**19EE3103-LINEAR CONTROL SYSTEMS**

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| **Course category:** | | Program core | | **Credits:** | 3 |
| **Course Type:** | | Theory | | **Lecture - Tutorial - Practical:** | 3 - 0- 0 |
| **Prerequisite:** | | Basic knowledge of differentiation, integration and Laplace transform techniques. | | **Sessional Evaluation :**  **External Evaluation:**  **Total Marks:** | 40  60  100 |
| **Course**  **Objectives** | Students undergoing this course are expected to understand: | | | | |
| 1. The various types of control systems and methods to obtain transfer  function.  2. The mathematical models of physical systems.  3. The time domain responses of first and second-order systems for  different input signals.  4. The stability of a control system using different techniques.  5. The frequency domain techniques to assess the system performance.  6. The different types of compensators for linear systems. | | | | |
| **Course Outcomes** | Upon successful completion of the course , the students will be able to: | | | | |
| CO1 | | Understand the various types of control systems and methods to obtain transfer function. | | |
| CO2 | | Develop mathematical models of physical systems. | | |
| CO3 | | Determine the time domain responses of first and second-order systems for different input signals. | | |
| CO4 | | Evaluatethe stability of a control system using different techniques. | | |
| CO5 | | Apply frequency domain techniques to assess the system performance. | | |
| CO6 | | Design the different types of compensators for linear systems. | | |
| **Course**  **Content**  **Course**  **Content** | **UNIT –I**  **INTRODUCTION TO CLASSICAL CONTROL SYSTEMS:** Open loop and closed loop control systems - types of feedback- feedback and its effects- transfer functions- block diagrams and their reduction- signal flow graphs- mason’s gain formula.  **UNIT-II**  **MATHEMATICAL MODELING OF PHYSICAL SYSTEMS:** Mathematical modeling and transfer functions of electrical, mechanical and electro-mechanical elements - DC servo motors- two-phase AC servo motors - synchros.  **UNIT-III**  **TIME DOMAIN ANALYSIS:**  Introduction, standard test signals- time response specifications-steady state error constants.  **UNIT-IV**  **STABILITY OF CONTROL SYSTEMS:** Routh-Hurwitz criterion- root locus- rules for the construction of root loci- introduction to proportional- derivative and integral controllers.  **UNIT-V**  **FREQUENCY DOMAIN ANALYSIS:** Introduction- frequency domain specifications- polar plots- bode plots- Nyquist stability criterion.  **UNIT-VI**  **DESIGN OFCOMPENSATORS:** Introduction- need for compensators- lag and lead compensators design in frequency domain. | | | | |
| **Text Books**  **and**  **Reference Books** | **Text books:**  1. “Control system engineering”, by I.J.Nagrath and M.Gopal, 6th Edition, New age International (P) Ltd.  2. “Control systems”, by A.Nagoorkani, 2nd Edition, RBA publishers.  3. “Control systems”, by A.Anandkumar, 2nd Edition, PHI publishers.  **Reference books:**  1. “Automatic control systems”, by B.C.Kuo, 7thEdition, PHI publishers.  2. “Discrete time control systems”, by K.Ogata, PHI Publishers.  3. “Control systems engineering”, by Norman S Nise, Wiley, 2000. | | | | |
| **E-Resources** | <http://nptel.ac.in/courses>  <http://iete-elan.ac.in>  <http://freevideolectures.com/university/iitm> | | | | |

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| **Contribution of Course Outcomes towards achievement of Program Outcomes** | | | | | | | | | | | | | | |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 1 | 1 | - | - | - | - | - | - | 2 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 3 | 2 |
| CO6 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 3 | 2 |