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| 1. | Title of the course | Linear Dynamical Systems |
| 2. | Course number | EE503L |
| 3. | Structure of credits | 3-0-0-3 |
| 4. | Offered to | PG |
| 5. | New course/modification to | Modification To EE5102/2 |
| 6. | To be offered by | Department of Electrical Engineering |
| 7. | To take effect from | July 2022 |
| 8. | Prerequisite | Control Engineering and Engineering Mathematics |
| 9. | Course Objective(s): The aim of this course is to introduce state-space techniques for analysis of linear system models. This course forms the prerequisite for all advanced control courses. | |
| 10. | Course Content: Models of physical systems;Equilibrium/operating points, Jacobian linearization; Relative degree, diffeomorphism, input/output linearization of nonlinear systems; Minimal realization, Smith-McMillan form; Continuous-time linear timevarying/time-invariant (LTV/LTI) state-space models, Peono-Baker series, matrix exponentials, similarity transformations, Jordan normal form, algebraic and geometric multiplicity, minimal polynomial; Reachable and controllable subspaces,Controllability and observability Gramians, Kalman and Popov-Belevitch-Hautus(PBH) test for controllability and observability, Controllable and observable canonical forms; Stabilizability and detectability, Kalman canonical decomposition, Review of matrix theory--matrix norms, positive/negative definiteness ; Lyapunov stability, Lyapunov equation, Eigenvalue conditions for Lyapunov stability,Separation principle, pole-placement and observer design; Linear optimal control techniques, Linear quadratic regulator (LQR), the algebraic Riccati equation. | |
| 11. | Textbook(s): 1. Joao P H, <i>Linear Systems Theory</i> , Princeton University, PressNew Jersey (2009). | |
| 12. | Reference(s): 1. Chen C T, <i>Linear System Theory and Design</i> , 3rd Edition, Oxford University Press (2009). 2. Brockett R W, <i>Finite Dimensional Linear Systems</i> , John Wiley and Sons, New York (1970). 3. Panos J A and Anthony N M, <i>Linear Systems</i> , Birkhauser, New York, 1997. | |