GUJARAT TECHNOLOGICAL UNIVERSITY

Mechanical Engineering

B. E. SEMESTER: VI

Subject Name: **Control Engineering**
Subject Code: **161905**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
3	0	0	3	70	30	50

Sr. No.	Course Content	Total Hours
1.	**BASIC CONTROL SYSTEM:** System differential equation of electrical, mechanical, thermal, hydraulic and electromechanical network, analogy	03
2.	**THEORY OF AUTOMATIC CONTROL:** Concept of feedback referred to linear control systems in general, e.g. displacement and speed control, process control, definition and terminology, open loop and closed loop systems and its advantages,	04
	2.1 Block diagrams and single flow graph representation of a physical system, block diagram algebra, transfer function from a block diagram. Basic control actions and controllers – on – off. Proportional, derivative and integral controllers, steady – state analysis,.	04
	2.2 Transient response of first order and second order systems to step, ramp and sinusoidal input, steady state errors, Applications of Laplace transform methods, Reuth's stability criteria and root locus methods improving system performance	05
3.	**3. HYDRAULIC SYSTEM:** Characteristic of hydraulic components control valves, sources of hydraulic power hydraulic meters, pistons and transmission, elements of circuit design, Accumulation control circuit such as position control and speed control circuit.	04
	3.1 Hydraulic Systems: Reciprocating Pump, pressure intensifier, cranes, ram, press, lift, coupling and hydraulic controls. Maintenance of hydraulic system: Fire Foam resistance oxidation and corrosion of hydraulic pipe sealing devices, Filters regulator, problems caused by gas in hydraulic circuit cooling of power pack	04

4.	**PNEUMATIC SYSTEMS:** Pneumatic power supply, Amplifiers with different controlling actions, Pneumatic valves and cylinders, theory of four way and pilot valves.	04
5.	**ELECTRICAL SYSTEMS:** Speed control of D.C. motors, Remote center positional serve mechanism (including effect of gearing between motor and load).	04
6.	**MICROPROCESSOR BASED DIGITAL CONTROL:** State space analysis optional and adaptive control systems – Industrial logic control system - programmable logic controller and its applications.	03
7.	**FUZZY LOGIC**: Concept of fuggy logic, basic notions, linguistic variables of fuggy control comparison of design methodology, examples and case study	03
	7.1 Control Systems for mechanical engineering systems like thermal power plants ,boiler, refrigeration plants , central air-conditioning plants and automobiles.	03
8.	**CONTROL COMPONENTS:** Pneumatic relays, control mechanisms for liquid level, boiler feed control, pressure regulation, throttle valve, temperature regulations and industrial process regulation.	04

Text Books:

1. Modern Control Engineering, By Ogata K, Pearson Education
2. Control Systems Engineering By Nagrath & Gopal, New Age International Publishers

Reference Books:

1. Automatic Control System By Kuo, Benjamin.C, Prentice Hall
2. Control Systems Engineering By Nise, Norman S John wiley & Sons, New York
3. Control Systems Engineering By S K Bhattacharya , Pearson Education
4. Control Engineering By D.Ganesh Rao, K. Chennavenkatesh Pearson Education