# PANIPAT INSTITUTE OF ENGINEERING & TECHNOLOGY
## Department of Electronics & Communication Engineering

## LESSON PLAN

**Subject Name: -**   Control System Engineering      **Subject Code: - EC-302A**

**Year: -**   3$^{rd}$      **Semester: - 6$^{th}$**

| Lecture No | Unit No | Topic | References |
|---|---|---|---|
| L1 | 1 | Unit-1: Introduction: The control system-open loop & closed loop | Control System Engg.: I. J. Nagrath & M.Gopal |
| L2 | 1 | Transfer function, block diagram algebra | Control System Engg.: I. J. Nagrath & M.Gopal |
| L3 | 1 | Block diagram Reduction Rules | Control System Engg.: I. J. Nagrath & M.Gopal |
| L4 | 1 | Block Diagram Reduction Numerical | Control System Engg.: I. J. Nagrath & M.Gopal |
| L5 | 1 | signal flow-graphs, Mason's formula & its application | Control System Engg.: I. J. Nagrath & M.Gopal |
| L6 | 1 | Conversion of Block diagram to SFG. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L7 | 1 | Mathematical Models of Physical Systems | Control System Engg.: I. J. Nagrath & M.Gopal |
| L8 | 1 | Differential equation of physical systems, Transfer function | Control System Engg.: I. J. Nagrath & M.Gopal |
| L9 | 1 | Analogy System: Force voltage & Force Current Analogy | Control System Engg.: I. J. Nagrath & M.Gopal |

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| L10 | 1 | Feedback Characteristics of Control Systems: Feedback and Non-feedback systems | Control System, B.S.Manke, |
| L11 | 1 | Effects of feedback on sensitivity (to parameter variations), stability, overall gain etc. | Control System, B.S.Manke, |
| L12 | 1 | Unit 2: Time Response Analysis: Standard test signals. steady-state errors and error constants | Control System, B.S.Manke, |
| L13 | 1 | Numerical related to error constant. | Control System, B.S.Manke, |
| L14 | 1 | Stability: The concept of stability ,necessary conditions for stability, Hurwitz stability criterion | Control System, B.S.Manke, |
| L15 | 1 | Routh stability criterion, Relative stability analysis. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L16 | 1 | The Root Locus Technique: The Root locus concept | Control System Engg.: I. J. Nagrath & M.Gopal |
| L17 | 1 | Construction /development of root loci for various systems | Control System Engg.: I. J. Nagrath & M.Gopal |
| L18 | 2 | Numerical related to Root Locus. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L19 | 2 | Transient Response of First Order and Second Order System. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L20 | 2 | Design Specification of Second Order System. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L21 | 2 | Numerical Related to Peak Time,Rise Time,Settling | Control System Engg.: I. J. |

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| | | Time,Maximum Peak Overshoot. | Nagrath & M.Gopal |
| L22 | 2 | **Unit 3:** Frequency Response & Stability Analysis. Polar Plots Concept. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L23 | 2 | Calculation of Real and Imaginary Value and System Stability. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L24 | 2 | Calculation of Phase Margin and Gain Margin | Control System Engg.: I. J. Nagrath & M.Gopal |
| L25 | 2 | Nyquist Stability Criterion. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L26 | 2 | Numerical on Nyquist stability criterion | Control System Engg.: I. J. Nagrath & M.Gopal |
| L27 | 2 | Numerical Related to Nyquist Criterion | Control System Engg.: I. J. Nagrath & M.Gopal |
| L28 | 2 | Bode Plots : Magnitude Plot | Control System Engg.: I. J. Nagrath & M.Gopal |
| L29 | 3 | Bode Plots : Phase Plot | Control System Engg.: I. J. Nagrath & M.Gopal |
| L30 | 3 | Drawing of Bode Plot on Semilog Graph Paper. | Control System Engg.: I. J. Nagrath & M.Gopal |
| L31 | 3 | Calculation of Stability Using Bode Plot | Control System, B.S.Manke, |
| L32 | 3 | Correlation between time and frequency response | Control System, B.S.Manke, |
| L33 | 3 | Unit 4: Compensation of Control Systems: Necessity of compensation | Control System, B.S.Manke, |
| L34 | 3 | Phase lag compensation, phase lead compensation, | Control System, B.S.Manke, |

| | 3 | phase lag lead compensation, feedback ompensation | Control System, B.S.Manke, |
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| L35 | | | |
| L36 | 3 | State Variable Analysis: Concept of state,state variable and state model | Control System, B.S.Manke, |
| L37 | 3 | state models for linear continuous time systems, | Control System, B.S.Manke, |
| L38 | 4 | concept of controllability and observability | Control System, B.S.Manke, |
| L39 | 4 | Numerical on State space analysis. | Control System, B.S.Manke, |
| L40 | 4 | Revision | Control System Engg.: I. J. Nagrath & M.Gopal |

**Text Books:**

1 Control System Engg.: I. J. Nagrath & M.Gopal; New Age India.

**Reference Books:**

1. Control Systems: Principles & Designing: Madan Gopal; TMH.

2. Control System, B.S.Manke, Khanna Publication.

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