NIELIT Ropar
Deemed to be University

MTech in Automotive Electronics

M. TECH – AUTOMOTIVE ELECTRONICS
National Institute of Electronics and Information Technology

Technology development has seen growth in leaps and bounds primarily in the Passenger Car Segment (PCS). The electronic content in cars started with the introduction of the in-car entertainment system, alternators, regulators and other electronics components. Other technological developments in the field of auto electronics were the result of Customer demand and Legislative Pull. Growing electronics content in PCS has led to the growth of the Global Auto Electronics market to $230 billion in 2020; up from $140 billion in 2010. With a growing number of sensors and ECUs installed, the overall cost of electronics in a car is expected to reach 45% by 2030 (ACM Report). With highly dynamic market scenarios, the Asia Pacific market is expected to drive the growth of Auto Electronics worldwide. Government mandate on emission norms and safety norms are the major thrust for the growth of electronics content in Powertrain and Safety programs worldwide.

The introduction of electronic substitutes in vehicles with a gradual phase-out of mechanical components also has fueled the growth of the auto electronics market. Legislative and Customer Pull are leading to the advent of new technologies across vehicle segments (PV, CV, and 2W) such as ABS, Rear lighting control, Active Suspension and others. Ninety per cent of innovations in the modern car are based on new developments in electronics.

Increase in the complexity of modern cars also increases the demands placed on design, development, diagnostics, maintenance and repair. Currently there is a great shortage of qualified automotive engineers with good design and development skills. Vehicles will continue to become more complex; therefore, the need for skilled human resources will continue to grow. Hence there need a unique training program in automotive electronics with an emphasis on electronics system of Vehicles. M.Tech in Automotive Electronics is designed to cater to the needs of skill requirements in Industries.

Program Education Objectives (PEO)

PEO1: To gain expertise and proficiency in the broader domains of automotive electronics and computation, enabling success in contemporary industry, academia, or research.

PEO2: To understand, assess, formulate, and develop innovative problem-solving approaches within the realm of Automotive Electronics that are technically, economically, and socially feasible and acceptable.

PEO3: To demonstrate professional proficiency and leadership attributes, harmoniously integrating ethical principles for comprehensive personality development.

Program Outcomes (PO)

PO1   The capability to autonomously conduct research, investigation, and developmental tasks to address real-world challenges.

PO2   Proficiency in composing and delivering a comprehensive technical report or document.

PO3   An ability to demonstrate a degree of mastery over the area as per the specialization of the program

PO4   The capability to showcase a level of mastery corresponding to the program's specialization area.

PO5   The skill to participate in self-directed and lifelong learning within the context of evolving technology and industrial requirements.

Course Category Wise Credit Distribution

Category	Credits
Program Core	12
Core Labs	4
Electives	15
Electives Labs	4
Audit Course	2
Open Electives	3
Project / Dissertation	28

Semester-I						
S. No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1.	AEL601	Program Core-I Automotive Embedded System	3	0	0	3
2.	AEL602	Program Core-II Automotive Engine Management and Sensors Systems	3	0	0	3
3.	AEL***	Program Elective-I	3	0	0	3
4.	AEL***	Program Elective-II	3	0	0	3
5.	ACL601	Research Methodology and IPR	2	0	0	2
6.	ACL602	Audit course	2	0	0	0
7.	AEP601	Laboratory-I (Embedded Computing and Programming)	0	0	4	2
8.	AEP***	Laboratory-II (Based on Electives)	0	0	4	2
		Total	16	0	8	18
Semester-II						
S. No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1.	AEL603	Program Core-III Vehicle Dynamics & Control	3	0	0	3
2.	AEL604	Program Core-IV Automotive networking and protocols	3	0	0	3
3.	AEL***	Program Elective-III	3	0	0	3
4.	AEL***	Program Elective-IV	3	0	0	3
5.	ACL***	Audit Course	2	0	0	0
6.	AEP604	Laboratory-III Automotive Control and Vehicle Simulation Lab	0	0	4	2
7.	AEP***	Laboratory-IV (Based on Electives)	0	0	4	2
8.	AED601	Mini project with Seminar	2	0	0	2

			Total	16	0	8	18

Semester-III

S. No	Course Code	Course Name	L	T	P	C
1.	AEL***	Program Elective-V	3	0	0	3
2.	OEL***	Open Electives	3	0	0	3
3.	AED701	Dissertation-I/ Industrial project	0	0	20	10
		Total	6	0	20	16

Semester-IV

S. No	Course Code	Course Name	L	T	P	C
1.	AED702	Dissertation-II	0	0	32	16

Walkthrough of Automotive Electronics Lab

Objectives:

The Automotive Electronics Laboratory imparts research related to vehicle electronics including electronic components, sensors, communications, embedded systems, BMS, and mechatronics with prominence on systems integration, and modelling. Exercises are provided to understand the concepts and working of automotive sensors and actuators.

Objectives

- To aim a technology lab for providing the knowledge on intelligent vehicle system.
- To support interdisciplinary research and industry driven innovation in embedded systems, control systems and automotive systems.
- To study and analyse automotive sensors and actuators.

1. **Raspberry Pi:**

The Raspberry Pi is a small, low-cost computer that is about the size of a debit card. It has a processor, memory, and graphics driver, and can connect to a TV or

2. **Arduino Uno:**

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator.

3. **NodeMCU ESP 8266**

NodeMCU ESP8266 is an open-source Lua based firmware and development board specially targeted for IoT based applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware which is based on the ESP-12 module, and like this, it can also be programmed using Arduino IDE and can act as both WiFi Hotspot or can connect to one. It has one Analog Input Pin, 16 Digital I/O pins along with the capability to connect with serial communication protocols like SPI, UART, and I2C.

4. **DHT Sensor**
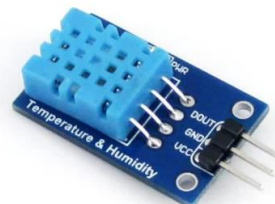
The DHT11 is a commonly used Temperature and humidity sensor that comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data.

computer desktop using a keyboard and mouse.

5. **Ultrasonic Sensor**

Ultrasonic sensors are electronic devices that determine a target's distance. They work by emitting ultrasonic sound waves and converting those waves into electrical signals. Furthermore, ultrasonic travel at a faster rate than audible sounds. Therefore, ultrasonic sensor work involves sound waves to find the distance to an item.

6. **Digital Oscilloscope**
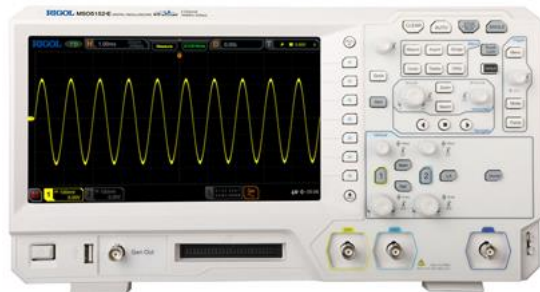
A digital storage oscilloscope (DSO) is an oscilloscope which stores and analyses the input signal digitally rather than using analog techniques. It is now the most common type of oscilloscope in use because of the advanced trigger, storage, display and measurement features which it typically provides.

7. **GSM Interface**

SIM900A Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. SIM900A GSM/GPRS modem is plug and play modem with RS232 serial communication supported. Hence Advantage of using this modem will be that its RS232 port can be used to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed. SIM900 modem supports features like voice call, SMS, Data/Fax, GPRS etc.

8. **Facilities**
- AVL Cruise Software
- 48V/20A Battery and Charging system for BMS
- Intel Real Sense Tracking Camera and Depth Camera
- CAN - Microcontroller Development Board
- Python supported FPGA Kits
- Embedded systems for connected cars
- Nividia Jetson TX2 and Nano graphical processing unit.
- Engine Fuel Injector kit
- Mass Air Flow Sensor kit
- Manifold Absolute Pressure Sensor kit
- Coolant Temperature Sensor kit
- CAM shaft position sensor kit.
- DC and AC motor control kit

Job Roles

This course aims to provide graduates with the technical qualities, transferable skills and independent learning ability to make them effective in organisations that design and develop automotive products. Our strategic links with industry ensure that all of the course material is relevant, timely and meets the needs of organisations competing within the automotive sector. This industry-led education makes NIELIT graduates some of the most desirable in the world for automotive companies to recruit.

An M.Tech. in Automotive Engineering opens doors to a wide range of career and job opportunities in both traditional and emerging sectors. Graduates with this specialized degree are in high demand, as they possess the skills and knowledge needed to excel in various roles within the automotive industry and related fields. Automotive engineering provides an array of job prospects. Here are the following career paths after studying automotive engineering

- Automotive Design Engineer
- Executive and Managerial Positions
- Driver Instrumentation Engineer
- Senior Production Engineer
- Automobile Designer
- Automotive Sales Engineer
- Dealer Account Manager
- Quality Engineer
- Service Engineer
- Marketing Expert
- Mechanical Design Engineer
- Automotive Developer
- Regional Transport Officer
- Service Advisor and Works Manager in Dealerships
- Automotive Technician
- Service Station owner

Top Recruiters

There are demands for engineering graduates in several domains including the private and public sector. Several companies recruit engineers in various capacities. Here are some examples of top companies recruiting M.Tech graduates:

- TATA Motors
- Mahindra and Mahindra
- Toyota
- Honda
- Ford
- Eicher Motors
- Escorts
- Bajaj Auto Limited
- Maruti Udyog Limited
- Hero Motors
- Honda Motorcycle and Scooter India Pvt. Ltd

Number of Seats: 18

Eligiblity Criteria

For Gate Passed Candidates: For admission to M. Tech.in Automotive Electronics candidate must have passed GATE paper. in EC/EE/IN/MECH.

For Non-Gate Candidates: For admission to M. Tech.in Automotive Electronics candidate must have passed B.E./B.Tech. in Electronics and Communication Engineering/ Electronics and Instrumentation Engineering/ Information Communication Technology /Electronics and Computer Engineering/ Electrical and Electronics Engineering/ Electrical Engineering/Mechanical Engineering or equivalent degree in Engineering with 50% (45% for SC/ST & Disabled Persons Categories) marks.

Reservation Policy

i. Seats are reserved as per Govt. of India Rules, AICTE and/or University Approval.
ii. A quota of 15 % is reserved for the SC candidates, 7.5% for ST candidates, 27% for Other Backward Classes and 10% for Economic Weaker Section (EWS):
iii. Candidates selected against the quota for persons with disabilities (5%) as per PWD Act 1995 are placed in the appropriate category viz.SC/ST/OBC/General candidates

depending upon the category to which they belong in the roster meant for reservation of SCs/STs/OBCs.

Hostel Facilities

NIELIT Ropar provides in-campus hostel accommodation for both boys and girls separately with a total capacity of 160 seats in each hostel with modern amenities. The hostels are secured by round-the-clock security guards at the entry gates.

Other Facilities

- NKN Connectivity
- 24x 7 Wi-Fi Campus
- IEEE Online Access
- Shodh Ganga Access
- ACM Online Access

Location and How to reach?
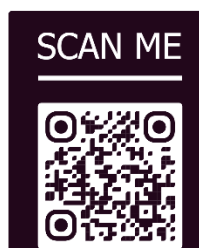
Please scan the code above to get the location detail wrt to NIELIT Ropar Campus

By Auto / Taxi from Ropar Bus Stand

https://maps.app.goo.gl/eEcEqsxMyetwy5AA6

By Auto /Taxi from Ropar Railway station

https://maps.app.goo.gl/sf5pjKz3eiLWYRqi8

By Airport

https://maps.app.goo.gl/53SosBhBckNDXMdH8

The nearest Airport is Shaheed Bhagat Singh International Airport which is situated at 55 kms away from the NIELIT Ropar Campus. One can reach the venue by hiring a taxi from the airport.

*The fee and admission dates will be announced soon