Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NMND 508	MINE AUTOMATION	3	0	0	3

Course Objective
This course will cover different automation techniques, including virtual reality, applicable to mining systems to improve productivity and safety in today's competitive world, as well as digitalization concepts.
Learning Outcomes
Upon successful completion of this course, students will: • aware about the comprehensive overview of state-of-the-art mining automation used inmining industries. • learn automation system in material transport and handling. • come to know mining process in virtual platform for safe mining operations.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Introduction to concepts of digitization and digitalization in the mining industry; Cyber-physical systems; Industry 4.0; Industrial IoT architecture; Integration of digital technologies with AI into the mining processes and operations such as exploration etc. What is Automation and why is it needed so urgently in the Mining Industry	6	A detailed overview of the automation system for better productivity and safety to sustain in the globally competitive market.
2. i. ii iii. iv. v.	Key Technologies Involved in Smart and Sustainable Mining: Robotic Technology: Integrating robotic components in mining vehicles and equipment. Process & Software Automation: Automation software is used to streamline operations. Integration of IoT and automated control systems Artificial intelligence for reducing human effort and making mining safer. Environmental Monitoring	12	The automation system is used in primary mining operations and process applications.
3.	Automated Communication and Tracking Technologies: Proximity Systems, GNSS/UPS, Vision-Based Systems, Radar Systems, RFID and Geo-fencing, CCD cameras, Data Logging Systems, SCADA, Image Processing, etc.	8	The sensors and automation tools for implementing automation in mine using a Programmable Logic Controller and SCADA systems
4.	Basic Statistics and Machine Learning Techniques such as Linear Regression, Clustering, and Random Forests	10	Students will understand the concepts and purpose of Data Analytics in mining industry.
5.	Virtual Reality Applications: Mining Equipment Concept development, Mine Safety Applications, Mining operation simulations	6	Visualization of the mining process for safe mine operations.
	Total	42	

Text Books:

1. **Data Analytics Applied to the Mining Industry** *Paperback – Import, 25 September 2023* by Ali Soofastaei (Author)Advanced Analytics in Mining Engineering

Reference Book

2. **Advanced Analytics in Mining Engineering: Leverage Advanced Analytics in Mining Industry to Make Better Business Decisions** *Paperback – Import, 25 February 2023*
by Ali Soofastaei (Editor)