

**CC – XII : Process Control**

**Unit I : Introduction**

Basic control systems with examples – Open loop and closed loop systems – Basic elements in control systems – methods of analysis of physical systems – Historical development – Manual, semi automatic, automatic and complex controls.

**Unit II : Process Dynamics**

Differential equation, transfer function and block diagram – Block diagram reduction techniques – signal flow graph – model for sample process – Elements of process control – Process variables – degree of freedom – Dynamics of physical system – Liquid, gas and thermal processors – Mathematical modeling.

**Unit III : Frequency Response**

Bode plot, polar plot, closed loop, response from open loop system – Nichol's chart.

**Unit IV : Controllers and Actuators**

Characteristic of two position, multiplication, proportional, integral and derivative control modes – composite control modes – P, P plus I, P plus D and P plus I Plus D control modes – Examples.

**Unit V**

Final control elements – Electrical, pneumatic signal conversion – Electronic pneumatic and hydraulic actuators – controls valves – Valve positioners.

**Books for study and reference:**

1. Automatic control engineering – H.Francis - McGraw Hill – Third Edition
2. Process control – A Pollard Heinman – Educational Book London.
3. Process control – P. Harriot - McGraw Hill
4. Principles of process control – D Patranbis – TMH – 1987.
5. Handbook of applied instrumentation – Douglas M Considence - McGraw Hill
6. Automatic process control – Donald P Eckman – Wiley Eastern Ltd.