National Institute of Electronics and Information Technology, Chennai

COURSE PROSPECTUS

Name of the Group:	VLSI & EMBEDDED
Name of the Course:	Certificate course in Automotive Electronics Technician
Course Code:	AE 200
Starting Date:	15th October 2018
Duration:	200 Hrs
Course Coordinator:	Bharath P
Start Date of Registration:	03rd October, 2018
Last Date of Registration:	12th October, 2018

Preamble:

Today's modern vehicle equipped with networked measurement, control and communications systems to meet the growing demands for complex features, including increased safety (brake systems, airbag system, Electronic Stability Program - ESP), driver assistance systems (cruise control, navigation, night vision, blind spot detection) or to comply with legal requirements (reducing the emission of pollutants by intelligent engine control).On-board diagnostics (OBD) check the operation of almost every electrical / electronic part in every major vehicle system. A vehicle's Engine Control Unit (ECU) monitors the operations of the fuel injectors, ignition coils, fuel pump, emissions system part, and other major components that affect vehicle performance and emission control.

The increase in the complexity of modern cars also increases the demands placed on diagnostics, maintenance and repair. Today's automotive technicians require an wide range of skill sets for troubleshooting vehicle, this demand not only trouble shooting skills for mechanical parts but also electrical and electronic system on the vehicle .Currently there is a great shortage of qualified automotive technicians with good diagnostics skills. Vehicles will continue to become more complex; therefore, the need for good technicians will continue to grow. Hence there need a practical training program in automotive electronics system of vehicle also.

Objective of the Course:

The course aims to equipping the Candidate with the operating principle of all Electronics / Electrical components used in Vehicle with hands-on practical experience, with focus on fault finding and fault elimination.

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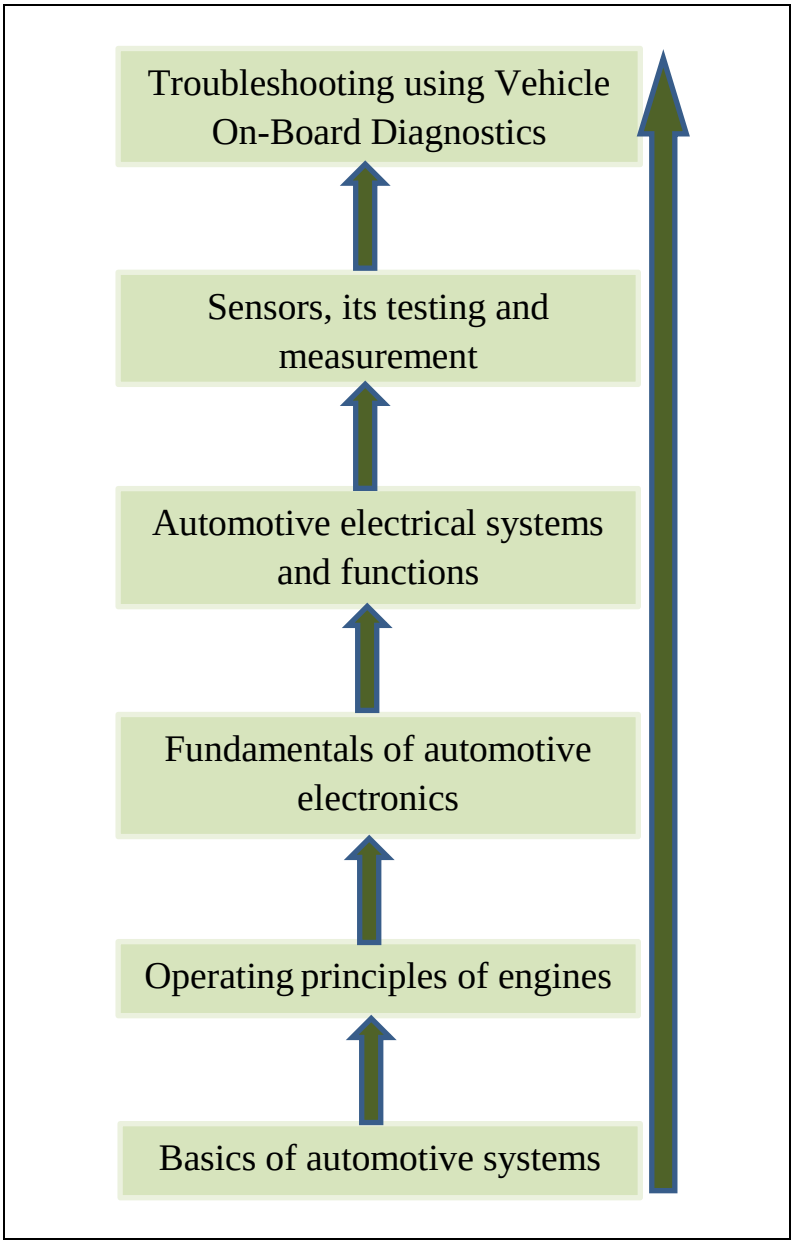
Outcome of the Course: After successful completion of this course, students can able to:

- Get expertize on the Operation of the Electrical and Electronic Components of the Vehicle.
- Thorough with working principle of Modern Electronically Controlled Engine Systems
- Assemble Test and Verify the sensor used in the Vehicle.
- Repair & Maintain the Battery System, Lighting System and Power Generation of Vehicle.
- Capable of identifying the problem in the vehicle by reading DTC using OBD Tools & Equipment. to take corrective action.

Flow of course



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Course Structure:

Sl. No.	Topics	Duration
AE 201	Introduction to Automotive Systems and Technology	10 Hrs
AE 202	Introduction Automotive Engine System	30 Hrs
AE 203	Automotive Electronics Systems	40 Hrs
AE 204	Automotive Electrical Systems	45 Hrs
AE 205	Automotive Sensors & its Testing and Measurement Techniques	45 Hrs
AE 206	Automotive On-board diagnostics (OBD)	25 Hrs
AE 207	Soft Skills and Personality Development	05 Hrs

Other Details:

Course Fees:

For General Candidates: Course fee is **Rs.9, 500/-(Including GST)**

For SC/ST Candidates

Tuition Fees are waived for eligible SC/ST students under the reservation policy (SC: 15%, ST: 7.5% of total seats). However they are required to remit an amount of **Rs.1, 000/-** as advance caution/security deposit. This amount will be considered as caution/security deposit and will be refunded after the completion of the course with no interest. If the student fails to complete the course successfully this amount along with any other caution/security deposits will be forfeited. Any other SC/ST candidates admitted over and above the reservation policy have to pay complete fee.

Registration Fee: (Non-refundable)

SC/ST: No registration fee

Others: **Rs.500/-.**

However the above registration fee shall be refunded on few special cases as given below

1. Course postponed and new date is not convenient for the student.
2. Course cancelled.

Course Fee Instalment Structure: Not applicable for this course

Eligibility

ITI or Diploma in following trades,

- ✓ Automobile
- ✓ Mechanical
- ✓ Electrical
- ✓ Instrumentation
- ✓ Electronics

Number of Seats: 25

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How to apply:

Candidates are advised to download the Registration from our website www.nielit.gov.in/chennai. After filling the form with all documents and fees, it can be submitted to NIELIT Chennai office in person or through post before staring of the course. Payment towards non-refundable Registration and Course fee can be paid through any one of the following modes:

- ✓ DD drawn from a nationalized bank (preferably SBI) in favour of "NIELIT Chennai" payable at Chennai.
- ✓ Online transaction: Account No: 32558810978 Branch: Kottur (Chennai), IFS Code: SBIN0001669.
- ✓ Pay through Nationalized Bank Debit Card (Service charges applicable)

Note: The Institute will not be responsible for any mistakes done by either the bank concerned or by the depositor while remitting the amount into our account.

Start Date of Registration: 03rd October, 2018

Last Date of Registration: 12th October, 2018

Selection of candidates: First Come First Serve basis

Admission Procedure:

All interested candidates are required to fill the Registration form with the fees (Registration and Course fees) before 12th October, 2018 with all the necessary following documents.

- Original and self-attested Copies of Proof of Age, Qualifications, etc.
- One passport size photograph.
- Self-attested copy of Govt. issued photo ID card.
- Self-attested copy of community certificate (if availing SC/ST fee concession)

Note: Working days are from Monday to Friday. Admission timings are from 9.30 am to 4.00 pm.

Discontinuing the course: No fees under any circumstances shall be refunded in case of a student discontinuing the course. No certificate shall be issued if discontinued.

Course Timings: 1:30 PM to 5:30 PM (Monday to Friday)

Location and how to reach: NIELIT Chennai is located at Gandhi Mandapam Raod, Kotturpuram, Chennai (Landmark: Opp. To Anna Centenary Library)

Address: National of Electronics and Information Technology
ISTE Complex, No. 25, Gandhi Mandapam Road, Chennai – 600025
E-mail: trng.chennai@nielit.gov.in/Phone: 044-24421445
Contact Person: Bharath.P, Mobile: 9940668667

Course enquiries: Students can enquire about the various courses either on telephone or by personal contact between 9.15 A.M. to 5.15 P.M. (Lunch time 1.00 pm to 1.30 pm) Monday to Friday.

Annexure

Detailed syllabus of the course

AE 201: Introduction to Automotive Systems and Technology

- Introduction to the various electronic systems that is used in most automotive vehicles.
- Electronic components found in transmission, steering, braking, emissions and entertainment systems.

AE 202: Introduction Automotive Engine System

Petrol Engine / Ignition Systems

• Design and function of various ignition systems
• Contact controlled ignition system
• Transistor controlled ignition system with induction sensor (TZ-I)
• Transistor controlled ignition system with Hall sensor (TZ-H)
• Semi and fully electronic ignition systems (EZ/VZ)
• Components of various ignition systems
• Design and function of spark plugs
• Effect of ignition firing angle on combustion
• Setting ignition firing angle and dwell angle
• Design and function of equipment to set angle by centrifugal force or vacuum
• Generation and distribution of high voltage
• Signal measurements over time from inductive and Hall sensors
• Measurement of the speed signal from an inductive sensor
• Measurements of ignition voltage signals over time
• Ignition parameters

Common Rail Diesel Injection System

• Requirements of diesel injection systems
• Design and operation of the common-rail system
• Fault localisation in a common-rail system
• Injection response of common-rail units
• Design and control of solenoid valve injector
• Design and control of piezo-injectors
• Design and operation of sensors and actuators
• Design and operation of high-pressure generating systems
• How high-pressure regulation works
• Pilot injection
• Main injection
• Post injection
• Regeneration of soot particle filter
• Zero fuel correction

AE 203: Automotive Electronics System

Fundamentals of electronics and AC-DC technology in Automotive

• Introduction to electrical engineering (current, voltage, electrical resistance). Use of Ohm's law
• Thorough understanding of different varieties of circuit, Voltage dividers
• Electrical resistors (Ohmic resistance, LDRs, thermistors), Potentiometers
• Capacitors • Coils and relays • Diodes (LEDs, Zener diodes, standard diodes)
• Complex components such as bipolar and unipolar transistors (field effect transistors)
• Temperature-dependent NTC (negative temperature coefficient) thermistors • Temperature-dependent PTC (positive temperature coefficient) thermistors

Semiconductor Electronics and Digital technology in Vehicles

• Introduction to common designs ad properties of diodes
• Identifying typical diode applications
• Determining the valve and rectifier actions of diodes
• Recording static and dynamic characteristics for various diodes
• Determining diode parameters by measurement
• Investigation of limiting circuits using Zener diodes (with and without load)
• Introduction to basic transistor circuits
• Design and investigation of a transistor switch
• Experiment to set the operating point of a transistor
• Measurement of gain and input/output resistances in common emitter and common collector circuits
• Investigating the effect of resistive and capacitive feedback in a common emitter circuit
• Introduction to basic logic circuits
• Introduction to truth tables and symbols, logic equations and timing diagrams for each of the basic gates
• Experimental derivation of Boolean functions and laws
• Design of basic logic circuits using NAND gates and NOR-gates
• Minimisation of logic circuits with the aid of Karnaugh maps with experimental testing
• Introduction to the principle of a flip-flop
• Investigating the operation of a JK flip flop by measurement (static and dynamic input signal/single pulse operation)
• Investigation of a counter circuit
• Fault simulation (16 simulated faults activated by relay)

Pulse-width Modulated Signals

• Principles of pulse-width modulation
• List use cases of PWM in automotive engineering
• Power matching with PWM
• Explain the difference between direct and pulsed current
• Measurement of PWM signal characteristics: frequency, amplitude, Pulse-width (duty cycle), edge
• Measurement of PWM signals
• Diagnosis of PWM-controlled components

AE 204: Automotive Electrical Systems

Fundamentals of Electricals in Vehicle

• Electrical Principles: • Voltage • Current • Resistance • Capacitance • Inductance
• Ohms law and DC, AC Power
• Series, parallel and mixed circuits
• Basic automotive circuits, wiring diagrams and electrical symbols
• Electrical components and its testing: Fuses • Relays • Switches • Transistors • Potentiometers
• DC motors • Power supplies
• Diagnosing of common automotive circuit failures and components with built in automatic fault switching in Open circuits, Short circuits and Faulty components.
• Testing and Measurement tools: Digital Multi meter • Voltmeter • Ohmmeter • Ammeter • Test light • Oscilloscope

Generator/Alternator
• Introduction to the basic terminology of magnetism/electro-magnetism
• Explaining the Lorentz force phenomenon
• Introduction to the design and function of single-phase and three-phase generators
• Experimental determination of phase-shift with a three-phase generator
• Determining the number of pole pairs of a three-phase generator by measurement
• Introduction to the principle of voltage regulation in vehicles
• Introduction to the design and function of electromagnetic and electronic voltage regulators
• Investigation of how alternator voltage depends on engine speed and load by measurement
• Measurement of threshold voltage and switching tolerance for a voltage regulator
• Fault simulation

Vehicle Energy Storage Systems (Battery System)
• Different types of Batteries • Principle of batteries • Battery rating
• Battery testing and • Battery charging • Safety when working with vehicle batteries
• Key parameters for vehicle batteries • Types of vehicle battery
• Fundamentals of electricity generation
• Chemical processes in lead-acid batteries • Charging • Discharging
• Vehicle maintenance – battery testing • Handling vehicle batteries
• Warning symbols on batteries
• Working rules and first-aid measures • Changing batteries
• Registering batteries with a control unit
• Care and maintenance • Testing battery charge level • Initial filling
• Storage • Disposal
• Measurements on batteries • Investigation of battery voltage
• Investigation of whether a battery is able to start the vehicle
• How to use a battery testing device using tester equipment
• Troubleshooting a battery

Lighting Systems

- Use of circuit diagrams • Printable circuit diagram for the entire lighting system
- Use of workshop order contracts • Conventional switching and CAN-based control
- Comprehensive handling of lighting equipment
- Dipped headlights
- Headlights, Fog lamps
- Daytime running lights, Parking lights, Sidelights, Brake lights, Rear lights
- Rear fog lamps, Reversing lights, Indicators
- Licence plate illumination, Interior lights
- Trailer lighting • Headlight configuration
- Horn and light flashing system
- Troubleshooting (circuit diagram)
- Main headlight unit with side light, headlight range control & indicator
- Main headlight unit with side light, headlight range control & indicator (right)
- Tail light unit with LED rear light (left) Tail light unit with LED rear light (right)
- Switch unit for headlights and indicators, range control, brake light switch
- Relay unit 1, headlights with indicator relay, relay
- Warning lights and fuse box, Auxiliary Lighting, Auxiliary lamp
- Rear fog lamp, Reversing lamp, Interior lighting, Extra brake light
- Standard & power horn

AE 205: Automotive Sensors, Testing & Measurement techniques:

• Real automotive sensors: inductive rpm sensor, phase sensor, throttle-valve switch, MAP sensor, knock sensor, NTC and PTC temperature sensors that can be heated, operational model of an intake duct with throttle valve, fan, throttle-valve potentiometer and air-flow meter
• How engine management sensors work • Where to find sensors on automobiles
• Engine management functions
• How to read circuit and wiring diagrams
• Establishing and testing sensor wiring connections
• Sensor performance checks • Troubleshooting and fault finding
• Using workshop tools to test vehicle components
• Instrumentation and process control technology • Physical variables to be measured
• Induction to: • Hall Effect • Piezo effect • Semiconductors • Absolute and relative pressure
• Inductive rpm sensors • Hall-type speed sensors
• Throttle-valve position measurement with throttle valve switch
• Throttle-valve position measurement with throttle valve potentiometer
• Air-flow measurement with hot-wire and hot film sensors
• Pressure measurement in the intake duct
• Detecting ignition timing with knock sensor
• Temperature measurement with NTC and PTC temperature sensor technology
• Fault simulation

AE 206: Automotive On-board diagnostics (OBD)

- What is OBD? • Requirements concerning OBD II and EOBD
- Differences from OBD I • Differences between OBD II and EOBD
- Fault display • Driving cycle • Diagnostics interface • Protocols
- Fault codes
- Readiness code
- Summary of EOBD • OBD knowledge test • Diagnostic unit
- Functions of a diagnostic unit
- Diamex operation • Diamex operation – part 2 • Launch CRecoder
- Simulator tests • Reading out actual values • Reading out fault codes
- Freeze frames (fault environment)
- Clearing the fault memory
- Data signals
- CAN bus terminating resistors
- Fault diagnosis
- Workshop job
- Job worksheet
- Fault diagnosis with an optional ADT
- Air-flow meter malfunction
- Injection valve malfunction
- Tests on an automobile and Reading out actual values

AE 207: Soft Skills and Personality Development

- Speaking & Presentation Skills, Self-Analysis, Creativity, Attitude, Motivation Goal Setting