



# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India  
(Autonomous Institute Affiliated to University of Mumbai)

| Course Code | Course Name                       | Teaching Scheme (Hrs/week) |    |           | Credits Assigned |       |   |       |
|-------------|-----------------------------------|----------------------------|----|-----------|------------------|-------|---|-------|
|             |                                   | L                          | T  | P         | L                | T     | P | Total |
| ELL42       | Principles of Control Systems Lab | --                         | -- | 2         | --               | --    | 1 | 1     |
|             |                                   | Examination Scheme         |    |           |                  |       |   |       |
|             |                                   | ISE                        |    | ESE       |                  | Total |   |       |
|             |                                   |                            |    | Practical | Oral             |       |   |       |
|             |                                   | 40                         |    | --        | 20               | 60    |   |       |

| Pre-requisite Course Codes   |     | EL42 (Principles of Control Systems)  |
|--|-----|---|
| After successful completion of the course, student will be able to |     |   |
| Course Outcomes  | CO1 | Examine working principle and application of given control system components.                                   |
|  | CO2 | Develop a program using suitable programming language for time and frequency domain analysis of a given system. |
|  | CO3 | Demonstrate the dynamic behavior of the system in time domain and frequency domain.                             |
|  | CO4 | Experiment the effect of compensator on the performance of control system.                                      |
|  | CO5 | Identify and demonstrate any control system for real life application.  |

| Exp. No. | Experiment Details   | Ref. | Marks |
|----------|--|------|-------|
| 1        | To plot Synchro characteristics and Synchro transmitter-receiver as an error detector.   | 1    | 5     |
| 2        | To plot Speed torque characteristic of DC servo motor.   | 1    | 5     |
| 3        | To plot characteristics of Potentiometer and its loading effect for different conditions of load.  | 1    | 5     |
| 4        | To determine the line and load regulation characteristics of AC servo voltage stabilizer at different line and load conditions and observe the mechanism of AC voltage stabilization as an example of closed control system.                                   | 1    | 5     |
| 5        | Using Linear System I Trainer Kit obtain the frequency response of first order and second order system.  | 1    | 5     |
| 6        | Using Linear System II Trainer Kit obtain the time response of closed loop RLC circuit with integrator circuit and study the effect of Lead, Lag Compensator on its time response. Compare these results with mathematical expressions derived for the system. | 1    | 5     |



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|                    |   |         |           |
|--------------------|---|---------|-----------|
| 7                  | <p>a) Develop a program to define the given closed loop transfer function of system and plot their poles &amp; zeros on s-plane.</p> <p>b) Develop a program to find the step response of a given second order control system and obtain its time domain parameters from this step response. Compare these results with mathematical calculations.</p> <p>c) Develop a program for a given control system described by its state space equation to find solution in terms of state transition matrix, zero input response, zero state response, complete response.</p> <p>d) Develop a program for a given control system described by its state space equation to find system is controllable or not, observable or not, to find rank of matrix and using rank comment on system controllability and observability</p> <p>e) Develop a program to obtain the root locus of a system described by its Transfer Function with unity feedback, Comment on the stability of this given control system. Compare these results with mathematical calculations.</p> <p>f) Develop a program to find gain margin and phase margin of the system described by its Transfer Function with unity feedback. Comment on the stability of this given control system. Compare these results with mathematical calculations.</p> | 2,3,4   | 5         |
| 8                  | <b>Mini-Project:</b> Identify the model of control system for real life application and demonstrate controlling action for the same. Use appropriate software platform.   | 1,2,3,4 | 5         |
| <b>Total Marks</b> |   |         | <b>40</b> |

## References:

- [1] Lab manuals
- [2] [www.mathworks.com](http://www.mathworks.com)
- [3] [www.scilab.org](http://www.scilab.org)
- [4] [www.ni.com/labview](http://www.ni.com/labview)