**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:** | 4060100 |
| **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 |