INTERNSHIP TRAINING REPORT

TO

Delphi TVS Technologies, Mannur

(09/06/2025 - 20/06/2025)

BY

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FROM

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Delphi TVS:

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all those who supported and guided me during my internship at Delphi TVS Technologies, Mannur.

First and foremost, I am deeply thankful to Mr. Mohan, Ms. Priyanka, Ms. Krithika, Ms. Madhangee, Ms. Lavanya, Mr. Suriya and Mr. AVS my internship supervisor at Delphi TVS Technologies for their valuable guidance, encouragement, and continuous support throughout the internship period. Their insights and mentorship greatly enhanced my learning and practical understanding of concepts related to Electrical, Electronic and Mechanical fields.

I would also like to extend my appreciation to the entire team at Delphi TVS Technologies for creating a welcoming and professional environment. Their collaboration and feedback played a vital role in my learning and growth.

My heartfelt thanks to Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam, Dr. V. Rajini (HOD of EEE Dept.), Dr. V. Kamaraj (Internship Incharge) for providing me with this valuable opportunity and for their academic support during this period.

This internship has been a significant step in my professional development, and I am truly grateful for the experience.

ELECTRONIC COMPONENTS

- We studied and analysed the working of basic electronic components such as resistors, capacitors, inductors, diodes, transistors, and LEDs.

- The multi ohm-meter is used to measure very low resistance values, which is important in analysing connections, tracks, and certain components accurately.

- We became familiar with **surface-mounted devices (SMDs)**, which are compact electronic components directly mounted onto the surface of printed circuit boards (PCBs).

- We observed two types of capacitors: **disc capacitors**, which are non- polarized and used in general purpose applications, and **electrolytic capacitors**, which are polarized and used where higher capacitance values are required.

- **Oscillators**:
  Generate periodic waveforms such as sine, square, or triangular signals, essential for clocking and signal generation in circuits. On the other hand, **amplifiers** boost signal strength and are widely used in audio and communication systems.

- **Adders:**
  We learned about **adders**, which are fundamental digital circuits used in arithmetic operations. Adders are crucial components in microprocessors and digital computing for performing binary addition.

- **Integrated Circuits (ICs):**
  We analysed the importance of integrated circuits (ICs), which are compact packages containing multiple electronic components like transistors, resistors, and capacitors embedded in a single chip.

- **555 Timer:**
  We studied the **555 timer IC** which has major modes of operation: monostable (one-shot pulse generation), bistable (toggle switch-like function), and astable (free-running oscillator). These modes enable the 555 timer to be used in various timing, delay, and pulse-width modulation applications.

- **Oscilloscopes:**

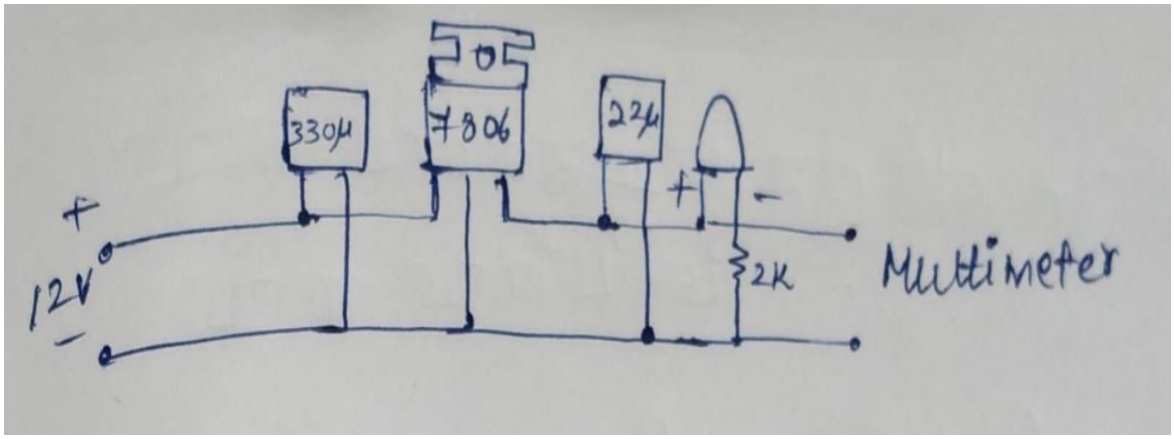
  The different types of oscilloscopes including the **Cathode Ray** Oscilloscope (CRO), Digital Storage Oscilloscope (DSO), and **Mixed Signal DSO**. These devices allow us to visualize and analyse signal waveforms, check timing, and detect faults in electronic circuits.

- **Soldering Station:**

  We used a **soldering station** equipped with a hot air gun and interchangeable nozzles of various shapes. These are selected depending on the type of electronic component and the number of terminals.

EXPERIMENT ON VOLTAGE REGULATOR USING INTEGRATED CIRCUITS:

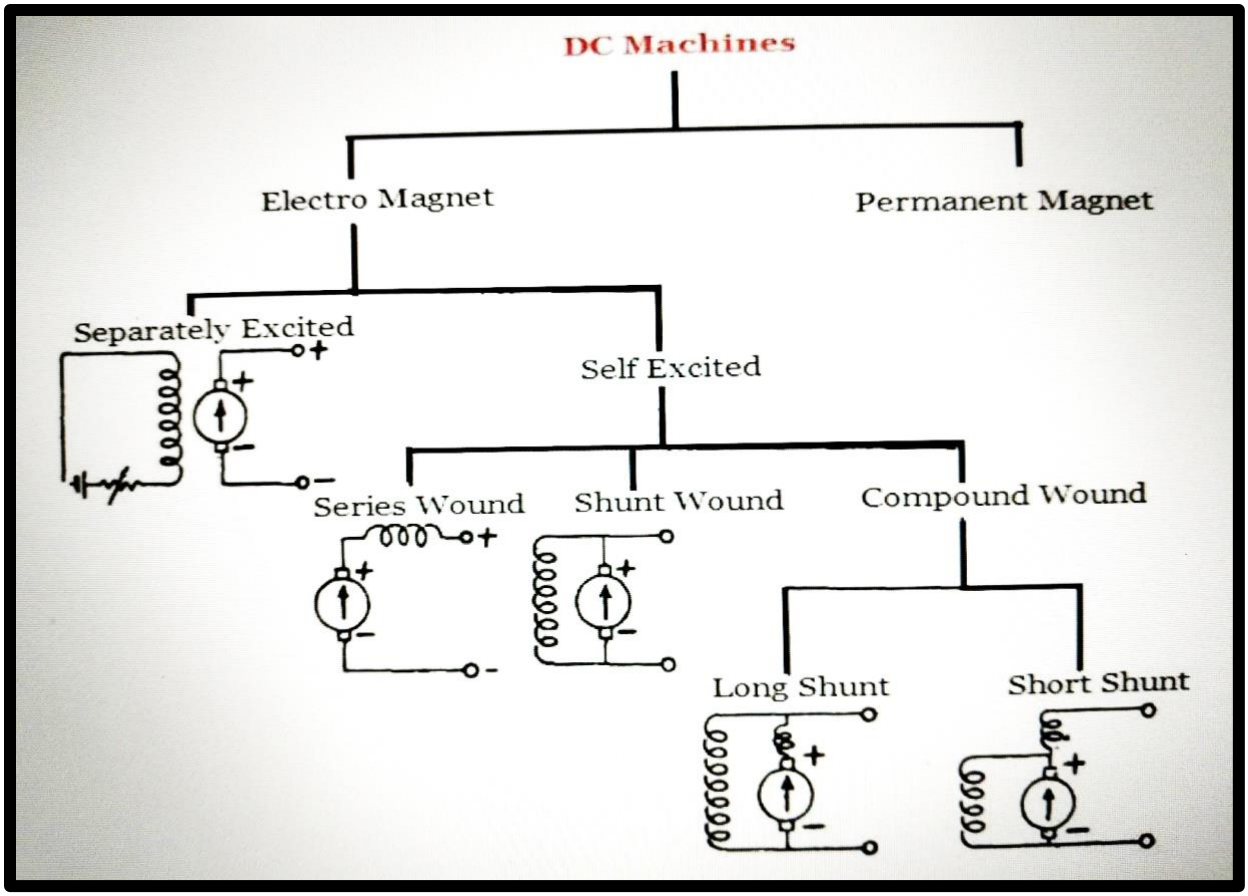
- Materials used: 7806 IC, 330 µF (25V), 22 µF (50V), LED, Multimeter, 12V RPS, Resistor (2kΩ).



DC Machines

Key points on DC Machines are listed as follows:

- DC motors - electrical to mechanical
- DC generators - mechanical to electrical
- EMI, inductive coil, Faraday's law
- Back emf (Eb) - NΦPZ/60A
- $V=I_aR_a+E_b$



Arduino Programming

We learned to use important Arduino functions such as pinMode(), which sets a pin as input or output, and digitalWrite() or analogWrite(), which are used to send signals to output devices like LEDs. Additionally, we used digitalRead() and analogRead() to receive input signals from sensors or other devices.

Blink Experiment:

We conducted a basic Blink experiment using an Arduino board, an LED, and a 330-ohm resistor. In this setup, the LED was programmed to turn on for one second and then turn off for one second repeatedly, creating a blinking effect. This helped us understand the use of pinMode() and digitalWrite() functions.

Blink Experiment Using 3 LEDs:

We extended the Blink experiment by using three LEDs, three resistors, and a potentiometer. Each LED was programmed to turn on sequentially with a fading effect—when the first LED faded after two seconds, the second LED began to glow, followed by the third. This experiment demonstrated timing control and analog signal output using analogWrite().

Solenoid Designed to achieve system requirements:

Calculations were done from the given data on how precisely each quantity should be used. The quantities measured are magnetic field, magnetic flux, area of solenoid coil and magnetic force.

PEMD- Product External Mechanisation Document

It's all about the pin configurations in an ecu connector to system from PCB it has two divisions i.e. engine and vehicle side or (A and B side) that has 105 and 91 pins respectively.

CRD- Customer Required Documents

CRD includes customer requirement details.

Engine Test Bed:

An engine test bed is a specialised laboratory setup where engines are tested outside the vehicle under controlled conditions. It allows engineers to study engine performances, efficiency, emissions and durability without installing the engine in an actual vehicle.
There are 5 major connections given outside to control the engine and machine parts from outside. Those are - Cam, crank, pedal, ignition switch, and ECU.

Few equipment that are used in engine test bed area are:

1. **Starter**: The starter is responsible for spinning the crank wheel to initiate the engine's operation. During this process, it facilitates the combustion cycle by processing the fuel and initiating ignition. The fuel is directed to a common rail system, from which it is evenly distributed to the four cylinders. Each cylinder receives an equal quantity of fuel through its injector.
2. **Alternator**: Once the crank wheel begins to spin, mechanical energy is generated. The alternator, acting as a generator, converts this mechanical energy into electrical energy. This electrical power is then supplied to the shaft to support further engine functions.
3. **Motors**: The system uses both single-phase motors (which require a phase and neutral connection) and three-phase motors, depending on the specific application and power requirements.
4. **Dynamometer**: The dynamometer is used to simulate speed and load (torque), functioning similarly to a motor. It plays a crucial role in testing the engine's performance under various conditions.
5. **Boom Box**: The boom box is a central measuring unit that captures and records various parameters of the engine. It is connected to external software for real-time monitoring and data analysis. All signals and measurements from the engine are

typically in millivolts.

6. **Smoke Meter**: The smoke meter measures the amount of smoke emitted from the engine. It does this by punching smoke imprints in a circular shape onto paper. Infrared light is then passed through these imprints; any darkness caused by smoke particles blocks the light path, allowing the device to measure smoke density and levels accurately.
7. **Fuel Meter**: The fuel meter is responsible for measuring and regulating the quantity of fuel being delivered to the engine, ensuring optimal fuel efficiency and combustion.
8. **Feed Pump**: After fuel passes through the fuel meter, it reaches the feed pump, which requires a 12V power supply to function. The feed pump then sends the fuel toward the injectors.
9. **Wiring Harness**: The wiring harness forms the electrical connection network. It links various components to the Engine Control Unit (ECU) and ultimately connects to the boom box to enable measurement and control.
10. **ECU (Engine Control Unit)**: The ECU is the central controller of the entire system. It manages and regulates all components within the engine and vehicle. The ECU receives its power from an SMPS (Switched Mode Power Supply), which converts AC to 32V DC. Additionally, 12V from the SMPS is supplied to a relay, which is used to start the engin

CIRCUIT THEOREMS

There are 4 circuit theorems to solve circuits easily;

1. Superposition Theorem
2. Thevenin's Theorem
3. Norton's Theorem
4. Power Transfer Theorem

WORKING PRINCIPLE OF AN ENGINE:

- Mechanics work in the mechanism of **combustion** to produce motion or mechanical work. Combustion is the process which occurs when air and fuel are react together.
- First air and the fuel are allowed to pass into the cylinder like material inside this there is a piston so the movement of the piston Is done after this following steps.
- The stator motor spins the crankshaft and the crankshaft moves the piston.
- After combustion starts, **combustion forces** push the pistons, and the pistons now drive the **crankshaft** so this how a piston moves.
- After this **the piston first takes in fuel and air (going down), then compresses it (going up), combustion happens and pushes the piston down, then it moves up again to remove the burnt gases and the burnt are taken out by using exhaust valve so that a new air can get inside.**

So basically, the engine is classified into these following types:

- Petrol
- Diesel

PETROL:

More volatile and for petrol so a spark is need and it doesn't ignite just by compression**. "THE SURROUNDING HIGH TEMPERATURE WILL NOT CAUSE THE FIRE".** so, a fire or spark must be given then only combustion process will cause the fuel to burn

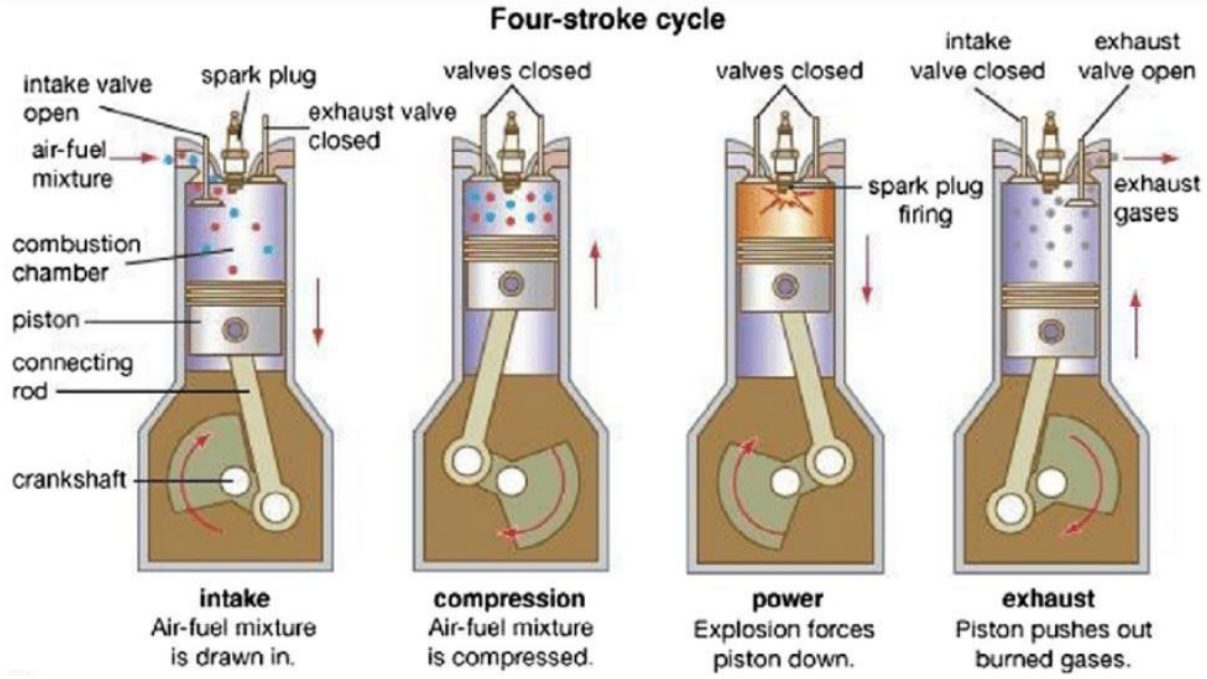
DIESEL:

Diesel has more density and lower volatile in case of diesel you don't need spark the high temperature around the surrounding will itself case it to burn "IN **DIESEL THERE IS NO NEED FOR SPARK".**

Why do we prefer petrol engine instead of diesel?

In earlier day's we were using both the engine but now the usage of petrol

engine is more while comparing to diesel engine the main reason of this is as day passes there is more production of smokes so now the companies are reducing it by making some changes in the engine so currently BH6 engines are design and some companies are trying to make BH7 engines so this type of changes are made in petrol engines not in diesel so this is the main reason for many companies to make petrol engine instead of diesel.



From the above figure we can know that the Working of 4 stroke engine is based on intaking fuel, compressing it, combustion the fuel (producing power, and sending that power to move a vehicle or machine) and the last one is exhaust.

This is done in a cyclical process using several moving parts like pistons, crankshaft, valves, etc.

- **Intake:**

  The intake is the first process of four stoke cycle in this first the inlet value is opened in the top so the opening of this inlet valve will allow the passage of air and fuel inside the chamber and a piston is found inside the chamber which is move by a crankshaft and the crankshaft is spin by a starter motor

  “PURPOSE: FILL THE CYLINDER WITH FUEL-AIR MIXTURE”

- **Compression:**
  The chamber is filled by air and fuel in the intake process so the work of this compression process is to move the piston up so that the air and the fuel will compression so due to this combustion reaction will take place and, in this case, both the valves are closed

“PURPOSE: MAKE THE FUEL-AIR MIX MORE EXPLOSIVE FOR BETTER POWER”

- **Power Stroke (Combustion Stroke):**

  From the name itself we can know that in the cycle only combustion reaction takes place (Air+Fuel). The combustion act in two different cases for two engines for petrol engine the Spark plug ignites and for diesel engine as it has a high pressure self- ignites take place this explosion force will make the piston to move downwards

“PURPOSE: THIS IS WHERE ACTUAL POWER IS GENERATED”

- **Exhaust Stroke:**
  During the combustion process air and fuel burns and contain some left over particle they are sent outside of this chamber through the exhaust valve

“PURPOSE: CLEAR THE CYLINDER FOR THE NEXT CYCLE”

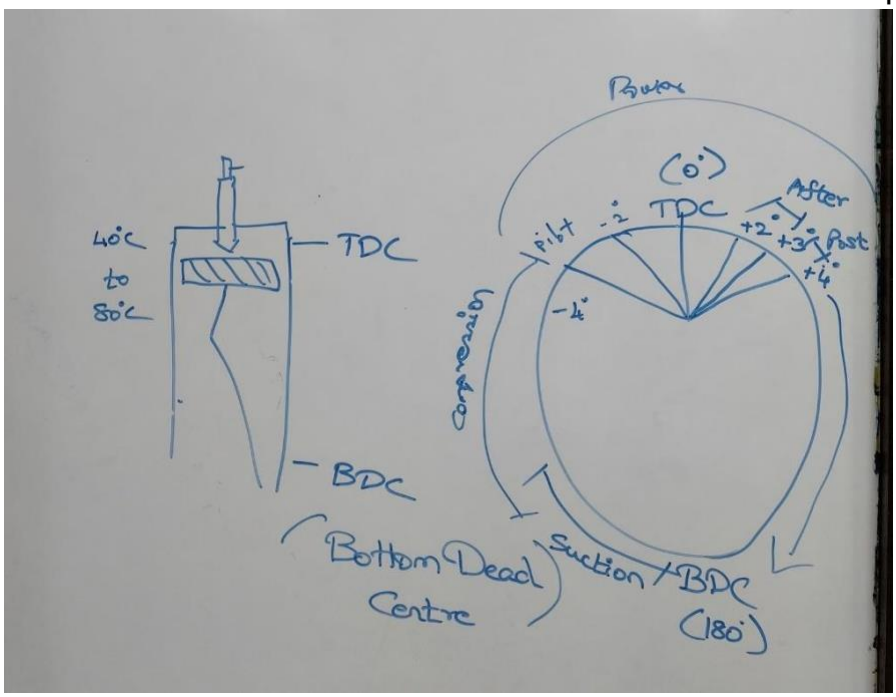
In this the working of the injection also plays a crucial role. In this, let us see what are the injection process that are involved in the injector. It is broadly classified into four types

- Pilot injection
- main injection
- after injection
- post injection

  let us see what are does the above injection process means:

- **Pilot** - It injects a small quantity of fuel slightly before the main injection. This small combustion event raises the in-cylinder temperature and pressure.
- **Main** - Delivers the bulk of the fuel needed for the power stroke and it occurs near TDC (top dead centre).

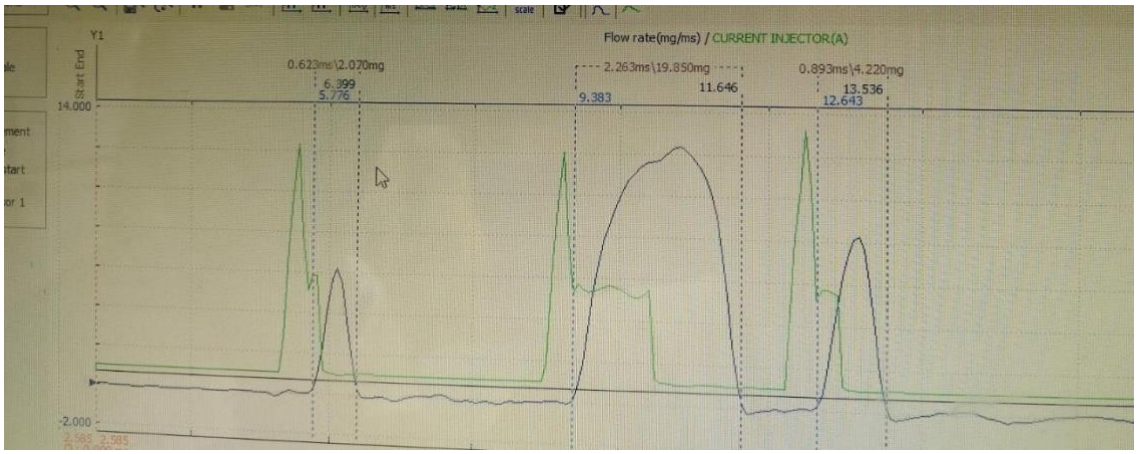
- **After and Post injection** - burns away the NO_X AND SO_X which are left over in the above two process.



From the above figure:

The fuel enters through the chamber from the injector in the nozzle and after that the air is enter inside through a process called Suction and then the piston moves upward and compress the air and the fuel and after this four Types of injection process take place according to time intervals and temperature. Injector sprays the fuel by pilot injection when the temperature is at 40-to-80-degree Celsius and Main injection is the one in which the actual combustion of fuel takes place in a large quantity and at a higher temperature. The left-out impurities such as NO_X and SO_X burn in the after injection and post injection and after these injections, the burnt gas enters the exhaust pipe there they are allowed to pass through a mixture of urea + water which converts these gases as carbon di-oxide and water.

This is a graph for relation of various injection:



From the above graph:

- **Hydraulic separation** - gap between 2 fuelling injections.
- Blue colour – shows the fuel flow to the injector
- **Electrical separation** - gap between 2 electrical quantities
- Green colour - shows the current flow to the injector.