Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NEED511	Mine Instrumentation	3	0	0	3

Course Objective

- To provide a comprehensive overview of monitoring and communication techniques aimed at enhancing productivity and safety in both underground and open pit mines. This includes familiarity with a range of instruments and controllers utilized in Heavy Earth Moving Machinery (HEMM) and other operational applications. However, strong fundamental knowledge about mine power system, electronics and communication, sensors and transducers are the prerequisite for the course.

Learning Outcomes

Upon successful completion of this course, students will:

- Gain a comprehensive understanding of various monitoring and communication systems utilized in both underground and open-pit mines.
- Analyze the diverse range of signalling systems specifically utilized in underground mining environments.
- Acquire the skills to perform basic Programmable Logic Controller (PLC) operations and applications within a mining context.
- Develop an understanding of CBM instrumentation systems and their significance in mine operations.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Underground mine monitoring systems:** Environment monitoring (Gases like methane, carbon monoxide, oxygen, carbon dioxide, temperature, humidity, air velocity). Roof subsidence monitoring.	6	Basic understanding of different monitoring instrumentation systems in underground mines.
2	**Communication Systems:** Existing data and voice communication in underground mines, Leaky feeders and Fibre optic-based systems. Applicability of wireless communication system. Different methods of continuous data monitoring and transmission. Miners tracking. Smart sensor and IoT applications in mines.	8	Understanding of various data and voice communications systems of mines.
3	**Signalling systems:** Mine winder signalling and instrumentation. Haulage signalling. GPS-based positional and dispatch management system in surface mine.	4	Understanding of different signalling systems.
4	**Prognostics and Health Management:** Condition monitoring and instrumentation systems for heavy earth moving machines.	4	Understanding of instrumentation schemes for heavy earth moving machines.
5	**Open-pit mine safety devices:** Surface slope stability monitoring. Anti-collision devices.	5	Understanding and analyzing the safety devices of mines.
6	**Programmable Logic Controller (PLC):** Working principle, the concept of ladder logic, Use of Timer, Counter.	8	Understanding the PLC and its basic concepts and applications in mine.
7	Application of PLC in mines. Programming examples. Mining machines troubleshooting using PLC.	7	Understanding the PLC applications in mines.
	Total Contact Hours	**42L**	

Text Books:

1. SME Mining Engineering Handbook, 3rd Edition
2. Programmable Logic Controllers, W. Bolton, 4th Edition

Reference Books:

1. The Gas Monitoring Handbook, G. L. Anderson, D. M. Hadden, 1st edition, New York