



Universidad Nacional Autónoma de México

Facultad de Ingeniería

Tema Selecto:

Automotive Electronics Group: 16

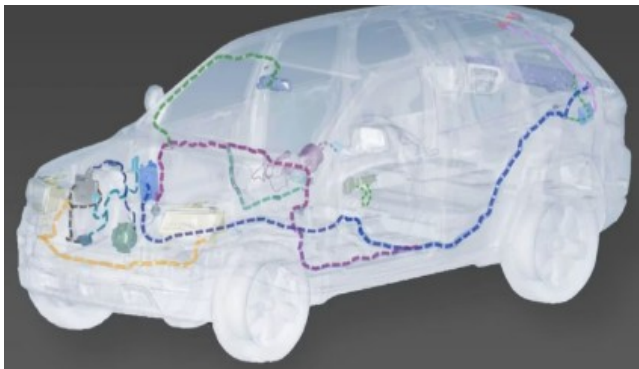
Schedule: (Lu – Mi 17:00 – 19:00 hrs)

Mecatrónica I (3089)

Mecatrónica II (3090)



Currently, the Automotive Industry is undergoing an intense transformation. With the arrival of electric vehicles, the number of ECUs (Electronic Control Units) per vehicle has increased.



Objective

This course seeks to apply the knowledge acquired by students in the subjects of Electronics and Digital Circuits to applications in the Automotive Industry.

Professor: Ing. Rafael Augusto Sobrevilla Figueroa

Class Model (In-person)

Topics:

1. Electrical systems in 12V and 24V vehicles
2. Harness design and voltage drop calculation
3. Voltage systems in modern electric vehicles
4. ECUs (Electronic Control Units)
5. CAN network for vehicles
6. UDS as a standard for automotive diagnostics

Source: <https://dewesoft.com/es/blog/que-es-el-bus-can>

Automotive Electronics Topics Schedule: (Lu – Mi 17:00 – 19:00 hrs) Group: 16

1. Electrical Systems in 12V and 24V Vehicles

- Fundamentals of DC electrical circuits
- Components: batteries, alternators, starters, wiring, fuses, relays
- Comparison of 12V vs. 24V systems (advantages, disadvantages, typical applications)
- Common issues and troubleshooting (e.g., shorts, open circuits, parasitic drains)

2. Harness Design and Voltage Drop Calculation

- Principles of automotive wiring harness design
- Wire sizing (AWG/mm²) and current carrying capacity
- Voltage drop concept and its impact on component performance
- Methods for calculating voltage drop (Ohm's Law application)
- Tools and best practices for harness assembly and routing

3. Voltage Systems in Modern Electric Vehicles (EVs)

- High-voltage (HV) battery systems (e.g., 400V, 800V and beyond)
- DC-DC converters and their role in EVs
- Thermal management of HV batteries and power electronics
- Safety protocols and isolation in high-voltage systems
- Charging infrastructure and standards (AC vs. DC, Level 1/2/3)

4. ECUs (Electronic Control Units)

- What is an ECU? (Definition, function, and purpose)
- Types of ECUs in a modern vehicle (e.g., Engine ECU, Transmission ECU, ABS ECU, Body Control Module)
- Basic architecture of an ECU (microcontroller, memory, I/O, power supply)
- Software and firmware aspects (bootloader, operating system, application layer)
- ECU flashing and calibration

5. CAN Network for Vehicles

- Introduction to Controller Area Network (CAN) protocol
- CAN bus topology and communication principles
- CAN messages (arbitration, identifiers, data frames)
- High-speed CAN vs. Low-speed CAN

6. UDS (Unified Diagnostic Services) as a Standard for Automotive Diagnostics

- Overview of UDS (ISO 14229)
- Client-server communication model
- Key UDS services (e.g., DiagnosticSessionControl, ReadDataByIdentifier, WriteDataByIdentifier, TesterPresent, RoutineControl, SecurityAccess, DTC management)
- Application of UDS in vehicle diagnostics and manufacturing
- Introduction to diagnostic tools and software utilizing UDS