PROTEUS CAN BUS

A complete CAN bus course: lectures, labs, tutor solutions and marking, built on a simulated vehicle network your students program.

A Ready-to-Teach Course in Automotive CAN

Creating and delivering a CAN bus course from scratch is a real undertaking. The practical work needs a multi-node network, and providing benches of ECUs, transceivers, wiring and analysers for a whole cohort is expensive and fragile. Then there are the teaching materials themselves: lectures, assessed lab exercises, mark schemes and worked solutions, all to prepare before the first week.

This course removes both problems. In-Vehicle Networking is a complete programme for further and higher education, with a one-hour lecture plus a self-paced lab for each topic, built on Proteus VSM. The lab is a simulated vehicle network: behavioural models of real car parts, an engine, a dashboard, lighting, braking and more, all talking over a CAN bus on the schematic. Students write real firmware for one ECU and watch the whole system respond, with nothing to wire and nothing to break.

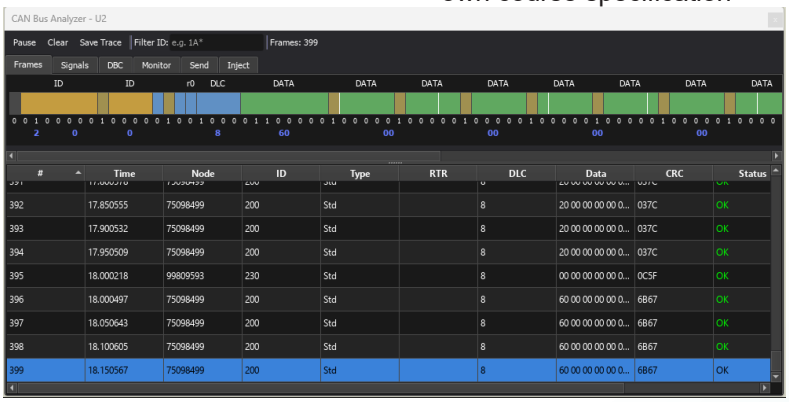
The programme follows a clear arc: read the bus, build on it, diagnose it, then extend it. A shared Foundations unit feeds two core modules, Embedded Vehicle Networks and Vehicle Network Diagnostics, with Higher Education extensions, cyber-security, LIN and a whole-vehicle capstone above them. The seven units hold more than forty sessions, covering framing, arbitration, decoding, transmit firmware, timing, gateways, diagnosis, recovery, security and reverse-engineering.

The course is built on Proteus VSM, so if you already use Proteus in your labs you are most of the way there. Both CAN controller and transceiver models are included, so the course can be taught on virtually any supported Proteus VSM processor, whatever microcontroller your embedded course already puts in front of students.

There is no hardware to buy, wire or maintain, and nothing to replace per seat. Every student runs the identical vehicle network on their own PC. Setup is a one-off install of the Proteus models on each machine, then open a session and press Run.

Every session includes:

- ✓ Each lecture, with a live analyser demo
- ✓ A tutor brief and session plan
- ✓ An interactive ProTutor lesson plan, so exercises can be set to self-mark
- ✓ The Proteus project the student builds on, with worked solutions supplied separately
- ✓ A curriculum-mapping template with a blank column for your own course specification



"The whole Proteus suite has been invaluable to us in delivering our advanced BTEC Electronic Courses. Proteus VSM processor simulation is excellent and very easy to implement."

Alan Duffy
B-Met – Sutton Coldfield Campus

CAN BUS SIMULATION

Runs on any MCU family: PIC, AVR, 8051, Arduino, ARM or MicroPython.

More than forty sessions across seven units, from first frame to whole vehicle, simulated.

ASSESSMENT & MARKING

Every lesson ships its own marking, so you are not writing mark schemes from scratch. Each carries a set of assessed tasks, a mark scheme and worked solutions, kept separate from the student project. You can use them in two ways. Mark by hand from the supplied scheme and solutions, or run the lesson as a ProTutor plan inside Proteus: it sets the tasks, checks the student's firmware and answers as they work, and scores each step against the scheme while you circulate. Tasks build from guided steps that get everyone to a result, up to open challenges with no ceiling. The three bands, Threshold, Good and Excellent, line up with Pass, Merit and Distinction, and every session includes a mapping template for your awarding body.

WORKS WITH ANY MCU

Some parts have a CAN controller built in: the pyboard and the STM32, for example, put frames straight onto the bus. For the many that do not, Proteus supplies stand-alone controller and transceiver models, so the microcontroller reaches the bus over SPI instead. Either way the course runs on whatever family you already teach: PIC, AVR, 8051, Arduino or ARM in C, or MicroPython on a pyboard. A CAN networking module slots into an existing embedded course without changing the chip on the bench.

WHAT STUDENTS LEARN

- ✓ Read a CAN frame field by field, and why the lowest identifier wins the bus
- ✓ Send on a fixed cycle and on events, with correct, observable timing
- ✓ Turn raw bytes into named, scaled signals using a DBC database
- ✓ Find a fault with the analyser, then recover from injected errors in firmware
- ✓ Run OBD-II diagnostics against a scan tool: live data, trouble codes and VIN

THE SEVEN UNITS

- ✓ Foundations of CAN: frames, arbitration, DBC decoding, bus load
- ✓ Embedded Vehicle Networks: transmit, timing, gateways and chassis
- ✓ Vehicle Network Diagnostics: fault codes, recovery and reverse-engineering
- ✓ Higher Education extensions: physical layer, CAN FD and trailer
- ✓ Vehicle Cyber-Security: spoofing, intrusion detection and secure access
- ✓ LIN and Multi-Bus: schedule tables, gateway and sub-buses
- ✓ Capstone: a whole-vehicle project

Every lesson ships a lecture, a tutor brief and a self-marking ProTutor plan.

Every session ships as a complete Proteus pack, ready to run in class.

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- ▶ CAN Bus Intro
- ▶ CAN Analyser
- ▶ CAN Fault Finding
- ▶ CAN Bus Safety