

**Maulana Abul Kalam Azad University of Technology, West Bengal***(Formerly West Bengal University of Technology)***Syllabus for B. Tech in Electronics & Communication Engineering**

(Applicable from the academic session 2018-2019)

<b>EC601</b>	<b>Control System and Instrumentation</b>	<b>3L:0T:0P</b>	<b>3 credits</b>
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Introduction to control problem- Industrial control examples, Transfer function, open loop and closed loop (Feedback) control systems, Block diagram and Signal Flow Graph (SFG) analysis.

[6L].

Feedback control systems- Stability concept- relative stability, Routh stability criteria, steady state error (SE), steady state accuracy, disturbance rejection, insensitivity and robustness, proportional (P), integral (I) and derivative (D) controller, Realization of PID controllers with op-amp and digital implementation. Feed forward and multi loop control configurations.

[6L].

Time response of second order systems, Steady state Error (SE) and error constants, Performance specifications in time domain. Root locus method of design. Lead and Lag compensations.

[4L].

Frequency response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency domain.

[6 L].

State Variable Analysis- Concepts of state, state variable, State Transition Matrix (STM), Solution for state variable of homogeneous and nonhomogeneous state equations, Transfer function with state space approach, Concepts of controllability and observability of systems.

[4 L].

Nonlinear control systems- Basic concepts and analysis- Describing function. Introduction to optimal control problem, regulator problem, output regulator, tracking problem.

[2 L].

CRO- measurement with it and its function with block diagram representation. Wave and Spectrum analyzers- requirements of these instruments and their functions with block diagrams. LVDT. DC and AC servomotors, tacho generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators.

[6L].

**Text Books :**

1. Automatic Control System: Benjamin Kuo, PHI
2. Modern Control Engineering, Katsuhiko Ogata, PHI, 5e
3. A.D. Helfrick and W. D. Cooper., "Modern Electronic Instrumentation and Measurement Techniques" ,PHI (EEE).

## **Reference**

1. Ernest O. Doeblin., “Measurement Systems” , MGH.
2. Control System Engineering, I.J.Nagrath, M.Gopal, New Age, 5e
3. Design of Feedback Control System, Raymond T Stepfani, Oxford University Press, 4e

## **Course Outcomes (CO):**

At the end of this course students will demonstrate the ability to:

1. Characterize a system and find its steady state behavior.
2. Investigate stability of a system using different tests.
3. Design various controllers.
4. Solve linear, non linear and optimal control problems.
5. Study with CRO, Wave analyzer, Spectrum analyzer knowing their functional details.