**Department of Electrical Engineering**

**BIT. Polytechnic, Balasore**

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

**CONTROL SYSTEM ENGINEERING**

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| **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** | |

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| 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 |
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| 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 |
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| 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 |
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| 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 |
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| 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 |
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| 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. |
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| 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. |
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| 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 |
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| 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 |
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| 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 |
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| 13th | 1st | Log magnitude versus phase plot. |
| 2nd | Closed loop frequency response. |
| 3rd | **NYQUIST PLOT**  Principle of argument |
| 4th | Nyquist stability criterion. |
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| 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 |
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| 15th | 1st | Assessment of relative stability. |
| 2nd | Constant M circle |
| 3rd | Constant N circle |
| 4th | Nicholas chart. |
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Lect. Elect Dept. HOD, Dept of EE BIT POLYTECHNIC, BLS BIT POLYTECHNIC, BLS

Principal

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