

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**DIPLOMA IN POWER ELECTRONICS**  
**SEMESTER: V**

Subject Name: **Control System**

Sr. No.	Course Content
1.	<p><b>Control Systems:</b></p> <ul style="list-style-type: none"> <li>• <b>Control system:</b> Role of control system in engineering, Definition,</li> <li>• Open loop control system, definition block diagram examples,</li> <li>• Closed loop control system, definition, block diagram examples, Comparison between open loop and closed loop control systems.</li> <li>• <b>Servomechanism</b> : definition, Speed control of motor circuit as servomechanism</li> <li>• Temperature control system as feedback control, Regulator as feedback control – definition, Voltage control of generator as example of regulator.</li> <li>• Applications of control system, Automatic machine tool control, Anti - Aircraft radar tracking system.</li> </ul>
2.	<p><b>Transfer Function:</b></p> <ul style="list-style-type: none"> <li>• Definition of Laplace transform, its advantages.</li> <li>• <b>Transfer Function:</b> Definition, Transfer function of electrical networks, Transfer function of R-C Network, R-C-R-C Network, R-L-C Network, Transfer function of a single transistor amplifier circuit, Transfer function of open loop control system and closed loop control system.</li> </ul>
3.	<p><b>Specifications of Systems and Time Response Analysis:</b></p> <ul style="list-style-type: none"> <li>• <b>Various test signals used in control system:</b> Step signal, Ramp signal, Parabolic signal, Impulse signal</li> <li>• Laplace transform and time response of test signals</li> <li>• Time domain specification – introduction, First order system and second order system, Step response of first order system, Step response of second order system, Definitions of second order system</li> <li>• Damping ratio, Damping constant, Undamped natural frequency.</li> </ul>
4.	<p><b>System Stability:</b></p> <ul style="list-style-type: none"> <li>• <b>Stability:</b> Need of stability in control system, Definition, Absolute and relative stability, Necessary conditions for stability.</li> </ul>
5.	<p><b>Control Components:</b></p> <ul style="list-style-type: none"> <li>• <b>Potentiometers:</b> Principle of potentiometer as error detector, Types of potentiometer, Linear potentiometer, Rotary movement potentiometer, Characteristics, Limitation of potentiometer</li> <li>• <b>Synchros:</b> Principle, Types of synchros, Construction, operation and working principles of Synchro transmitter, Synchro receiver, Synchro control transformer, Synchro differential transformer.</li> </ul>

	<ul style="list-style-type: none"> <li>• Synchro indicator system, Synchro error detector system, Applications of synchro</li> <li>• <b>Servo amplifier:</b> Special features of servo amplifier, Electronics amplifier, comparison</li> <li>• <b>Servo Motor:</b> Construction operation and characteristics of DC Servomotor, AC servomotor, two phase AC motor as AC servomotor, Comparison between AC servomotor and DC servomotor, Applications of servomotor</li> <li>• <b>Tachometers:</b> Characteristics of good tachometer, Construction and operation of AC tachometer, Application of tachometers</li> <li>• AC position control system: Its working / block diagram and working principle</li> <li>• DC position control system: Its circuit / block diagram and working principle</li> </ul>
6.	<p><b>Types of Modern Control System:</b></p> <ul style="list-style-type: none"> <li>• <b>Proportion control system:</b> Its introduction, working principle with example</li> <li>• <b>Integral control system:</b> Its introduction working principle and example</li> <li>• <b>Derivative control system:</b> Its introduction working principle and example</li> <li>• Proportional plus integral system</li> <li>• Proportional plus derivative system</li> <li>• Proportional plus integral plus derivative system with working principle and circuit Diagram.</li> <li>• Effect of proportional, integral and derivative control action on system performance</li> </ul>

### Reference Books:

1. Modern control engineering, PHI, K.Ogata.
2. Control system engineering, NEW AGE, J. J. Magrath, M.Gopal.
3. Control Engineering, PHI, M. N. Bandopadhyay.
4. Control system analysis and design, KHANNA, K.K.Agrawal.