**Department of Electrical Engineering**

**BIT. Polytechnic, Balasore**

**LESSON PLAN FOR ACADEMIC SESSION - 2023-24**

**CONTROL SYSTEM ENGINEERING**

|  |  |
| --- | --- |
| **Course Code : Th.3** | **Semester : 6th**  |
| **Total Periods : 75(60+15) Periods**  | **Examination : 3 Hours**  |
| **Theory Periods : 4 P/Week**  | **Internal Assessment : 20 Marks** |
| **Tutorial : - 1 P/Week** | **End Semester Examination : 80 Marks** |
| **Maximum Marks : 100** |  |
| **Semester From Date : To Date :** |
| **Name of Teaching Faculty: Er. Sanjana jena** |

|  |  |  |
| --- | --- | --- |
|  WEEK |  PERIOD |  TOPIC |
|  1st | 1st | **FUNDAMENTAL OF CONTROL SYSTEM**  Classification of Control system Open loop system & Closed loop system and its comparison  |
| 2nd | Effects of Feed back  |
| 3rd | Standard test Signals(Step, Ramp, Parabolic, Impulse Functions)  |
| 4th | Servomechanism  |
|
|  2nd  | 1st | **MATHEMATICAL MODEL OF A SYSTEM** Transfer Function & Impulse response, Properties, Advantages & Disadvantages of Transfer Function  |
| 2nd | Poles & Zeroes of transfer Function  |
| 3rd | Simple problems of transfer function of network.  |
| 4th | Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)  |
|  3rd  | 1st | **CONTROL SYSTEM COMPONENTS** Components of Control System Gyroscope,  |
| 2nd | Synchros, Tachometer  |
| 3rd | DC servomotors  |
| 4th | Ac Servomotors  |
|  |  |
|  4th  | 1st | **BLOCK DIAGRAM ALGEBRA & SIGNAL FLOW GRAPHS** Definition: Basic Elements of Block Diagram  Canonical Form of Closed loop Systems  |
| 2nd | Rules for Block diagram reduction  |
| 3rd | Procedure for of Reduction of Block Diagram  |
| 4th | Simple Problem for equivalent transfer function  |
|  |  |
|  5th  | 1st | Basic Definition in Signal Flow Graph & properties  |
| 2nd | Construction of Signal Flow graph from Block diagram  |
| 3rd | Mason‘s Gain formula  |
| 4th | Simple problems in Signal flow graph for network  |
|  |  |
|  6th  | 1st | **TIME RESPONSE ANALYSIS.**  Time response of control system.Standard Test signal. Step signal,  |
| 2nd | Ramp Signal Parabolic Signal  Impulse Signal  |
| 3rd | Time Response of first order system with: Unit step response  Unit impulse response  |
| 4th | Time response of second order system to the unit step input. Time response specification. Derivation of expression for rise time  |
|  |  |
|  7th  | 1st | Derivation of expression for peak time, peak overshoot, settling time and steady state error |
| 2nd | Steady state error and error constants  |
| 3rd | Types of control system.[ Steady state errors in Type-0, Type-1]  |
| 4th | Steady state errors in Type-2 system] Effect of adding poles and zero to transfer function.  |
|  |  |
|  8th  | 1st | Response with P, PI controller  |
| 2nd | Response with PD and PID controller  |
| 3rd | **ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE.** Root locus concept  |
| 4th | Construction of root loci.  |
|  |  |
|  9th  | 1st | Construction of root loci..  |
| 2nd | Rules for construction of the root locus. |
| 3rd | Rules for construction of the root locus. |
| 4th | Problems related to Root Locus |
|  |  |
|  10th  | 1st | Problems related to Root Locus |
| 2nd | Effect of adding poles and zeros to G(s) and H(s). |
| 3rd | Problems related to Root Locus |
| 4th | Problems related to Root Locus |
|  |  |
|  11th  | 1st | **FREQUENCY RESPONSE ANALYSIS.** Correlation between time response and frequency response  |
| 2nd | Polar plots.  |
| 3rd | Problems related to Polar plots. |
| 4th | Bode plots.  |
|  12th  | 1st | Problems related to Bode plots |
|  | 2nd | All pass and minimum phase system.  |
| 3rd | Computation of Gain margin and phase margin.  |
| 4th |  Problems related to computation of Gain margin and phase margin |
|  |  |
|  13th  | 1st | Log magnitude versus phase plot.  |
| 2nd | Closed loop frequency response.  |
| 3rd | **NYQUIST PLOT**  Principle of argument  |
| 4th | Nyquist stability criterion.  |
|  |  |
|  14th  | 1st | Problems related to Niquist stability |
| 2nd | Niquist stability criterion applied to inverse polar plot. |
| 3rd | Problems related to inverse polar plot. |
| 4th | Effect of addition of poles and zeros to G(S) H(S) on the shape of Niquist plot  |
|  |  |
|  15th  | 1st | Assessment of relative stability.  |
| 2nd | Constant M circle  |
| 3rd | Constant N circle |
| 4th | Nicholas chart.  |
|  |  |

Lect. Elect Dept. HOD, Dept of EE BIT POLYTECHNIC, BLS BIT POLYTECHNIC, BLS

 Principal

 BIT Polytechnic, Balasore