SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19OE120 AUTOMOTIVE ELECTRONICS I YEAR /I SEMESTER

MECHATRONICS ENGINEERING

Unit 2 – Sensors & Actuators

❖ Syllabus:

- Working principle of sensors, Types of sensors, Airflow rate sensor, Position sensor, Throttle angle sensor, Temperature sensor, MAP sensors, Knock/Detonation Sensor, Load cell, Lambda Sensor(Exhaust gas O2 Sensor), yaw rate sensor, sensor feedback control, Electronic Control Unit (ECU), Principle of actuator, Types of actuators, engine control actuators, Solenoid actuators, motorized actuators (Stepper motors).

❖ Actuators:

- Actuators are the devices, such as fuel injectors, ignition coils, ABS modulators etc., that are operated by outputs from the ECM.
- Actuators normally rely on one of two electrical devices for their operation; they are either operated by **a solenoid or by an electric motor.**
- Solenoid-operated actuators are normally controlled in one of two ways. One is the duty cycle method, where the solenoid is switched on for a percentage of the time available, e.g. 20 or 80%.
- This means that pulses of varying width can be used to provide the desired result. The other method of solenoid control is known as pulse width modulation (PWM). Here the current is switched on and off at frequencies that change to suit operating requirements.

- Electric motors that are used in actuators may be stepper motors, or reversible permanent magnet d.c. motors.
- A stepper motor can be made to provide small movements of valves by pulsing the current supply.
- Some stepper motors rotate 7.5° per step, which means that a full rotation of the motor shaft takes 48 steps. A common form of stepper motor uses two sets of windings.
- Current in one set of windings drives the motor shaft forward and when this is switched off and current is applied to the other set of windings, the motor shaft rotates in the reverse direction.
- This means that accurate control over the position of a valve can be achieved because the control computer determines the valve position by counting the number of pulses applied to the stepper motor windings.