evaluated through reviews with industry judges and advisors, ensuring comparability across universities while allowing flexibility for teams to pivot, refine, or discontinue products as they learn.

Year 1: Priming & Foundations

- Training in innovation methods, entrepreneurial/intrapreneurship frameworks, and Applied AI.
- Introduction to MarCom basics: storytelling, branding, technical-to-nontechnical translation.
- Initial product ideation, scoping, and feasibility analysis.

Years 2–4: Product Development Gates

- Teams advance through phase gates aligned with product lifecycles: concept, prototype, validation, and market-readiness assessment.
- Deliverables may include: technical progress, maturity assessments, and communications products (pitch decks, demos, investor briefs).
- Teams may pivot, refine, or discontinue products as needed. Flexibility is encouraged to simulate real-world innovation cycles.

The Product Innovation Track will also include scored elements derived from the Project Management, Marketing, and Communications functions of the team (see Sections A-6.3 and A-6.4 for more details).

A-3.4 Requirements & Bounds for Innovation Product

Teams will be afforded a broad design envelope to identify their Innovation Product across a wide array of technical domain areas and applications. However, all student-developed products must be closely related to their vehicle development, even if the innovation product isn't directly deployed within their vehicle. The expectation will be for students to bring outside-the-box thinking and innovation to the design, build, and testing of their vehicles while employing an entrepreneurial mindset towards commercializing their solutions. Teams will be encouraged to develop their product *toward* market viability, but will not be penalized if they are unable to bring their product to market. Teams will also be encouraged to pursue multiple ideas simultaneously to pivot as new opportunities or challenges emerge.

A-4 Stellantis Vehicle Track

A-4.1 Goals & Objectives

The Stellantis vehicle track will challenge teams to enhance and optimize the efficiency and off-road capabilities of a **Hybrid Electric Vehicle (HEV) platform**. The challenge will involve the design, integration, and optimization of a new High Voltage Battery System (HVBS), electric rear-axle drive (eRAD), and an additional Human Machine Interface (HMI) into the vehicle for the following stated objectives:

- Optimize the overall energy efficiency of the vehicle through an increased bias towards the electric rear axle
- Enhance the offroad capabilities through modifications to the mechanical, thermal, and electrical systems along with development and calibration of advanced propulsion / battery controls
- Advance the consumer appeal and serviceability of the vehicle through the integration of a new HMI system that integrates well with the team-added controllers and systems

A-4.2 Vehicle Design Envelope

The Stellantis vehicle track focuses on advanced propulsion systems and battery technology. In Year 1, teams will propose their propulsion and battery system architecture during a formal architecture selection process. Modifications to the stock engine and transmission will be highly restricted. The use of nonstandard or exotic energy storage devices or energy converters must be pre-approved by the organizers. Team vehicle architectures are subject to approval by organizers pending feasibility of design, availability of components, and other factors. Teams will also be required to add an additional HMI System to the vehicle without modifying the vehicle's stock infotainment system.

TABLE 3: SUMMARY OF VEHICLE DESIGN ENVELOPE FOR STELLANTIS VEHICLE TRACK

	Required	Allowed with Approval	Out of Scope
Propulsion Hardware	• Integrate eRAD & Rear Propulsion Controller • Integrate team-built RESS • Integrate HV Junction Box • Interface with stock thermal loop • Removal / modifications to rear axle to accommodate eRAD & RESS hardware	• Subframe Modifications to Enable New Propulsion System Integration	• Engine / Transmission Replacement
Body / Chassis	• Integrating Team's System HMI	• Suspension Component Swaps (e.g. springs with different rates) • Changing Wheels/Tires • Body and Aero Changes	• Modifications to Vehicle Structure or Safety Systems • Removal or Physical Modification of Stock Infotainment

eRAD: electric Rear-Axle Drive
RESS: Rechargeable energy storage system
HMI: Human-machine interface

A-4.3 Vehicle Development Process & Expected Yearly Milestones

The Stellantis vehicle track will employ a Vehicle Development Process (VDP) that establishes a structured, year-by-year glidepath that guides teams through simulation, subsystem design, integration, testing, and validation activities. This VDP provides students with a realistic, industry-informed engineering experience while allowing the challenge to evaluate teams on their ability to apply professional vehicle development practices in an academic environment.

The VDP emphasizes:

- Reliance on verified models and simulations as the primary tools for design and validation.
- Decoupled subsystem development to manage risk and support incremental integration.
- Progressive functional testing of propulsion and connected/automated vehicle systems leading to full-vehicle validation.
- Reduced reliance on physical prototypes, with strict adherence to evaluation events and deliverables.

Table 4 covers some of the expected engineering milestones for the Stellantis Track. Teams are expected to follow this VDP over the four-year program. Each year introduces specific technical milestones that build toward a final, fully integrated and validated vehicle at the Year 4 competition. This structured progression ensures that all universities adopt industry-relevant methods while adapting them to the learning-focused context of EcoCAR.

TABLE 4: FOUR-YEAR OVERVIEW OF EXPECTED CHALLENGE MILESTONES – STELLANTIS TRACK

Year	Expected Annual Milestones – Stellantis Track
Year 1	• Model-based design tools setup for simulating and evaluating propulsion / battery controls • Baseline vehicle evaluation and initial off-road evaluation completed • CAD Packaging studies completed for various component options and architectures • Simulations of various propulsion and battery architectures complete to identify key trade-offs • Architecture and vehicle technical specifications proposed and approved by organizers
Year 2	• Structural analysis completed (team-modified subframe / team-designed battery pack) • Low-level propulsion components packaged within the vehicle • Propulsion controls developed and tested in MIL / HIL • Mounts manufactured, and eRAD integrated into subframe / vehicle • Modified propulsion system functional over basic range of driving scenarios • Preliminary offroad evaluation of modified propulsion system complete • Prototype battery modules / Battery Disconnect Unit (BDU) designed and characterized • Battery controls development and MIL / HIL testing in progress • HMI Concept design completed and hardware bench verified
Year 3	• Propulsion system calibrated and functional for offroad evaluation • HMI / UX system fully integrated into vehicle • Vehicle system (propulsion and HMI) calibrated and optimized for serviceability • Battery controls developed and tested in MIL / HIL • Modules, BDU, and BMS fully integrated into battery pack • Battery pack design verification tested
Year 4	• Battery pack fully integrated into vehicle with power limits on propulsion system unlocked • All customer / service facing features functional • Vehicle testing and calibration for energy efficiency and final off road evaluation complete • Reliable vehicle operation achieved with production level calibration refinement

A-4.4 Deliverables, Vehicle Evaluation Events, and Scoring

Each year, team vehicles will undergo rigorous evaluation at EcoCAR-organized vehicle testing events focused on efficiency and offroad capabilities. Test activities increase in complexity year-over-year, giving teams the opportunity to validate their designs, benchmark performance and efficiency, and iterate for the next yearly cycle. Team vehicles will be required to undergo and pass rigorous safety inspections before they are eligible to participate in any testing event.

All testing is synchronized with the annual vehicle development roadmap defined by organizers, providing a structured progression toward advanced capabilities. Beyond physical testing, teams must also demonstrate their engineering rigor through technical reports, design reviews, presentations, and service / consumer appeal events. Each event is scored, fostering both competitive drive and collaborative learning across teams. Table 5 outlines examples of testing activities and deliverables across the four years (for illustrative purposes only).

TABLE 5: SAMPLE COMPETITION DELIVERABLES AND ACTIVITIES

Events	Example Description (Measurements)
Vehicle Performance	Acceleration, handling, braking, ride quality, drive quality
Energy Efficiency	Evaluation of propulsion system efficiency
Off-road Assessments	Approach / departure angles, ground clearance, gradeability
Written Reports	20-page technical report
Oral Presentations	30-minute formal oral design presentations
Vehicle Design Review	Vehicle inspection and design review
Module / Pack Cycling	Charging / discharging team-designed battery modules and packs
Consumer Appeal	Consumer acceptability review and static vehicle utility
Serviceability	Review of vehicle and service documentation by technicians
Inspections	Vehicle safety and functionality inspections prior to vehicle testing

A-4.5 Potential Opportunities for Innovation and AI Applications

Beyond the core challenge requirements, teams are strongly encouraged to pursue novel solutions that push the boundaries of propulsion system and battery technology. This challenge provides a unique opportunity for students to conceptualize, design, and implement their own innovative hardware and software solutions on a modern vehicle platform.

Teams may find opportunities to pursue Machine Learning based features for propulsion and battery controllers wherever the trade-offs against traditional controller algorithms are considerably positive. In developing their controllers, teams may also use LLMs and develop agent-driven workflows to streamline Model-Based Design, software development, and testing, reducing iteration cycles and boosting reliability.

From the Human-Machine Interface (HMI) perspective, teams may find opportunities to add to the vehicle's existing interfaces and will be encouraged to explore LLM-driven enhancements that elevate consumer experience and serviceability by making the vehicle more intuitive to use for consumers, and easy to diagnose and fix for technicians and customer service teams.

Other areas for innovative solutions and development in the Stellantis vehicle track may include:

- Development and usage of wireless BMS technology
- Battery recyclability, second life usage and end-of-life disassembly
- Emerging battery technologies
- Passive suspension and aerodynamics improvements to the vehicle

A-5 General Motors Vehicle Track

A-5.1 Goals & Objectives

The General Motors vehicle track will challenge teams to advance the design, integration, and optimization of a production **battery electric vehicle (BEV) platform** while emphasizing propulsion innovation, vehicle performance, and connected and automated vehicle (CAV) technologies.

- **Advance Propulsion Innovation** by integrating a student-designed rear propulsion system into a production AWD BEV platform, leveraging the unmodified front system as a reliable baseline
- **Connected & Automated Vehicle Capabilities** with energy efficiency and safety as top priorities, including vehicle-to-anything (V2X) connectivity solutions, energy-aware perception stacks, and automated driving features
- **Balance Performance and Consumer Appeal** by optimizing range, regenerative braking, and drive quality while demonstrating improved dynamic performance and delivering a desirable consumer experience

A-5.2 Vehicle Design Envelope

The GM track will employ advanced propulsion system, electrification, V2X connectivity, and autonomous vehicle technologies. Table 6 summarizes the vehicle design envelope for the GM vehicle track.

TABLE 6: SUMMARY OF VEHICLE DESIGN ENVELOPE FOR GM VEHICLE TRACK

	Required	Allowed with Approval	Out of Scope
Propulsion	• Integrate new rear propulsion • Replace supervisory controls • Interface with stock cybersecurity • Interface with rear EDU coolant connections	• Subframe modifications to enable new propulsion system integration	• RESS modifications • Charging or power export systems modifications •
AV	• Integration of AV control software • Sensor & compute integration • Interface with serial data • V2X connectivity	• Removal of stock sensors	• Modifications to GM software or controllers
Body / Chassis	• Integrating team systems HMI via added screen or stock screen application	• Suspension component swaps (e.g. springs with different rates) • Changing wheels/tires • Minor body and aero changes	• Modifications to vehicle structure or safety systems • Removal or physical modification of stock infotainment

AV: automated vehicle
V2X: vehicle to everything connectivity
RESS: rechargeable energy storage system
EDU: Electric drive unit

Propulsion System Design Envelope

Teams will be challenged with replacing the rear drive unit with alternative electrical propulsion device(s) – the proposed solution from teams can include multiple motors, multispeed transmissions, and other unique mechanical driveline elements. Vehicles will be powered exclusively by the stock high-voltage energy storage system; **no additional energy sources will be permitted**. In Year 1, all teams will submit a proposal for their team-designed rear propulsion system. Organizers will assess the design's feasibility, component selection, and overall risk. This mandatory approval serves as a critical design gate to ensure teams can successfully execute their concept and to prevent costly, time-intensive changes in subsequent years of the challenge.

Teams will also be responsible for developing and calibrating software and controls to replace the propulsion supervisory controls in the stock rear drive unit controller. This includes coordination with stock components (e.g. front motor capability), implementation of communication cybersecurity features, team-added components, and control features including but not limited to energy management strategies, torque architectures, and diagnostics.

To supplement hardware and controls changes, teams will be permitted to make additional changes to the stock vehicle for performance, efficiency, or other consumer-targeted reasons. This could include items such as performance tires and suspension components for autocross/handling, or eco tires and aero wheel inserts for efficiency depending on the team's propulsion architecture and goals.

Connected and Automated Vehicle System Design Envelope

Teams will be challenged with developing CAV features to achieve SAE Level 4 driving automation, which will be tested with a safety driver present in limited closed-course conditions across a variety of city and highway operational design domains (ODD) of moderate complexity; including the following features:

- Cooperative Adaptive Cruise Control (CACC)
  - Vehicle to Vehicle (V2V) connectivity
  - Evaluated for energy consumption impacts
- Intersection and corridor optimization and navigation
  - Connected & unconnected intersections
  - Straight and left/right turns
  - Infrastructure to Vehicle (I2V) and Vehicle to Infrastructure (V2I)
  - Evaluated for energy consumption impacts
- Lane centering & lane changes (pre-planned (routing) and unplanned)
- Route planning and navigation with turns (including dynamic routing for energy efficiency)
- Interoperability of V2X communication
- Direct C-V2X (PC5) communication & indirect (Uu) communication for latency tolerant applications
- Autonomous autocross

In pursuit of these CAV features, teams will develop their own perception stack and will navigate "make or buy" decisions with flexibility to use "off the shelf" products if desired. Teams will develop their own custom automated vehicle control software and will be expected to heavily utilize simulation environments to develop and validate code prior to on-vehicle deployment.

- **Hardware Selection**: Teams are responsible for selecting, justifying, and integrating their own suite of on-board computational hardware (e.g., GPU, SoC).
- **System Design**: Teams will design the complete software architecture, including training and testing frameworks for their solution.
- **Model Development**: Teams will develop and implement their own models for perception (object detection and classification), sensor fusion, path planning, and vehicle controls.

Similar to the propulsion system, teams will propose their automated vehicle hardware stack during Year 1. Teams will be permitted to remove stock sensors not part of their architecture but may not modify existing stock software or controllers. As part of their automation system, teams will incorporate vehicle-to-everything (V2X) connectivity and interface with stock controllers and serial data.

A-5.3 Vehicle Development Process & Expected Yearly Milestones

The GM vehicle track will employ a Vehicle Development Process (VDP) that establishes a structured, year-by-year glidepath that guides teams through simulation, subsystem design, integration, testing, and validation activities. This VDP provides students with a realistic, industry-informed engineering experience while allowing the challenge to evaluate teams on their ability to apply professional vehicle development practices in an academic environment. The process emphasizes:

- Reliance on verified models and simulations as the primary tools for design and validation.
- Decoupled subsystem development to manage risk and support incremental integration.
- Progressive functional testing of propulsion and connected/automated vehicle systems leading to full-vehicle validation.
- Reduced reliance on physical prototypes, with strict adherence to evaluation events and deliverables.

Table 7 outlines some of the expected engineering milestones for the GM Track VDP. Teams are expected to follow this VDP over the four-year program. Each year introduces specific technical milestones that build toward a final, fully integrated and validated vehicle at the Year 4 competition. This structured progression ensures that all universities adopt industry-relevant methods while adapting them to the learning-focused context of EcoCAR.

TABLE 7: GM TRACK VEHICLE DEVELOPMENT PROCESS OVERVIEW

Year	Propulsion Systems	Connected & Automated Vehicle Systems
Year 1	• Baseline testing of stock vehicle • Architecture selection & initial design concepts • Cybersecurity messaging operational	• Architecture for sensor suite & compute selection • Static perception stack system testing • Simulation established for motion planning & lateral / longitudinal control
Year 2	• Rear propulsion design complete (Fall) • Component bench testing complete (Fall) • AWD integration & team controls functional (Spring) • Basic HMI developed	• Integration of sensors & compute into vehicle • Demonstration of vehicle motion control (basic ODD) • Basic HMI developed
Year 3	• Refinement of AWD integration & software and controls • Calibration workflow established • Full HMI developed (MIL, DIC, etc.)	• Expansion of ODD (route following, basic intersections / road geometry) • Improved HMI
Year 4	• Finalized software & controls released • Final testing of vehicle	• Finalized software & controls released • Full ODD capability (complex road geometry / intersections, dynamic rerouting)

AWD: All-wheel drive
MIL: Malfunction indicator lamp
DIC: Driver information center
ODD: Operational design domain
HMI: Human-machine interface

A-5.4 Vehicle Evaluation Events and Deliverables

Each year, team vehicles will undergo rigorous evaluation at EcoCAR-organized vehicle testing events. Test activities increase in complexity year over year, giving teams the opportunity to validate their designs, benchmark performance and efficiency, and iterate for the next yearly cycle. Vehicle testing may span multiple modalities, including chassis dynamometer, closed-track testing, and Hardware-in-the-Loop (HIL) integration. Team vehicles will be required to undergo and pass rigorous safety inspections before they are eligible to participate in any testing event.

All testing is synchronized with the annual vehicle development roadmap defined by organizers, providing a structured progression toward advanced capabilities. Beyond physical testing, teams must also demonstrate their engineering rigor through technical reports, design reviews, presentations, and customer appeal events. Each event is scored, fostering both competitive drive and collaborative learning across teams. Table 8 outlines examples of testing activities and deliverables across the four years (for illustrative purposes only).

TABLE 8: GM VEHICLE TRACK SAMPLE COMPETITION DELIVERABLES AND ACTIVITIES

Events	Example Description (Measurements)
Vehicle Performance	Autocross, acceleration, and handling
Energy Efficiency	Propulsion system energy consumption evaluation, CACC energy consumption impacts evaluation, connected corridor energy consumption impacts
CAV System Evaluation	Intersection navigation (connected & unconnected), CACC feature demonstration, route planning challenge, lane change on demand, lane centering, Autono-cross
Consumer Appeal	Consumer ride & drive evaluation, accelerator pedal calibration evaluation (drive quality)
Written Reports	Technical reports for various subsystems
Oral Presentations	Formal oral presentations for CAV and propulsion systems design, development and testing
Vehicle Design Review	Around-the-vehicle presentation with industry experts to discuss design choices (why they were made and how do they make a better vehicle)
Inspections	Vehicle safety and functionality inspections prior to vehicle testing
Autocross	Culminating year 4 event for a human-driver run versus an autonomous run

A-5.5 Potential Opportunities for Innovation and AI Applications

Beyond the core requirements, teams are strongly encouraged to pursue novel solutions that push the boundaries of vehicle technology. This challenge provides a unique opportunity for students to conceptualize, design, and implement their own innovative hardware and software solutions on a modern vehicle platform. Potential opportunities for additional innovation in the GM vehicle track may include:

- AI-driven requirements generation for verification, and testing generation for validation
- Integrate new and prototype propulsion hardware onto a modern production vehicle
- Predictive maintenance and vehicle health monitors using ML techniques
- Use AI-agents and LLMs to enhance model-based design efforts in CAV and propulsion systems
- AI-powered route planning using energy management strategies with live environmental data
- Enhancement of driver monitoring systems
- Predictive vehicle control for an Autocross course
- AI-supported cybersecurity development

A-6 Team Structure & Student Roles

A-6.1 Student Focus

The core mission of the EcoCAR Innovation Challenge is to prepare the next generation of engineers, communicators, innovators, and leaders for tomorrow's workforce. Universities should therefore focus on **student** contributions (primarily undergraduate students) rather than relying on faculty, industry, or contractor effort to complete challenge activities and deliverables. To successfully execute the multifaceted scope, participating universities should endeavor to build a strong interdisciplinary program. Teams are encouraged to recruit students from a variety of disciplines, especially mechanical engineering, electrical and/or computer engineering, and computer science. Students from other engineering disciplines are welcome and may be necessary or beneficial to the successful completion of challenge activities and deliverables. Other non-engineering undergraduates may also be included within the team to supplement activities beyond the engineering aspects. Teams are encouraged to identify strengths unique to their university and leverage those strengths to assemble the most competitive team possible.

A-6.2 Team Organizational Structure & Self-Defined Student Leadership Team

Sustained guidance from a core cadre of graduate student leaders is essential to drive repeatable team performance and competitiveness. This student leadership team will be supported by EcoCAR-provided funding (see Section B-1 for details) and will play a key role in propelling the team forward. In general, this student leadership team is expected to complement the capabilities of a large team of undergraduates in the following ways:

- Provide **domain expertise** beyond the capabilities of a typical undergraduate student
- Provide **big-picture coordination** to harness the effort of volunteer student team members
- Maintain year-to-year **continuity** for the team and knowledge transfer over the multi-year challenge

Rather than prescribing specific roles for the student leadership team and overall team organizational structure, organizers have defined an aggregate list of leadership core functions that must be executed (see Section A-6.2.1). Each university will then be tasked with establishing roles and responsibilities for their own **self-defined student leadership team.** Teams will be permitted significant latitude to propose their own organizational structure and position titles. However, teams must meet minimum bounding requirements defined by the EcoCAR Organizers (see Section A-6.2.2).

Teams will be required to submit a proposal for their self-defined student leadership team to organizers on an annual basis. Organizers will review team proposals to verify compliance with EcoCAR requirements and to ensure the proposed structure is likely to enable teams' success in the upcoming year. This review process combined with the minimum bounding requirements will serve as a safety net for this open-ended process. The review process will also function as accountability mechanism for required university matching support (see Section C-1.1).

A-6.2.1 Core Executable Functions for the Student Leadership Team

Table 9 outlines an aggregate list of core functions the student leadership team will be expected to execute. While reviewing this list of core functions and considering how to allocate functions to a self-defined student leadership team, universities should bear in mind the following considerations:

- This is an aggregate list of functions, not a breakdown of roles.
- Teams will bear the responsibility of assigning functions to team-defined student leadership roles
- The list makes no attempt to capture the time/effort required to execute each function.
- Some of the listed functions may require significantly more effort than others
- The list is summarized for brevity in this document.
- Teams should expect to use their own judgement to further decompose this list to match their vision for how these functions will be enacted in discrete roles within the leadership team.
- This list is detailed, but not comprehensive. It should capture the vast majority of student leadership team functions, but omissions are possible. This list may be amended throughout the challenge to adapt to lessons learned and evolving best practices amongst teams.

TABLE 9: CORE FUNCTIONS OF THE STUDENT LEADERSHIP TEAM

Core Function Category	Description
Team Leadership and Administration	Point of contact for organizers, stakeholder communications, team culture & goals, team sponsorship / fundraising
Project Management & Team Operations	Project scheduling, resource management, procurement, scope management & change control, risk management & issue tracking within the team's vehicle track and Product Innovation track as well as overall program management (see Table 13 for more details)
Vehicle Track Technical Leadership	Overall leadership of technical scope within the team's vehicle track: vehicle system architecture, vehicle development strategy, systems-level integration of vehicle engineering work
Vehicle Track Domain Expertise	Subject matter expertise in critical domain areas emphasized in each vehicle track (reference Section A-4 for details on the GM vehicle track and Section A-5 for details on the Stellantis vehicle track)
Innovation Product Entrepreneurship & Commercialization	Development of business-focused elements of the Innovation Product: business case, value proposition, market research, customer discovery, product development strategy (note: some of these functions overlap with the MarCom category)
Innovation Product Development	Development of the Innovation Product itself: design concept, analysis, prototyping, testing, validation, data collection, release planning
Marketing & Communications	Overall: communications strategy, team branding, creative design & marketing assets, digital communications & storytelling, multimedia production, social media management, media relations, outreach event management (see Table 11 for more details) Product Innovation: stakeholder research & discovery, product positioning & brand identity, product pitch & stakeholder engagement, evaluation & continuous improvement (see Table 12)
Artificial Intelligence	Data infrastructure planning, design, and testing, policies governing data security and ethical use of AI tools, developing and disseminating best practices for using generative AI tools

A-6.2.2 Bounding Requirements for Self-Defined Student Leadership Teams

University proposals for student leadership team roles and organizational structure must meet the requirements defined in Table 10. These requirements are designed to ensure that teams address the core demands of the challenge while permitting maximum possible flexibility for teams to align with institutional strengths and develop a strategic approach to their team structure.

TABLE 10: BOUNDING REQUIREMENTS FOR SELF-DEFINED STUDENT LEADERSHIP TEAM POSITIONS

Requirement	Additional Notes
The student leadership team must include a minimum of **6 distinct positions**	Teams may add supplemental positions if desired. All positions must be filled by students enrolled full-time at the participating university (or a partner school).
A minimum of **4 positions** must be filled by graduate students currently enrolled in an engineering major	Either Masters or Doctorate degree paths are acceptable. Any engineering major is acceptable.
All graduate students filling a student leadership team position must be fully-funded	Any graduate student funding mechanism is acceptable (e.g. Graduate Research Assistantship, Graduate Teaching Assistantship, fellowship, etc.)
A minimum of **2 positions** must be fully dedicated to the team's vehicle track. These positions must be filled by graduate students currently enrolled in an engineering major with an undergraduate degree from a STEM field.	This requirement represents the bare minimum staffing level required for success in the team's vehicle track. Teams may elect to fully dedicate more than two positions to the vehicle track and/or design positions with matrixed responsibilities intended to provide partial support for the vehicle track
A minimum of **1 position** must be filled by a student currently enrolled in one of the following majors: Communications, Public Relations, Strategic Communications, Organizational Communication, Visual Communications, or Journalism	If a university does not offer an appropriate Communications degree program, it may, as an exception, partner with a neighboring institution to identify and recruit a suitable candidate
The 6th required student leadership team position not covered by the above requirements may be filled by a student from any major or degree path	This position is a "Team Choice" intended to provide flexibility and allow teams to take advantage of unique institutional strengths
Positions responsible for executing project management functions must be filled by a graduate student who is either currently enrolled in an engineering program or holds an undergraduate degree in engineering.	Either Masters or Doctorate degree paths are acceptable. Any engineering major is acceptable.
EcoCAR teams must allocate at least $170,000 annually to support funded student leadership positions.	EcoCAR sponsors provide $95,000 annually to support funded student positions (see Section B-1). Universities must provide at least $75,000 as a cost-share match (see Section C-1).

A-6.3 Marketing & Communications Roles & Functions

The EcoCAR Innovation Challenge will feature elements of marketing and communications throughout the program. Every team will designate at least one position on their student leadership team that will be responsible for leading the MarCom functions defined in this section. However, teams who identify multiple MarCom students to support the execution of these responsibilities will be better positioned for success. These core functions are divided into separate categories for clarity: Overall Communications and Product Marketing.

Every team must designate **at least one** position on their student leadership team that will be responsible for executing the marketing and communication functions outlined in Table 13. In this section 'MCM' refers to all students who share in the execution of the MarCom functions.

Student MarCom Managers (MCM) will lead brand building, storytelling, strategic outreach, and market positioning to support the team's mission and success. These activities are designed to build both creative and strategic capabilities, preparing students to plan, execute, and manage impactful communications initiatives and campaigns in a real-world setting. Teams are encouraged to recruit graduate students to fill the MCM functions given the wide range of required activities and skills; however, qualified undergraduates will be considered.

Communications Activities will focus on defining and promoting the team's brand and voice. This includes creating a strong visual identity, managing social media and digital content, producing multimedia assets, and building relationships with campus and community partners. Students will also plan and execute events, design promotional materials, and ensure consistent, effective messaging across all platforms. These core functions are defined in Table 11.

TABLE 11: COMMUNICATIONS CORE FUNCTIONS – OVERALL COMMUNICATIONS

Core Function	Activity Details
Communications Strategy	Develop and implement communications plan defining goals, target audiences, key messages, and campaign strategies for yearly activities.
Brand Development & Identity	Define team mission, vision, values, and goals; create cohesive brand identity with digital toolkits, logos, templates, and guidelines for consistent messaging.
Creative Design & Marketing Assets	Design promotional materials including flyers, posters, vehicle wraps, tradeshow booths to support campaigns and events. Design graphics, social media templates, and other digital visuals for online promotion.
Digital Communications & Storytelling	Create and maintain webpage content; develop blogs highlighting team progress and events; translate technical concepts into clear messaging and visuals.
Multimedia Production & Promotion	Produce videos, conduct interviews, edit content, manage post-production; distribute multimedia across channels to increase visibility and engagement.
Social Media Management	Plan, create, schedule, and monitor content across social platforms; manage community engagement and track performance metrics.
Media Relations	Develop and implement media advisories for key events.
Outreach Event Management	Plan and execute outreach events: k-12 STEM education; on-campus events; community events.

Product Marketing Activities will primarily support the Product Innovation Track. Students will perform structured market research, define target audiences, and establish a brand identity for a student-engineered product. Teams will be required to develop professional pitch strategies, design and execute promotional campaigns, engage stakeholders, and assess performance metrics to continuously refine their approach. These core functions are defined in Table 12.

TABLE 12: MARKETING CORE FUNCTIONS – SUPPORTING PRODUCT INNOVATION

Core Function	Activity Details
Stakeholder Research & Discovery	Conduct research to understand internal priorities, decision-makers, and organizational opportunities. Identify key stakeholders and interests.
Product Positioning & Brand Identity	Define the product's value proposition and positioning for stakeholders, executives, and sponsors. Develop messaging, visuals, and pitch materials for product. Align product identity with overall team or organizational brand. Create compelling narratives and presentations that translate technical innovations into persuasive internal stories.
Product Pitch & Stakeholder Engagement	Create briefs, presentation decks, and communication strategies to secure stakeholder buy-in. Craft targeted messaging, presentations, and supporting materials. Conduct meetings, demos, and boardroom presentations to communicate product value. Manage engagement and collaboration with sponsors, executives, and cross-functional teams.
Evaluation & Continuous Improvement	Assess the effectiveness of pitches, presentations, and engagement strategies. Collect stakeholder feedback to refine messaging, presentation style, and materials.

Opportunities for AI Applications

Students executing MarCom functions will be encouraged to explore opportunities to **integrate AI tools** to enhance efficiency and creativity across communications and marketing activities. Potential opportunities for AI applications may include:

- **LLMs:** Used for text-based tasks such as blogs, social media content, communication plans, event templates, and outreach presentations as well as product marketing research and analysis
- **Generative AI (e.g., Diffusion Models):** Used for design work, video generation, and rapid prototyping of creative assets.

By leveraging LLMs to refine brand messaging and craft polished marketing assets, teams will be able to ensure that their communications are accurate, scalable, and consistent. Meanwhile, diffusion models or other generative AI methods used for design and digital media creation will allow teams to quickly prototype visuals, formats, or videos to support broader campaign goals.

A-6.4 Project Management Roles & Functions

Project management will play a critical role in the EcoCAR Innovation Challenge. EcoCAR is a multifaceted, technically challenging project involving a large volume of contributors, crossing several disciplines, and spanning multiple calendar years. To manage a project of this complexity, EcoCAR will strongly feature elements of project management throughout all EcoCAR tracks.

Every team must designate **at least one** position on their student leadership team that will be responsible for leading the project management functions outlined in Table 13. However, teams who identify multiple students to support the execution of these responsibilities will be better positioned for success. In this section 'PM' refers to all students who share in the execution of the project management functions.

These student project managers (PMs) will be responsible for applying industry-aligned tools and processes that mirror professional practice. In doing so, students will gain hands-on experience executing a broad range of project management functions, strengthening both technical and leadership abilities, and ensuring they will leave the program prepared to manage complex, cross-functional projects in any industry.

TABLE 13: EXECUTABLE PROJECT MANAGEMENT FUNCTIONS

PM Domain	Executable PM Functions	Description
Planning	Gantt Chart Development and Management	Creating and maintaining project timelines and schedules.
	Resource Management	Managing budget, personnel, facilities, and physical assets.
Project	Procurement	Planning, executing, and monitoring acquisition of goods and services.
	Change Management	Evaluating and implementing scope or process changes effectively.
Measurement / Uncertainty	Issue Logging	Documenting and tracking issues through resolution.
	Risk Register	Identifying, assessing, and managing project risks.
Team	Team Charter	Defining team purpose, goals, and working agreements.
	Conflict Management	Addressing and resolving interpersonal and team conflicts.
Delivery	Knowledge Management	Capturing and organizing project knowledge for current and future use.
	Project Closeout	Ensuring deliverables, documentation, and lessons learned are completed at project conclusion.
Stakeholder	Communications Plan	Establishing methods, frequency, and channels of communication.
	Stakeholder Management	Mapping, engaging, and communicating with stakeholders using tools such as communication matrices, registers, and influence matrices.

Budget Awareness

Project Managers are encouraged to gain exposure to the team's budget to develop practical understanding of financial management and project fiscal awareness. Where possible, Faculty are encouraged to share budget information with PMs and empower them to make operational spending decisions (within limits set by the faculty), including travel stipends, award money, software budgets, and procurement allocations.

Project Management Deputy

Student PMs are encouraged to assign at least one student to serve in a deputy or support role to the PM. This approach will enable amplification the PM's impacts while also allowing a more experienced student to focus on higher-complexity strategic PM functions while delegating tactical day-to-day PM functions to a more junior student. Designating a PM deputy also creates opportunities for leadership succession with PM functions.

Opportunities for AI Applications

Students executing project management functions will be encouraged to explore opportunities to apply AI tools and methods to improve efficiency in day-to-day tasks. At a minimum, PMs will develop a set of baseline competencies that combine core project management practices with emerging AI applications:

- **Responsible AI Use** – Understanding the role of a PM in using AI ethically and guiding appropriate AI use within their team.
- **AI Plug-in Proficiency** – Training on existing tools such as BOX AI, Asana AI, and other relevant platforms.

Student PMs will also be encouraged to explore novel ways to integrate AI into project management methodologies and tools. Potential opportunities for AI applications in the within project management functions may include:

- **Document Efficiency with LLMs** – Applying AI to streamline writing, editing, and structuring project deliverables.
- **Data Synthesis and Reporting** – Using AI to combine quantitative and qualitative inputs into clear, actionable reports.
- **Automated Document Generation** – Creating project documents with the aid of AI to save time and reduce manual work.
- **Performance Management Automation** – Building and interpreting automated key performance indicator (KPI) dashboards that pull from testing, financial, and recruiting metrics, as well as analyzing budget and schedule variance.

B EcoCAR Support for Accepted Teams

Participating universities will receive extensive support from program-level sponsors to enable their success throughout EcoCAR. As of the release of this document, sponsor support for EcoCAR is still in development; however, commitments from EcoCAR Headline Sponsors are captured in this section. In previous AVTC series, sponsors contributed an annual average of $135,000 in cash support and $45,000 in hardware donations to teams (a total of $550,000 cash and $180,000 hardware over the full four-year series). Prior EcoCAR series delivered similar levels of cash and in-kind donations to universities, demonstrating a long track record of strong support from EcoCAR sponsors.

B-1 Cash Contributions

Universities accepted to compete in the EcoCAR Innovation Challenge will receive cash support from Headline Sponsors as detailed in Table 14.

TABLE 14: CASH SUPPORT PROVIDED TO ECOCAR UNIVERSITIES

Item	Amount	Note
Seed money	$20,000	One-time award to each team during Year 1 (2026-2027 academic year). Seed money can be allocated at the recipient's discretion for any program-related costs
Funded student positions	$95,000	Awarded to each team annually. This funding must be used exclusively to support the student leadership team and may not be re-directed for other purposes. All funding must be used on an annual basis; unused funds will be deducted from the following year's support and will not carry over. Refence Section A-6.2 for additional details on the funded student positions and requirements for the student leadership team. ***Note: Canadian universities are ineligible for this funding and must secure equivalent funding through alternative pathways***
Travel support	~$25,000	Estimated annual travel support provided by to teams by General Motors and Stellantis to support student and faculty attendance at EcoCAR events (see Section A-2.4 for details). Actual stipend amount will vary depending on location of the event and the school. Travel stipends will significantly defray the costs of travel but will not cover all travel costs. Participating teams should expect to supplement the EcoCAR-provided travel stipend funding by an additional 30%-40% through cost-share funding from the university or local/team sponsors.
Prize money	$150,000	Each year, $150,000 in prize money will be awarded to participating teams according to performance across a variety of categories.

Note: all amounts are in US dollars

B-2 In-Kind Contributions

To maximize the success and learning opportunity for competing teams, the EcoCAR program will offer various in-kind donations, including software, hardware, and engineering/mentoring support. The full list of sponsor-donated hardware is not yet confirmed and may not cover all components needed to compete. Teams are therefore highly encouraged to develop a plan to purchase or solicit donations for components and/or parts not provided by program sponsors.

B-2.1 Vehicle Platform and Technical Data

Each EcoCAR team will receive **one** vehicle from either Stellantis or General Motors, according to their vehicle track. As an additional in-kind donation, GM and Stellantis will also arrange for vehicle transportation to and from official events. Each team is also expected to receive proprietary connectors and interfaces (electrical, thermal, etc.) needed to mate new parts to vehicle components

Teams will also receive various technical data related to their donated vehicle and components. Exact details are yet to be confirmed; the following list illustrates the type of technical data participating teams can generally expect to receive:

- Online vehicle service repair manual access (schematics, diagrams, procedures, specifications, etc.)
- CAD data for the donated vehicle and/or donated components
- Donated vehicle and/or component specifications
    - Example: vehicle performance specifications and characteristics
    - Example: pack/cell operating ranges (voltage, current, temperature, power), aging characteristics, safety data, etc.
    - Example: stock vehicle automated driving sensor specifications
    - Example: vehicle off-roading assessments and capability information
- Interface control documentation for donated vehicle and/or components
    - Example: CAN cybersecurity interfacing information
    - Example: Thermal and electrical system interface specifications

B-2.2 MathWorks Modeling and Simulation Tools

EcoCAR will provide MathWorks-sponsored licenses to teams to use MATLAB, Simulink, Simscape, and other Model-Based Design tools that are used across the automotive industry. Model-Based Design is commonly used for the development of propulsion, CAV, and battery systems, naturally leading to a strong emphasis on modeling, simulation, and requirement-based testing in AVTC15. Additionally, MathWorks will provide teams with a Simulink model of the base powertrain and vehicle dynamics to guide teams on industry-grade development processes.

B-2.3 Vehicle Production Part Team Allowance

To support design work on the donated vehicle, EcoCAR intends to provide teams with a yearly allowance for procuring production North American service parts. Historically, the allowance is $5,000 per challenge year, with no rollover. More specifics on this process will be released closer to the start of the challenge.

B-2.4 Other Hardware and Software Support

EcoCAR sponsors have historically offered no-cost or low-cost parts and components to participating teams, greatly leveraging the ability of those teams to develop and implement the complex systems and subsystems required for the challenge. The EcoCAR program expects to offer various in-kind donations to teams, which may include some or all of the following:

- Modeling, simulation, and analysis software to support engineering activities
  - Controls modeling, CAD, Finite Element Analysis, Thermal, Electrical, etc.
- Rapid prototyping controller hardware
- Hardware-in-the-loop (HIL) simulators
- CAV components, such as sensors or V2X radios (General Motors Track)
- Vehicle CAN data collection, diagnostics, and troubleshooting tools (hardware and software)
- Tools and toolboxes
- Battery cells to each university (Stellantis Track)

B-2.5 Subject Matter Experts

Most EcoCAR sponsors provide subject matter experts (SMEs) to contribute to EcoCAR activities, collectively spanning a wide variety of domain areas (both technical and non-technical). The program utilizes these SMEs to enrich the student experience by providing industry-relevant training on tools, methods, and concepts as well as SME design review sessions for student design work. These frequent connect-points between students and industry sponsors are also valuable for student network-building and students' career search.

B-2.6 Headline Sponsor Mentor Programs

General Motors, Stellantis, and MathWorks will each provide engineering mentors to teams. General Motors and Stellantis mentors will be vehicle track dependent. Each mentor will be a knowledgeable automotive engineer with years of industry experience and will function as a resource to help guide the team through various aspects of the challenge including vehicle integration and model-based design processes. These mentors will also serve as the team's main point of contact for GM, Stellantis, and MathWorks throughout the challenge.

C UNIVERSITY COMMITMENTS FOR ACCEPTED TEAMS

As a condition of acceptance into the EcoCAR Innovation Challenge, university participants are required to provide matching cash and in-kind support to complement the resources provided to participating teams by the program.

C-1 Matching University Cash Support

Overhead Fees / Indirect Costs

If indirect costs must be assessed by the university, a description of the fees must be provided, and the university must present a plan in the proposal for how they will secure additional resources to make up the cost difference.

C-1.1 Matching Support for Funded Student Positions

EcoCAR Headline Sponsors will provide each team with $95,000 annually to support their student leadership team (see Section B-1 & A-6.2 for details). As a matching contribution, universities must commit at least $75,000 annually to supplement EcoCAR-provided funding to support the funded student leadership team. Table 15 details what university contributions may be counted toward this university cost-share requirement.

TABLE 15: FUNDED STUDENT SUPPORT ELIGIBLE TO COUNT TOWARD UNIVERSITY COST-SHARE REQUIREMENTS

Item	Counted toward university cost-share requirement?
Student salary / stipends / hourly wages	Yes
Student tuition payments / tuition waivers / scholarships	Yes
Student fringe benefits / insurance	Yes
Student housing allowance	Yes
University overhead / indirect fees	No*

*See above for more details on indirect fees

While summer positions may be used at a university's discretion, this practice is discouraged as it competes with internship and co-op opportunities. As such, university support committed to funded student positions during summer terms will not count toward this university cost-share requirement.

Note: Canadian universities are ineligible for student position funding provided through EcoCAR sponsors (see Section B-1); these cost-share requirements are therefore moot for Canadian Universities.

C-1.2 Supplemental Seed Money and Travel Funding

Participating teams will likely need to supplement EcoCAR-provided travel funding by an additional 30%-40%. Supplemental travel funding provided through the university will increase opportunities for students to travel to EcoCAR events, interface with industry sponsors, and receive high-impact industry-relevant training.

Similarly, donated hardware made available by EcoCAR sponsors is unlikely to cover all component needs for every university. EcoCAR teams will likely need to purchase some vehicle components or secure donated components through team-specific sponsors.

Universities are therefore highly encouraged to provide supplemental cash support as a match for EcoCAR-provided seed money and travel funding. Matching seed money and travel funding are not a hard requirement; however, this will be a competitive element considered during the team selection process.

C-2 Faculty Support

Strong support from an enthusiastic team of faculty advisors is a critical enabler of success for EcoCAR teams. Faculty advisors are essential for providing technical expertise, professional guidance, and continuity as students progress through the challenge. They are also responsible for ensuring the team follows all EcoCAR and university policies and safety guidelines as well as engineering best practices while working on campus or while traveling to EcoCAR events.

Each university is therefore required to assign a **minimum of two Lead Faculty Advisors** to support their EcoCAR team. Universities should target faculty with relevant experience in the technical domain areas described in this RFP. Universities are encouraged, but not required, to recruit faculty from the following departments to serve as Lead Faculty Advisors:

- Mechanical Engineering
- Electrical and Computer Engineering
- Computer Science

Universities will also find it advantageous to recruit faculty from departments outside the College of Engineering, such as Communications or Business (Entrepreneurship, Marketing), to assist with the Product Innovation track and cross-disciplinary elements of the program.

Given the significant time commitment required by faculty to support the EcoCAR program, universities must offer a **minimum of two** of the following accommodations to **at least one** Lead Faculty Advisor, but are highly encouraged to provide similar support for both Lead Faculty Advisors (this will be a competitive element of the proposal review process):

- Receive faculty release time for one course from their teaching load annually
- Receive one month of paid summer salary support
- Teach an EcoCAR-specific course for academic credit each year as part of their regular teaching load

A minimum of one faculty advisors is expected to travel to all EcoCAR workshops and events to guide the team, ensure student safety, and act as the official university representative. If a faculty advisor is unavailable for a specific event, a university representative must be designated by an administrator in writing and communicated to the organizers in advance of the event

C-3 Student Participation & Curriculum Integration

EcoCAR universities are required to offer students a mechanism to earn course credit for their participation in their EcoCAR team; operating EcoCAR solely as a student club or extracurricular activity is not permitted. This approach ensures students have dedicated time to contribute to their EcoCAR team and receive academic recognition for their efforts. Universities are free to determine how best to meet this requirement but integrating EcoCAR into a specific course (like a senior design or capstone project) has proven to be a successful pathway in prior series. If needed, competing universities will be given until Year 2 (Fall 2027) to fulfill this requirement.

Universities should consider multidisciplinary pathways to enable course credit for, as illustrated in the following examples:

- **Engineering:** Teams can leverage EcoCAR-specific materials to enrich the technical electives in electrical, mechanical, or systems engineering via industry-specific examples and data
- **AI/Machine Learning:** Teams can integrate challenge-specific tasks into advanced courses or research projects focused on algorithms, data science, or automation.
- **Innovation/Entrepreneurship:** Teams with access to a university entrepreneurship program could use EcoCAR as a platform to develop a business plan or explore commercialization opportunities.

C-4 Support for Project Management & MarCom Functions

Project Management

Teams are strongly encouraged to secure access to a mentor with demonstrated leadership and management experience to support the development of the student leadership team. Ideally, this mentor will be a faculty member with the ability to provide coaching in leadership, decision-making, and communication, although an industry mentor dedicated to the team is also valuable. Teams that integrate mentorship into their structure are expected to demonstrate stronger leadership development outcomes and are likely to be more competitive within the program. See Section A-6.4 for more details on project management functions

Marketing & Communications

The university's Communications department or their engineering department's communications office should actively mentor and support the MarCom Manager, providing guidance throughout the four-year program. Engaging the department in this way will strengthen the MarCom Manager's success, promote visibility for the university, and showcase the skills and accomplishments of participating students. See Section A-6.3 for more details

Universities are also encouraged to secure access to resources to provide expertise or mentorship for students responsible for the entrepreneurship and/or commercialization aspects of the Product Innovation track

C-5 Administrative Support

EcoCAR students will greatly benefit from the support and guidance of university administration and support staff. Universities are therefore encouraged, but not required, to provide their EcoCAR team with access (at no cost) to administrative services and support staff. Some examples may include:

- University staff to support the team with accounting, procurement, invoice processing, and travel coordination
- Development staff to support the team's local fundraising and sponsorship efforts
- Communications staff to support local media relations and team news coverage

C-6 Safety

C-6.1 Safety Requirements for All EcoCAR Teams

Safety is a fundamental priority of the EcoCAR Innovation Challenge. All teams must comply with competition-wide safety requirements. Universities will be responsible for providing certain safety training, processes, procedures, and equipment to establish an overall healthy safety culture for their team. Teams are encouraged to identify university staff (such as a facility manager, environmental health & safety coordinator) who can support the delivery of safety training to students, assist in the development of safety protocols, establish a robust safety culture, and/or provide oversight for safety-critical activities. This will be a competitive element in the proposal process

Facilities Safety Protocols

Universities are responsible for identifying and implementing proper safety protocols for all high voltage (HV), fabrication, and testing activities. At a minimum, this includes the following safety-related items:

- Defined operating procedures for all labs, shops, and garages that teams may utilize
- Training and certification protocols (approved by university administration) for all equipment, including welding, machining, hoists, HV and always energized electrical work
- Integration of university Environmental Health and Safety (EHS) or equivalent safety experts into team operations for oversight, consultation, and plan approval

Note: More information on Facilities can be found in Section C-7.

Training Requirements

Students must complete safety training before working on any EcoCAR-related hardware. EcoCAR may provide some training materials to teams, but responsibility for designing and implementing an effective training program and safety culture ultimately rests with the university. Required training topics include:

- General shop and garage safety
- Safe use, inspection, and maintenance of personal protective equipment (PPE)
- Vehicle operational safety and testing protocols (including emergency stops, test site limits, and safe conduct during automated testing)
- High Voltage safety
- Lithium-ion battery awareness and handling
- Energized electrical work (Stellantis track only)

High Voltage Safety Training Levels

Teams must adopt a tiered certification structure to ensure students only perform work aligned with their training level. This required training structure pulls inspiration from standard industry practices as well as NFPA 70E:

- **Level 1 (Awareness):** General HV safety, hazard recognition. No hands-on HV work permitted
- **Level 2 (Non-Exposed Work):** Hands-on work with non-exposed / non-energized components permitted
- **Level 3 (Exposed Work):** Assembly, service, and testing of exposed / energized HV permitted

Energized Electrical Work Requirements

Teams must follow industry best practices when working on energized systems, including:

- Clearly defined lockout/tagout (LOTO) procedures
- Functional interlocks and emergency stops (E-Stops)
- Use of HV barriers, blankets, and rescue hooks
- Restricted work areas with controlled access during energized operations
- Compliance with NFPA 70E PPE categories and arc flash boundaries

Required Personal Protective Equipment (PPE)
Universities must supply teams with the following PPE items (including but not limited to):

- Safety glasses with side shields
- Abrasion-resistant work gloves
- Chemical-resistant gloves
- Hearing protection
- Face shields/respirators for cutting, grinding, or chemical exposure
- HV-rated gloves (valid per certification requirements)
- HV-insulated blankets, barriers, and rescue hook
- HV-rated insulated tools
- Safety-toe shoes for work with heavy components (>50 lbs.)

Note: Frequent inspection and replacement of expired PPE is the responsibility of the University.

C-6.2 Additional Safety Requirements for Stellantis Vehicle Track Teams

The Stellantis track will focus on hybrid vehicle propulsion and battery development. Universities participating in the Stellantis vehicle track must also comply with safety requirements specific to hybrid propulsion and battery pack development, including hazards related to combustion engines, rotating driveline components, and advanced battery pack development.

Hybrid Powertrain Safety
Teams must follow all safety requirements for working around internal combustion engines (ICEs), including:

- Exhaust gas handling and emissions awareness (per EPA and OSHA guidance)
- Safe procedures for handling fuels, lubricants, and coolants
- Guarding and PPE requirements for rotating components and belts

Battery Development Safety

- Teams developing HV battery packs will be guided by requirements related to the UL 2580 standard for pack-level testing and validation
- Battery test facilities must include appropriate fire suppression, ventilation, and thermal runaway management strategies
- All transportation of battery cells and modules must comply with UN/DOT 38.3 requirements
- Students must receive university training on lithium-ion hazards (thermal runaway, chemical exposure, disposal/recycling).

C-6.3 Additional Safety Requirements for GM Vehicle Track Teams

The GM track will focus on Battery Electric Vehicle (BEV) propulsion and Connected and Automated Vehicle (CAV) systems. Universities participating in the GM vehicle track must also comply with the following safety requirements for **vehicle testing and automation safety**:

- All CAV testing must be conducted within approved test environments, with safeguards to prevent unintended vehicle behavior
- Vehicle testing plans must identify operational limits and describe how those limits are enforced
- Students must be trained in CAV-specific hazards, including perception system limitations, fallback strategies, and safe human-automation interaction protocols

C-7 Facilities

C-7.1 Overall Facilities Requirements (All Tracks)

To be eligible for participation in the EcoCAR Innovation Challenge, universities must provide facilities that support team activities. Facilities located far away from the engineering center of campus can create logistical hurdles that add barriers to participation for students (particularly undergraduate students). The location of team work areas (garage, office space, computer lab) will therefore be scrutinized as part of the team selection process. Access to facilities located on or near campus is not a hard requirement, but **will be viewed favorably**. At a minimum, teams proposing to utilize off-campus facilities must outline an operational plan to help students overcome logistical barriers to participation in team activities.

Required Facilities

- **Access-Controlled Team Work Areas:** All areas mentioned should be access controlled to only allow EcoCAR students access and protect competition sponsor and team property (physical, virtual, and intellectual)
    - **Dedicated Office Space(s)** that provide sufficient capacity for students to meet and collaborate. Ideally, this is separate from the garage space.
    - **Dedicated Garage Space** with an 8,000 lb. vehicle hoist (minimum), common automotive hand and power tools, and all required PPE for work that will be conducted. If a student needs a specific tool to complete their required work in a safe manner, the university shall support those needs (i.e. HV rated tools).
    - **Controlled-Access High Voltage Work Area** to provide a secure and safe environment for energized subsystem testing. This requirement can be satisfied through engineering and administrative controls (e.g. temporary safety boundaries to prevent non-trained team members or the general public from entering the boundary of approach).
    - **Secured Storage** for vehicle parts to safeguard team and sponsor property.
- **Team Computer Lab** with simulation, CAD capabilities, sufficient computing power, and software licenses. Computer lab can be located within the office space. Teams are highly recommended (but not required) to secure **IT support** to assist teams with network storage, virtual machines, databases, version control servers, sponsor software licensing and installation, etc.
- **Machine Shop**: teams must secure abundant access to a machine shop with fabrication capabilities. Support from a machinist or shop technician is an added benefit.
- **Digital Information Security:** A mechanism for secure storage and controlled access of sensitive sponsor-provided digital data to comply with non-disclosure agreements
- **Closed-Course Testing Facility Access:** Universities must secure abundant access to an area where the team may regularly conduct closed-course dynamic vehicle testing at low-cost or no-cost to the team. Teams may adapt parking lots or roadways to their testing needs (as long as the area can be closed for testing). See Appendix E: Closed Course Testing Facilities for more details on requirements for closed-course test sites. Team must also secure a method to transport vehicles to and from the site (vehicles must be trailered and may not be flat-towed or dolly-towed).

In general, these facilities must be available for student use starting September 1, 2026. Access to garage space, secure HV work area, and vehicle testing facilities may be delayed until January 1, 2027 if necessary. If a required facility is not currently available, proposals must include a detailed plan to secure or develop equivalent facilities in time for competition milestones.

Recommended Facilities

Proposals that demonstrate strong collaboration with other university research labs (e.g., transportation, energy storage, controls, automation, etc.) will be viewed favorably. The following facilities are recommended, but not required:

- Electronics lab with test and measurement equipment
- All Wheel Drive (AWD) Vehicle dynamometer with on-staff university support
- Access to GPU-enabled compute clusters
- Access to generative AI-related tools

C-7.2 Additional Facilities Requirements for Stellantis Vehicle Track Teams

Teams participating in the Stellantis vehicle track must secure access to additional facilities that that support the development, integration, and testing of hybrid propulsion (including internal combustion engines) and advanced lithium-ion battery systems. These facilities must be in place by January 1, 2027.

Required Facilities

- **Garage Requirements**:
  - Battery/Subframe Lifting Table - University to provide a lifting table that can raise and lower a hybrid vehicle lithium-ion battery pack weighing up to 300 lbs or subframe weighing up to 1000 lbs.
  - Exhaust Gas Extraction - University provides a method to evacuate vehicle exhaust gases from an indoor garage space to allow for vehicle operation within the garage (including vehicle idling).
  - Battery Module Lift Tool - University shall have a strategy to lift battery modules with a lift assist tool such as an overhead crane, engine lift crane, or equivalent.
- **Battery Testing Equipment:**
  - Access to equipment capable of charging and discharging individual cells and modules in a controlled environment (can be through test facility partnership).
  - Access to equipment capable of charging and discharging a FHEV (full hybrid electric vehicle) battery pack. This may be accomplished via commercially available battery cycler, power supplies, or other controlled methods. This may be achieved through a partnership with a test facility.
- **Battery Work Space:** Controlled-access, secure space for battery fabrication, testing, and integration work
- **Thermal Testing Equipment:** Access to thermal chambers (up to ~8 ft^3), heaters, chillers, or equivalent for validating FHEV battery performance (can be through test facility partnership)
- **Proper Lithium-Ion Battery/Cell Storage:** Dedicated area for secure and proper storage of all lithium-ion cells and/or battery components following manufacturer requirements (climate controlled).
- **Compliance with Transportation Regulations:** Any movement of cells, modules, or packs must comply with UNDOT 38-3 – Transportation of Lithium-Ion Batteries. Proposals should describe how compliance will be ensured for shipping, handling, and local movement of batteries.

Recommended Facilities

- Vehicle battery cycler
- Electronics lab for battery management system (BMS) development
- Access to a battery simulator
- Access to closed-course testing site with offroad evaluation capability. See Appendix E: Closed Course Testing Facilities for more details
- Specialized safety equipment (gas detection, fire suppression designed for lithium-ion systems, etc.)

C-7.3 Additional Facilities Requirements for GM Vehicle Track Teams

Teams participating in the GM vehicle track must secure access to additional facilities that support the development, integration, and testing of electric propulsion and connected and automated vehicle (CAV) systems. These facilities must be in place on or before January 1, 2027 and will be inspected for compliance by the organizers.

Required Facilities

- **CAV Testing Environments:** Access to facilities suitable for CAV feature testing with lane lines and painted intersections present (or ability to be easily added). See Appendix E: Closed Course Testing Facilities for more details
- **Level 2 EVSE Infrastructure:** Teams must have direct access to a Level 2 EVSE (at no cost to the team). Having the EVSE within the garage space is recommended, but it must be located such that the vehicle could easily be pushed to it if needed (i.e. just outside of garage, not across campus).
- **DC Fast Charging:** Teams must have free access to a DC Fast Charger (100 kW or greater). This can be on-site or off-site (public), but the University must support the cost of all team charging sessions. SAE J3400 NACS connector (or SAE J1772 CCS to SAE J3400 NACS adapter) preferred. GM provided vehicle will have an SAE J3400 NACS inlet.

Recommended Facilities

- Indoor space suitable for controlled AV sensor calibration (radar, lidar, camera systems)
- Universities are encouraged to demonstrate alignment with existing smart-city or intelligent transportation research assets
- Motor/drive unit dynamometer/test bench setup
- Subframe Lifting Table capable of removing and installing a completed BEV EDU Subframe weighing up to 1000 lbs

D Proposal Process and Requirements

D-1 Proposal Process & Timing

Universities wishing to apply for the EcoCAR Innovation Challenge must submit a proposal with letters of support, as described in Section D-3. An electronic version of the proposal must be submitted no later than 4:00 p.m. Eastern Standard Time (US) on **December 18, 2026**. More details about the process for submitting proposal materials will be released at a later date.

Each selected university will compete in ***one*** of the two vehicle tracks: ***either*** the Stellantis vehicle track ***or*** the GM vehicle track (see Section A-2.1). These two vehicle tracks are designed to require a similar workload and year-over-year progression but will feature a unique set of technical challenges based in differing technical domain areas. Each vehicle track therefore requires unique resources and personnel to support a university's participation. Many of the required university commitments described in Section C apply to all teams, but some requirements only apply to one of the two vehicle tracks.

For this reason, universities must select one of the two vehicle tracks during the proposal stage and tailor their proposal to meet the unique requirements for that vehicle track. Universities **may apply to both vehicle tracks** and are encouraged to do so. Teams that apply to both tracks will be **eligible for selection into either vehicle track** but will only be **approved to compete in one vehicle track** (not both). Universities that apply to both vehicle tracks must submit two separate proposals: one tailored to the requirements of the GM vehicle track and another tailored to the requirements of the Stellantis vehicle track. Each proposal must be fully standalone and meet all proposal requirements. During the submission process, these universities will be given an opportunity to express a preference for one vehicle track over the other (if desired).

IMPORTANT: Submissions not conforming to all the requirements of this solicitation may result in rejection of the proposal. Argonne National Laboratory is not responsible for any costs associated with the preparation or submission of a proposal. Argonne assumes no liability for disclosure or use of any proposals for any purpose. Argonne reserves the right to select or reject any or all proposals. Argonne reserves the right to amend the RFP as it may consider appropriate to meet the goals of the EcoCAR Innovation Challenge. Any potential funding associated with selection for this program is subject to availability of funding from the government and/or industry sponsors.

D-2 Notification of Acceptance & Program Launch Timeline

Universities selected to participate will be notified by the organizers in March 2026. The Dean of Engineering and Lead Faculty Advisor of accepted schools will receive an official acceptance letter. Organizers will also contact the Lead Faculty Advisor of each accepted school to review the program timeline and other details.

At least one faculty advisor will be required to attend a Launch Workshop, tentatively planned for April 2026 in Detroit. Teams are highly encouraged to recruit and secure 1-2 student participants to serve on the team and attend the Launch Workshop in spring 2026. These early student participants can accelerate the onboarding process when the program kicks off in fall 2026.

During the Launch Workshop, teams will receive additional information on the competition, including next steps and action items for the spring and summer to prepare the team for success when the challenge officially begins begins in Fall 2026. Public discussion (including media coverage) about the selected schools or about EcoCAR will be strictly embargoed until those details are publicly announced by the organizers.

D-3 Requirements for University Proposals & Support Letters

To apply for the EcoCAR Innovation Challenge, universities must prepare a proposal and a provide letter of support signed by a senior administrator, such as the Dean of Engineering. Teams may also submit letters of support from industry partners or local sponsors, although this is not required to apply to the program. The following sections define the requirements for proposals and support letters.

D-3.1 University Proposal

Universities must prepare a proposal outlining the resources, facilities, personnel, and operational plan to function as an EcoCAR team. EcoCAR organizers will use proposals (in conjunction with support letters) to evaluate universities' readiness to compete and their potential to succeed in the EcoCAR Innovation Challenge. An *outline* of the content required for this proposal is provided below. Lower-level details on content requirements as well as formatting requirements will be provided at a later date.

- **Team Pitch**:
  - Short-form opportunity to make your case for why your university should be selected
- **Budget**:
  - High-level four-year plan to support the costs of participation in EcoCAR
  - Example items: funded student positions, vehicle parts, tools, equipment, safety supplies, vehicle testing, team travel, etc.
- **Facilities**:
  - All teams: Team office space & work area, computer lab, garage space, controlled-access HV work area, secured storage, machining / fabrication facilities, vehicle testing facilities, high-performance compute clusters, and AI capabilities or resources (see Section C-7.1)
  - Teams applying to the Stellantis vehicle track: battery testing equipment, battery work space, thermal testing equipment, and lithium-ion battery storage location (see Section C-7.2)
  - Teams applying to the GM vehicle track: CAV feature test facilities and electric vehicle charging infrastructure (see Section C-7.3)
  - Note: special emphasis will be placed on the location of facilities relative to campus. Teams proposing to use off-campus facilities will be expected to propose an operational strategy to overcome barriers to student participation driven by the distance of the facility from campus
- **Safety**:
  - All teams: Facility safety protocols, safety training, safety protocols for HV and always-energized electrical work, personal protective equipment, university staff to support safety (see Section C-6.1)
  - Teams applying to the Stellantis vehicle track: hybrid powertrain safety & battery development safety (see Section C-6.2)
  - Teams applying to the GM vehicle track: vehicle testing and automation safety (see Section C-6.3)
- **Faculty**: roles/responsibilities for lead faculty (see Section C-2)
  - Example items: bio, research areas, tenure status, competing commitments, teaching load, etc.
- **Proposed Team Structure**
  - Proposed organizational structure and roles & responsibilities for a student leadership team based on the requirements contained in Section A-6.2 - utilizing EcoCAR-provided funding (see Section B-1) and university matching funding (see Section C-1.1)
  - Strategy for recruiting and engaging students across multiple disciplines
  - Proposed mechanism(s) for students to earn credit for participation (see Section C-3)
- **Additional Support** for project management, marketing, and communications functions (see Section C-4)

D-3.2 University Administrator Support Letter

Strong support from university administration sustained over the duration of the four-year program is critical to the success of any EcoCAR team. To ensure adequate institutional backing, each university must submit a **letter of support** signed by a senior administrator, such as the Dean of Engineering, confirming commitments made in the team's proposal. This letter must confirm the university's commitments to support the team for all four years of the competition. An *outline* of the content required for this support letter is provided below. Lower-level details on content requirements as well as formatting requirements will be provided at a later date.

- Outline all university cash support commitments, including support for funded student leadership positions (see Section C-1.1), supplemental seed money and/or travel funding (see Section C-1.2), and the application of overhead fees or indirect costs (see Section C-1)
- Support for lead faculty advisors (see Section C-2)
- Commitment to provide facilities and safety resources described in proposal (see Sections C-6 & C-7)
- Administrative support provided by the university (see Section C-5)

D-3.3 Additional Letters of Support

Universities are encouraged to obtain letters of support from local sponsors or industry partners who will support the team. Additional letters of support are not required to apply. There is no limit on the number of additional support letters applicants may submit.

The most impactful support letters will include the following elements:

- Concrete details about what support the sponsor/partner will provide (such as product donations, cash, facilities access, technical support, etc.)
- A clearly defined time period during which the sponsor/partner will provide this support
- A signature from a representative authorized to commit the sponsor/partner to provide this support

Mailing Address:
Argonne National Laboratory / STEP
9700 S Cass Ave
Lemont IL, 60439

APPENDIX A: DETAILED STUDENT COMPETENCIES

The following tables provide a detailed outline of competencies students can expect to develop through participation in EcoCAR.

TABLE 16: STUDENT COMPETENCIES FOR ARTIFICIAL INTELLIGENCE (AI) ACTIVITIES

Competency Developed	Description
Machine Learning Model Development	Train, test, and deploy machine learning models while assessing accuracy, bias, and generalizability.
Data Engineering	Design and implement data pipelines for acquisition, cleaning, labeling, and transformation to support iterative ML workflows.
Generative AI Applications	Integrate generative AI tools and context systems into engineering tasks such as requirements drafting, code generation, and design documentation.
AI-Enhanced Software Development	Leverage industry-standard AI tools (e.g., TensorFlow, PyTorch, MATLAB/Simulink, GitHub Copilot) to accelerate software development, debugging, and documentation.
AI Workflow & Agent Deployment	Develop and deploy autonomous AI workflows and agents to support tasks such as testing, simulation, reporting, and decision support.

TABLE 17: STUDENT COMPETENCIES FOR LEADERSHIP AND MANAGEMENT ROLE ACTIVITIES

Competency Developed	Description
Strategic Planning & Vision	Develop long-term strategies, goals, and priorities that align technical objectives with competition requirements and team mission.
Project & Program Management	Plan, monitor, and control scope, schedule, cost, and risk across multi-year projects using industry-standard tools and processes.
Cross-Functional Leadership	Lead and coordinate diverse subteams (vehicle, product, business, communications) to achieve integrated technical and organizational outcomes.
Stakeholder & Sponsor Engagement	Manage relationships with sponsors, faculty, and external partners through effective communication, reporting, and collaboration.
Knowledge Transfer & Succession	Document and transition processes, tools, and lessons learned to ensure continuity across competition years and team generations.
Team Development & Mentorship	Foster leadership, technical growth, and professional development in peers and junior team members.
Decision-Making Under Uncertainty	Evaluate and act on incomplete or ambiguous information, balancing technical trade-offs, risks, and stakeholder expectations.

TABLE 18: STUDENT COMPETENCIES FOR CONNECTED AND AUTOMATED VEHICLE SYSTEM ACTIVITIES

Competency Developed	Description
Energy-Aware Systems Design	Design and optimize connected and automated vehicle architectures with energy efficiency as a primary constraint.
Perception and Decision-Making	Develop and validate perception algorithms for object detection, traffic signal recognition, and low-speed maneuvering.
Connectivity & Communications Protocols	Implement and test V2X communication protocols (e.g., PC5, Uu) while evaluating their impact on energy use and system performance.
Sensor Integration and Fusion	Select, integrate, and calibrate sensor stacks while applying sensor fusion techniques to support automated driving functions.
Testing and Safety Assurance	Apply structured testing methods (e.g., HIL, SIL, closed-course evaluations) to validate CAV features against safety and compliance standards.

TABLE 19: STUDENT COMPETENCIES FOR BATTERY SYSTEM ACTIVITIES

Competency Developed	Description
Module Hardware Design	Perform cell-level design with emphasis on configuration, thermal management strategies, and safety considerations.
High-Voltage Battery Architectures	Apply knowledge of HVBS architectures to integrate energy storage systems within a broader vehicle platform.
Dynamic Battery Modeling	Create simulations of thermal and electrical behavior at the cell and pack levels to predict performance and limitations.
Virtual Configuration Validation	Reduce design cycle time and risks by validating custom battery configurations virtually before physical builds.
Control Strategy Optimization	Improve system reliability by continuously updating and testing control algorithms using real-world feedback and sensor data.
Battery Management Systems (BMS)	Develop advanced BMS capable of monitoring state-of-charge, battery health, and overall system performance.

TABLE 20: STUDENT COMPETENCIES FOR PROPULSION SYSTEM ACTIVITIES

Competency Developed	Description
Propulsion System Simulations	Demonstrate proficiency with MiL, HiL, and ViL simulations to explore performance, efficiency, and design trade-offs.
CAD Packaging Studies	Conduct packaging studies to optimize physical layout, mounting solutions, and subframe modifications for propulsion components.
Architecture Selection & Specifications	Select appropriate propulsion architectures and develop vehicle-level technical specifications aligned with performance goals.
Finite Element Analysis (FEA)	Apply FEA methods to perform stress analysis on components such as subframes and mount designs.
eRAD System Integration	Integrate, test, and calibrate electric Rear Axle Drive systems, addressing mechanical, thermal, and electrical considerations.
System Calibration & Serviceability	Perform calibration and serviceability assessments to ensure propulsion reliability and ease of maintenance.
HMI / UX Development	Develop user-facing HMI/UX software that meets propulsion-specific requirements and enhances operator interaction.
On-Vehicle Optimization & Testing	Execute off-road testing, consumer drive quality assessments, and optimization strategies to refine propulsion system performance.

TABLE 21: STUDENT COMPETENCIES FOR PRODUCTION INNOVATION DEVELOPMENT ACTIVITIES

Competency Developed	Description
AI-Enabled Product Development	Apply AI/LLM technologies to conceive, prototype, and validate innovative automotive-related products or IP.
Entrepreneurial Methods	Implement frameworks such as Lean Startup and I-Corps to conduct customer discovery, assess market viability, and make informed pivots.
Marketing Communications (MarCom)	Develop compelling narratives, pitch decks, and stakeholder materials that translate technical innovations into persuasive business and consumer stories.
Innovation Project Management	Plan and manage product development milestones, risks, and pivots using structured methods and AI-assisted tools.
Commercialization Awareness	Evaluate intellectual property, regulatory pathways, and funding strategies to understand commercialization processes without requiring market launch.

APPENDIX B: PROJECT MANAGEMENT

Best Practices for Recruiting Students to Fill Project Management Roles

To ensure the success of project managers in the EcoCAR Innovation Challenge, universities should prioritize candidates with strong technical foundations and the ability to bridge technical expertise with leadership and organizational skills. The following guidance outlines recommended academic pathways for recruitment.

Technical Foundation. Project managers should have a strong technical background, ideally grounded in engineering or a similarly rigorous technical field. This foundation is critical because successful PMs must understand how to work effectively with engineers and within technical environments.

Preferred Academic Pathways. The most effective profile is a combination of an undergraduate degree in engineering (or another technical discipline) paired with a graduate degree in business, management, or a related field. This blend equips students with both technical credibility and leadership or organizational skills.

Graduate vs. Undergraduate Balance. If a student is pursuing a graduate degree in a non-technical field, we recommend they hold a technical undergraduate degree to ensure the necessary balance. Conversely, graduate students in technical programs are strong candidates regardless of their undergraduate focus.

Flexibility and Exceptions. We encourage an "engineering-agnostic but technical-required" approach. Universities may also consider candidates from adjacent technical areas, such as design or communications, if they demonstrate substantial experience in highly technical environments.

Additionally, Table 22 outlines some characteristics to look for in candidates to fill project management roles on the EcoCAR team. The intent is to give preference to individuals who demonstrate a balance of leadership, communication, and technical awareness, combined with practical project management experience.

TABLE 22: CHARACTERISTICS OF STRONG CANDIDATES TO FILL PROJECT MANAGEMENT ROLES

Characteristic	Description
Empathy	• Ability to understand and support teammates. • Help with team morale, collaboration, and conflict resolution.
Prior Project Management Experience	• Formal training OR example of hands-on practice leading a project with defined scope and duration (e.g., student-led project, bachelor's thesis, volunteer initiative). • Preference for candidates with this background, though not a strict requirement.
Leadership Experience	• Could come from leading a student team, sports team, or other group. • Comfort with guiding others and taking responsibility. • Willingness (even enthusiasm) to handle conflict productively, since it is a major part of project management.
Communication Skills	• Strong interpersonal communication across technical and non-technical contexts. • Ability to adapt messaging to different audiences.
Basic Technical Awareness	• General familiarity with vehicle, EV, or battery technology (does not need to be expert-level but should know the fundamentals so they are not starting from zero). • A demonstrated curiosity or interest in EVs, batteries, or vehicle technologies, even if not deep expertise.
Adaptability	• Comfort working across multiple environments, from technical discussions to social media/communications tasks. ("Chameleon Factor")

APPENDIX C: MARKETING & COMMUNICATIONS (MARCOM)

Best Practices for Recruiting Students to Fill MarCom Roles

To ensure the success of MarCom activities, universities should prioritize candidates with strong foundations in strategic communications, as well as leadership and organizational skills that bridge marketing and communications functions.

Students in the Marketing and Communications Management / Leadership role should be drawn from majors in Communications (reference Table 10 for requirements related to the self-defined EcoCAR student leadership team). Ideal candidates come from the following programs:

- Communications
- Public Relations
- Strategic Communications
- Organizational Communication
- Visual Communications
- Journalism

Additionally, Table 23 outlines characteristics to look for in candidates to fill MarCom roles on the EcoCAR team.

TABLE 23: CHARACTERISTICS OF STRONG CANDIDATES TO FILL MARCOM ROLES

Characteristic	Description
Leadership & Team Management	Ability to guide, coordinate, and motivate team members; delegate responsibilities effectively; take ownership of initiatives and drive projects to completion.
Strategic Thinking & Planning	Skill in developing communication, marketing, and outreach strategies that align with team goals; anticipating challenges and opportunities; setting measurable objectives and KPIs.
Creative & Visual Communication	Capacity to design compelling visuals, materials, and campaigns that clearly communicate brand identity, technical concepts, and messaging to diverse audiences.
Digital & Multimedia Literacy	Proficiency in creating, managing, and promoting content across digital platforms, including websites, blogs, social media, and multimedia channels; understanding analytics to optimize engagement.
Audience Engagement & Storytelling	Ability to craft narratives, presentations, and campaigns that resonate with target audiences, translate technical or complex information into accessible messaging, and inspire action or interest.
Project & Event Management	Competence in planning, organizing, and executing projects and events, including logistics, scheduling, stakeholder coordination, and evaluating outcomes for continuous improvement.

Graduate vs. Undergraduate Balance

Graduate students are preferred for the MarCom Management / Leadership due to their advanced coursework, degree specialization, and applied experience in strategic communications and marketing. Undergraduate students can also be effective if they demonstrate strong leadership, creative, and project management abilities within their programs. If a graduate student is unable to fill the role, exceptions can be made for qualified undergraduates.

Flexibility and Exceptions

If a university does not offer an appropriate Communications degree program, it may, as an exception, partner with a neighboring institution to identify and recruit a suitable candidate. Only in these cases may candidates with relevant professional experience or interdisciplinary coursework be considered to ensure the MarCom leadership and support needs of the team are met.

Functional Support Roles

Due to the broad scope of activities spanning both Communications and Marketing, specialized support roles to will be essential to high-value in carrying out the full range of MarCom functions. Since these focus areas require distinct skill sets, the following outlines academic majors best suited to support each specific area of activity.

- **Recruitment Guidance for General Communications Support:** Graphic Design, Digital Media, Multimedia Production, Education, and Event Management / Hospitality.
- **Recruitment Guidance for Product Marketing Support:** Marketing, Business Administration, Communications, Economics, Data Analytics, Advertising, and Entrepreneurship.

APPENDIX D: SUMMARY OF FACILITIES REQUIREMENTS

Table 24 and Table 25 summarize required and recommended facilities for EcoCAR teams, broken down by technical track.

TABLE 24: SUMMARY OF REQUIRED FACILITIES

Facility Requirement	GM Track	Stellantis Track
Access-controlled team work areas (all team facilities restricted to AVTC15 students)	X	X
Dedicated office space (sufficient for subteam collaboration; ideally separate from garage)	X	X
Dedicated garage space (≥8,000 lb hoist, tools, PPE, HV-rated tools if needed)	X	X
Controlled-access high voltage work area	X	X
Computer lab with CAD/simulation software and computing power	X	X
Secured storage for vehicle parts (i.e. locked)	X	X
Digital information security (secure storage of sponsor-provided data per NDA)	X	X
Closed-course testing facility access (safe site with transport method, no flat/dolly towing)	X	X
Machine shop to support component fabrication	X	X
CAV testing environments (closed course with lane lines/intersections)	X	
Level 2 EVSE infrastructure (direct access; in/near garage recommended)	X	
DC fast charging access (≥100 kW, free to team; university covers costs)	X	
Lifting table (capable of handling battery pack up to 300lbs or subframes up to 1000 lbs.)		X
Exhaust gas extraction (for garage testing)		X
Battery module lift tool (overhead crane, engine lift, or equivalent)		X
Battery testing equipment (cell/module charge-discharge systems)		X
Full HEV battery pack charge/discharge equipment (cycler, power supplies, etc.)		X
Battery work space (controlled-access, secure)		X
Thermal testing equipment (thermal chambers, chillers, etc.)		X
Proper lithium-ion battery/cell storage facilities		X
Compliance with UNDOT 38.3 for lithium-ion battery transport/shipping		X

TABLE 25: SUMMARY OF RECOMMENDED FACILITIES

Facility Recommendation	GM Track	Stellantis Track
Electronics lab with test and measurement equipment	X	X
AWD vehicle dynamometer with on-staff university support	X	X
Access to GPU-enabled compute clusters	X	X
Collaboration with university research labs (transportation, energy storage, automation)	X	X
Indoor space for AV sensor calibration (radar, lidar, camera)	X	
Smart-city or intelligent transportation research asset alignment	X	
Motor/drive unit dynamometer / test bench setup	X	
Lifting table (capable of handling subframes up to 1000 lbs.)	X	
Vehicle battery cycler		X
Electronics lab for BMS development		X
Access to a battery simulator		X
Specialized Li-ion safety equipment (gas detection, fire suppression, etc.)		X

APPENDIX E: CLOSED COURSE TESTING FACILITIES

University must secure abundant access to an area where the team may regularly conduct closed-course dynamic vehicle testing. This appendix provides guidance on the dimensional requirements of testing space that teams will likely need throughout the EcoCAR Innovation Challenge.

Universities are encouraged to consider these dimensional requirements when evaluating sites for potential vehicle testing. For reference, teams in past AVTC series have conducted closed-course testing through a variety of means, such as:

- Chassis dynamometer (university owned or through an industry partnership)
- Vehicle proving ground (through an industry partnership)
- Racetrack (road course or oval circuit)
- Drag strip
- Airport taxiway or runway (closed for other use through cooperation with the airport authorities)
- Local public road or campus road closed to traffic through cooperation with local authorities
- Municipal driver training facility (examples: law enforcement or emergency services driver training)
- Large parking lots (example: sports stadium parking lot).
    - Note: teams must control access to the parking lot (temporarily closed off to public access)

Note: access to DC fast charging at the test site can also be beneficial, for teams in the GM vehicle track.

Longitudinal Propulsion System Testing

Historically, AVTC series have included one or more vehicle testing events that requires straight-line driving. Examples include: acceleration, braking, and drive quality evaluations. To safely conduct this type of testing, teams will need at least 1,500 ft (~1/4 mile) of straight roadway that is at least 2 lanes wide.

It is possible to conduct these types of maneuvers on an oval track with straightaways of <1,500 ft: acceleration and deceleration leading up to or occurring after an evaluation can be done in the curved portion of the tracks. As an example: the vehicle can build speed up to 60 MPH in the curved portion of the track then execute a 60-0 MPH braking maneuver in the straightaway. In this scenario, tracks will need at least 750 ft of straight track. The curved portions of the track must also be able to safely accommodate speeds up to 75 MPH.

Vehicle Dynamics Testing

Historically, AVTC series have included one or more vehicle testing events that requires lateral vehicle maneuvers at medium-to-high speeds. Examples include: maximum lateral acceleration & autocross. A test site with a smooth & level paved surface with dimensions of at least 500 ft. x 500 ft. will be required to safely conduct this type of testing. Smaller test areas (example: 300ft. x 500 ft.) may still be useful but will limit the scope of testing that can be conducted (types of maneuvers, top speed, etc.)

Continuous Driving

EcoCAR vehicle development often requires sustained vehicle operation (sometimes at sustained highway speeds). This type of continuous vehicle driving is useful to accumulate mileage, evaluate thermal system performance, and prove vehicle/subsystem reliability. Energy consumption evaluations will also require continuous driving over many miles at variety of sustained vehicle speeds (exact driving profiles will vary; test parameters for the EcoCAR Innovation Challenge are not yet defined). When evaluating test sites, prioritize spaces that enable sustained operation at speeds of at least 45 MPH. Sites with some type of roadway circuit are best suited to meet this criterion (examples: oval track, circuit track, perimeter of a large parking lot).

CAV Feature Testing

CAV feature testing only applies to teams competing in the GM vehicle track. CAV feature testing typically demands extended operations at speed and therefore requires a test site with a larger operational envelope. In contrast to the minimum distance of ~1/4 mile needed for propulsion system testing, CAV feature testing will require approximately 1.5 miles of straight roadway or a track with some type of roadway circuit. It is also beneficial if standard roadway lane lines are present on the testing surface.

Longitudinal CAV Feature Testing

Testing longitudinal CAV features such as CACC will require a 1.5 mile straightaway or a track with some type of roadway circuit. Access to tracks that allow for continuous driving at sustained speeds will likely be beneficial for more extensive testing (see prior section). The ability to deploy additional target vehicles onto the closed-course testing area will also be needed to replicate various lead vehicle scenarios and fully test vehicle automation.

Lateral CAV Feature Testing

Testing lateral CAV features such as lane centering will require a 1.5 mile straightaway or a track with some type of roadway circuit with multiple lanes striped and visible. If lane lines are not present on the available testing surfaces, the university will need a plan to create lanes either permanently or temporarily with the use of paint, tape, or other methods. A standard lane width of 12 feet is recommended for all lanes.

Intersection Navigation Testing

Multiple forms of intersections will be featured in CAV competition events. Access to testing facilities with defined intersections or the ability to close off an intersection on campus is recommended to meet testing objectives. The ability to create intersections in an open testing area through the use of paint, tape, or other method may also be sufficient. Facilities with controllable traffic lights are also beneficial for intersection testing but are not required.

Off-Road Evaluations

Off-road testing only applies to teams competing in the Stellantis vehicle track. Access to closed-course facilities with natural terrain and obstacles like logs, rocks, ditches, sand troughs, holes, and dirt banks may be useful for teams.