Automobile Industry Professional Course

A comprehensive 4-month online program designed to launch your career in the automotive sector — from foundational engineering concepts to industry-ready skills and real-world applications.

4 MONTHS · 16 WEEKS · CAPSTONE INCLUDED

WHY THIS COURSE MATTERS

The Automotive Industry Is Transforming — Are You Ready?

The global automobile industry is undergoing its most significant shift in a century. Electric vehicles, connected mobility, autonomous driving systems, and sustainable manufacturing are no longer future concepts — they are today's hiring requirements. Companies like Tesla, GM, Ford, Stellantis, and Tier-1 suppliers are actively seeking professionals who combine traditional automotive knowledge with modern digital and engineering fluency.

This course bridges the gap between academic learning and industry expectations, giving you the structured foundation, hands-on practice, and mentorship needed to step confidently into roles across design, manufacturing, quality, and systems engineering.

Industry Shifts Driving Demand

- EV adoption accelerating globally
- ADAS and autonomous vehicle R&D expanding
- Connected car and IoT integration
- Sustainability mandates reshaping manufacturing
- Software-defined vehicle architecture rising

COURSE OVERVIEW

Program Structure at a Glance

This 16-week program is structured in four distinct phases, each building on the previous, culminating in a real-world capstone project that demonstrates your readiness to employers.

Foundation Phase

Weeks 1–4

Core automotive concepts, vehicle systems, and industry overview

Intermediate Phase

Weeks 5–8

Powertrain, chassis, electronics, and manufacturing processes

Advanced & Application

Weeks 9–12

EV systems, ADAS, connected vehicles, and quality engineering

Capstone Project

Weeks 13–16

Real-world problem solving, presentation, and portfolio building

Each week includes a **recorded concept session** (weekend), a **live 1:1 or small-group mentoring session**, and structured assignments with measurable outcomes.

PHASE 1 · WEEKS 1–4

Foundation Phase: Automotive Fundamentals

Build a rock-solid understanding of how vehicles work, how the industry is organized, and where you fit in. No prior automotive experience required — just curiosity and commitment.

1

Week 1: Automotive Industry Landscape

- Global OEM ecosystem and supply chain structure
- Tier-1, Tier-2, and Tier-3 supplier roles
- Key regulatory bodies: NHTSA, EPA, EURO standards
- Industry value chain from design to dealership
- Career pathways and job family overview
- Introduction to automotive standards (ISO/TS 16949, IATF 16949)

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Week 2: Vehicle Architecture & Systems Overview

- Body-on-frame vs. unibody construction
- Major vehicle systems: powertrain, chassis, body, electrical
- Vehicle classification: ICE, HEV, PHEV, BEV, FCEV
- Bill of Materials (BOM) and vehicle platform concepts
- Reading engineering drawings and schematics
- Introduction to CAD tools: CATIA, SolidWorks basics

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Week 3: Internal Combustion Engine (ICE) Fundamentals

- 4-stroke engine cycle: intake, compression, combustion, exhaust
- Engine types: inline, V-type, flat/boxer configurations
- Fuel systems: carburetion vs. direct injection
- Cooling and lubrication systems
- Engine performance metrics: torque, horsepower, BMEP
- Emissions: CO_2, NO_x, particulate matter and control strategies

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Week 4: Transmission & Driveline Systems

- Manual, automatic, CVT, and DCT transmission types
- Clutch systems: friction, torque converter operation
- Drivetrain configurations: FWD, RWD, AWD, 4WD
- Differential types and locking mechanisms
- Gear ratio calculations and performance impact
- Assignment: Powertrain comparison analysis report

PHASE 2 · WEEKS 5–8

Intermediate Phase: Systems Engineering & Manufacturing

Dive deeper into the core engineering domains that define automotive product development. Gain hands-on exposure to the tools and processes used every day in the industry.

Week 5 — Chassis, Suspension & Braking

- Suspension geometry: MacPherson, double-wishbone, multi-link
- Steering systems: rack-and-pinion, EPS, steer-by-wire
- Braking: disc, drum, ABS, EBD, regenerative braking
- Ride and handling fundamentals: spring rate, damping
- Vehicle dynamics: understeer, oversteer, yaw control
- Tools: Adams/Car simulation basics

Week 6 — Automotive Electronics & Embedded Systems

- Electronic Control Units (ECUs) and their functions
- CAN bus, LIN, FlexRay, and Ethernet communication protocols
- Sensors: LIDAR, radar, ultrasonic, cameras
- OBD-II diagnostics and fault code interpretation
- Embedded C basics for automotive applications
- Introduction to AUTOSAR architecture

Week 7 — Manufacturing Processes & Quality Systems

- Stamping, casting, forging, and injection molding
- Welding types: MIG, TIG, spot welding in body-in-white (BIW)
- Paint shop processes: E-coat, primer, base coat, clear coat
- Assembly line design: takt time, cycle time, line balancing
- Quality tools: FMEA, Control Plan, MSA, 8D problem solving
- Introduction to IATF 16949 quality management standard

Week 8 — Automotive Materials & Lightweighting

- Steel grades: HSLA, AHSS, UHSS in body structures
- Aluminum, magnesium, and titanium applications
- Composites: CFRP and GFRP in structural and cosmetic parts
- Lightweighting strategies and regulatory targets
- Material selection criteria: cost, weight, formability, crash performance
- Mini project: Material selection report for a vehicle component

PHASE 3 · WEEKS 9–12

Advanced Phase: EVs, ADAS & Connected Vehicles

Master the technologies defining the future of mobility. This phase covers the most in-demand skill areas in today's automotive job market — electric vehicle systems, advanced driver assistance, and connected mobility.

Week 9 — Electric Vehicle Architecture

- EV powertrain: motor types (PMSM, induction), inverters, reducers
- Battery chemistry: NMC, LFP, solid-state comparisons
- Battery Management System (BMS): cell balancing, SOC/SOH
- Thermal management: liquid cooling, heat pump systems
- Charging standards: AC Level 1/2, DC fast charge, CHAdeMO, CCS
- Range estimation and energy efficiency modeling

Week 10 — ADAS & Autonomous Driving Systems

- SAE Levels 0–5 of driving automation
- Sensor fusion: combining LIDAR, radar, and camera data
- Perception algorithms: object detection, lane recognition
- Path planning and decision-making architectures
- Functional safety: ISO 26262 ASIL levels
- Testing and validation: simulation (CarSim, MATLAB/Simulink)

Week 11 — Connected Vehicles & V2X

- Telematics architecture: TCU, cloud platforms, APIs
- V2V, V2I, V2P communication standards (DSRC, C-V2X)
- Over-the-Air (OTA) software update strategies
- Cybersecurity in automotive: ISO/SAE 21434 fundamentals
- Fleet management and data analytics platforms
- Introduction to AUTOSAR Adaptive Platform

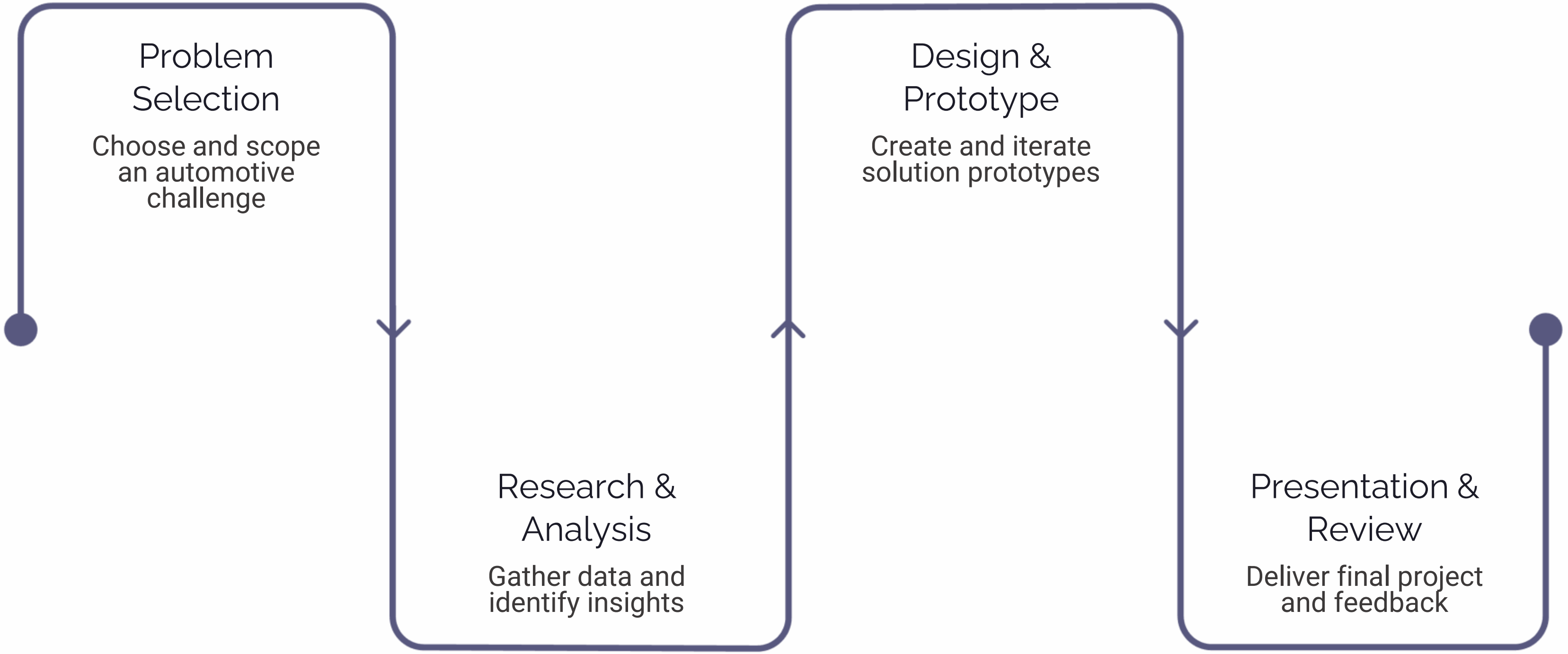
Week 12 — NVH, Safety & Regulatory Compliance

- Noise, Vibration, and Harshness (NVH) sources and control
- Crashworthiness: NCAP ratings, structural design for safety
- Passive safety: airbags, crumple zones, seatbelt pretensioners
- Active safety systems: ESC, TCS, lane keep assist
- Homologation and type approval processes
- Assignment: ADAS system evaluation case study

PHASE 4 · WEEKS 13–16

Capstone Project: Real-World Problem Solving

The capstone transforms your accumulated knowledge into a portfolio-ready deliverable. You will select a real-world automotive challenge, develop a structured solution, and present it to a panel of industry mentors.



Capstone Options (Choose One)

- EV battery thermal management system design
- ADAS sensor fusion strategy for urban environments
- Lightweighting analysis for a BIW structural component
- Manufacturing line optimization using lean principles
- Connected vehicle cybersecurity threat modeling
- Quality improvement plan using FMEA and 8D methodology

Deliverables & Evaluation Criteria

- Written technical report (15–20 pages)
- Presentation deck (10–12 slides, industry standard)
- Live demo or simulation output where applicable
- Peer review and mentor feedback session
- Evaluated on: technical depth, practicality, communication clarity
- Certificate awarded upon successful completion

How Each Week Is Structured

Every week follows a consistent rhythm designed to balance self-paced learning with real-time mentorship — maximizing both flexibility and accountability.

Recorded Concept Session

Weekend pre-recorded lecture covering that week's core topics. Includes annotated slides, worked examples, and embedded knowledge checks. Average duration: 90–120 minutes, split into 20-minute segments for digestibility.

Live Mentoring Session

Weekend 60-minute live session with your mentor or small group. Covers doubt clearing, case study discussions, assignment feedback, and industry Q&A. Sessions are recorded for asynchronous review.

Practical Exercises

Hands-on tasks aligned to each week's topic — calculations, tool exercises, case analysis, or design reviews. Submitted before the live session so mentors can provide targeted feedback.

Weekly Assessment

Short quiz or reflection prompt (15–20 minutes) to consolidate key concepts. Results tracked in your learning dashboard. Cumulative assessments inform the final readiness score at course end.

Industry Example 1: EV Battery Thermal Management at a Major OEM

The Business Problem

A leading North American EV manufacturer was experiencing accelerated battery degradation in vehicles operating in extreme climates (desert Southwest summers, Northern Midwest winters). Field data showed a 15–18% reduction in usable battery capacity within 24 months — far exceeding warranty projections and triggering recall risks.

How Course Concepts Apply

- BMS monitoring algorithms for real-time temperature tracking
- Liquid cooling loop redesign using thermal simulation
- Heat pump integration for cabin and battery conditioning
- Cell chemistry analysis to select more thermally stable NMC variants

Tools & Technologies Used

- MATLAB/Simulink for thermal modeling
- GT-Suite for full system simulation
- Python for field data analysis and anomaly detection
- CATIA V5 for cooling plate redesign

Measurable Business Impact

- Battery degradation reduced by 40% over 36-month period
- Warranty cost savings of approximately $120M annually
- Customer satisfaction (NPS) improved by 22 points

Role of Early Professionals

Junior engineers ran simulation models, collected and analyzed field telematics data, authored technical reports, and supported design reviews — gaining full exposure to cross-functional product development.

Industry Example 2: ADAS Sensor Calibration at a Tier-1 Supplier

The Business Problem

A global Tier-1 ADAS supplier was facing a critical quality issue: forward collision warning systems were generating false positives at a rate of 3.2% in urban environments — causing unnecessary braking events, customer complaints, and potential liability exposure. The root cause was poor sensor fusion calibration across varied lighting and weather conditions.

How Course Concepts Apply

- Sensor fusion principles: LIDAR + radar + camera alignment
- ISO 26262 functional safety analysis and ASIL classification
- FMEA for detecting failure modes in perception pipeline
- Embedded systems debugging using CAN diagnostic tools

Tools & Technologies Used

- CarSim and PreScan for scenario simulation
- Vector CANalyzer for bus traffic analysis
- MATLAB Sensor Fusion Toolbox
- Python-based data pipeline for test log processing

Measurable Business Impact

- False positive rate reduced from 3.2% to 0.4%
- OEM customer retained — $340M multi-year supply contract
- Validation cycle time reduced by 30% through simulation-first approach

Role of Early Professionals

Early-career engineers designed test scenarios, ran HIL simulations, documented results in DOORS, and participated in DFMEA workshops — building cross-disciplinary competence in safety-critical systems.

Industry Example 3: Manufacturing Quality Transformation at an Assembly Plant

The Business Problem

A major Midwest assembly plant producing pickup trucks was struggling with a defect rate of 4.7 defects per vehicle (DPV) — significantly above the industry benchmark of 1.5 DPV. The primary culprits were body panel fit-and-finish issues and weld quality variations in the body shop, leading to customer-facing quality scores dropping below competitive thresholds.

How Course Concepts Apply

- FMEA and Control Plans applied to BIW welding operations
- Statistical Process Control (SPC) for weld parameter monitoring
- 8D problem-solving methodology for root cause elimination
- Line balancing and takt time analysis to reduce operator errors

Tools & Technologies Used

- Minitab for SPC charting and Gauge R&R studies
- CATIA for gap and flush analysis on digital mockups
- SAP Quality Module for defect tracking and reporting
- Lean VSM (Value Stream Mapping) workshops

Measurable Business Impact

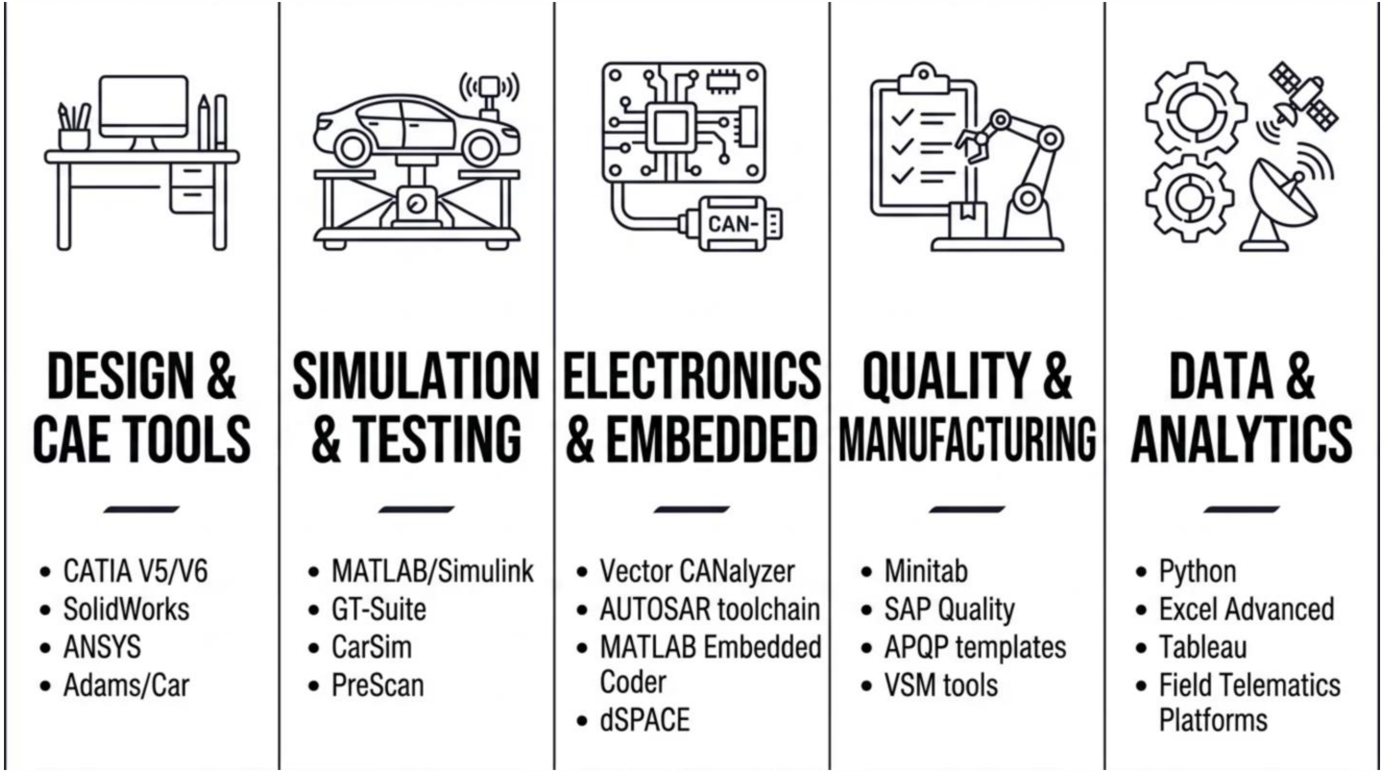
- DPV reduced from 4.7 to 1.8 within two production quarters
- Annual scrap and rework cost reduced by $18M
- Plant moved from bottom quartile to top 3 in internal quality rankings

Role of Early Professionals

Quality engineers led 8D documentation, ran SPC monitoring shifts, facilitated operator training sessions, and presented corrective action plans to plant leadership — developing real ownership and communication skills.

Your Automotive Technology Toolkit

Proficiency with industry-standard tools is non-negotiable in today's automotive hiring landscape. This course provides structured exposure to the tools you'll use from day one on the job.



You will not be expected to master every tool — instead, you will develop **working fluency** in the most commonly required tools per domain, with guided exercises and real-world workflows integrated into weekly assignments.

CAREER ALIGNMENT

Job Roles This Course Prepares You For

The automotive sector offers diverse career tracks across engineering, quality, software, and manufacturing. This course is designed to make you competitive across the following roles within 6–12 months of completion.

Vehicle Systems Engineer

OEMs and Tier-1s. Responsible for integrating subsystems, resolving system-level conflicts, and supporting DVP&R (Design Verification Plan & Report) activities.

EV Powertrain Engineer

Battery, motor, and power electronics teams at EV startups and established OEMs. Focus on thermal management, BMS development, and charging strategy.

ADAS/Autonomy Engineer

Works on perception, path planning, or sensor integration teams. Requires strong simulation skills and familiarity with ISO 26262 safety frameworks.

Quality Engineer

Supports APQP, PPAP, and production launch activities. Uses FMEA, SPC, and 8D tools daily. Critical role at both OEMs and supplier organizations.

Manufacturing / Process Engineer

Designs and optimizes production processes, manages takt time, line balancing, and tooling. Requires understanding of BIW, paint, and final assembly operations.

Embedded Systems / Connected Vehicle Engineer

Develops ECU software, validates CAN/LIN communication, and works on OTA update pipelines. Growing demand in software-defined vehicle programs.

Skills Mapping: Beginner → Intermediate → Job Ready

This course is intentionally structured as a progressive skill ladder. Each phase unlocks new capability levels and builds directly on what came before — ensuring no learner is left behind and every learner is stretched forward.

Beginner (Weeks 1–4)

Understands vehicle architecture, ICE fundamentals, transmission types, and industry structure. Can read engineering drawings and explain supply chain roles. Ready for entry-level plant tours and informational interviews.

Intermediate (Weeks 5–8)

Can analyze chassis dynamics, interpret ECU diagnostic data, apply FMEA on a real component, and use simulation tools for basic modeling. Ready for internship roles and technical conversations with engineers.

Advanced (Weeks 9–12)

Understands EV system architecture end-to-end, can evaluate ADAS sensor fusion strategies, apply ISO 26262 thinking, and design a connected vehicle data pipeline. Ready to apply for full-time engineering roles.

Job Ready (Weeks 13–16)

Has a portfolio capstone demonstrating real-world problem solving, a structured resume of tools and competencies, and the communication skills to present technical work to non-technical stakeholders. Industry interview-ready.

YOUR NEXT STEPS

Your Roadmap After Completing This Course

Completing this course is a major milestone — but it's also a launchpad. Here is the recommended path to maximize your career impact in the 6–12 months following graduation.

1 — Month 1 Post-Course

Finalize your capstone portfolio. Update your LinkedIn and resume with tools, projects, and course completion. Apply to 3–5 targeted roles per week using the job roles map from this course.

2 — Month 2–3

Pursue SAE International student membership and attend local automotive chapter events. Begin one specialized certification: APQP/PPAP, MATLAB fundamentals, or ISO 26262 awareness training.

3 — Month 4–6

Secure your first internship, co-op, or entry-level role. Apply course learnings on real projects. Begin building your professional network at OEMs, Tier-1s, and industry associations like SAE and AIAG.

4 — Month 7–12

Deepen one domain specialty (EV, ADAS, Quality, Manufacturing). Contribute to an open-source automotive project or publish a technical blog post. Target your first performance review with clear growth metrics.

> Your mentor from this course remains available for 3 post-graduation check-in sessions. Use them strategically — for resume review, mock interviews, or career decision guidance.

Key Takeaways

What you walk away with after 16 weeks in this program.

Deep Automotive Fundamentals

From ICE to EV, chassis to electronics — a comprehensive engineering foundation that no employer can ignore.

Hands-On Tool Proficiency

Working fluency in CATIA, MATLAB/Simulink, CANalyzer, Minitab, and Python-based automotive workflows.

Portfolio Capstone Project

A real-world engineering project that demonstrates your problem-solving ability and communication skills to hiring managers.

Industry-Ready Mindset

You understand how automotive organizations work, speak the language of OEMs and suppliers, and can contribute from day one in a professional environment.

> The automobile industry isn't just building vehicles anymore — it's building the future of mobility. This course puts you at the center of that transformation.