

7 th Semester	RML7D004	Process Instrumentation and Control in Mineral Engineering	L-T-P 3-0-0	3 Credits
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Module-I:**(10 hours)**

Introduction: Need for process control; justification in terms of overall technical and economic benefits. Fundamental Aspects: Recognition of dynamic nature of control operation; identification of controllable and non-controllable operating variables; need for obtaining quantitative relationships for describing the effect of controllable operating variables on process performance; defining control objectives; identification of process and plant constraints

Module-II:**(10 hours)**

Basic Data Required for Control System Design: Ways of obtaining data for control system design; Nature and frequency of process disturbances; investigating basic properties of process response (impulse and step response).

Module-III:**(10 hours)**

Types of Control Actions: Feed Forward and feedback control; construction of a feedback controller; proportional action, integral action and derivative action; tuning of feedback controllers; multiple input control; ratio control and cascade control. Control of Individual Unit Operations: Crushing, grinding and flotation circuits; control of thickener and other allied operations.

Module-IV: **(10 hours)**

Instrumentation for measurement: On-line particle size distribution, Metallurgical Grade analysis and coal analysis; pulp density, pulp level, froth level, slurry flow rate, Ball mill load and other required measurements. Some Published Case Studies: Some examples taken from published papers on actual implementation of control systems in an operating plant and the control strategies used.

Books:

- [1] Advanced Control and Supervision of Mineral Processing Plants, Edited by Daniel Sbárbaro and René del Villar, Springer
- [2] Chemical Process Control: An Introduction to Theory and Practice, George Stephanopoulos: PHI Learning