

Course Type	CourseCode	Nameof the Course	L	T	P	Credits
DE	NMND509	Mine Simulation And Data Analytics	3	0	0	3

Course Objective

This course will cover mine automation and data analytics applicable to mining systems.

Learning Outcomes

- The students will gain a comprehensive overview of state-of-the-art mining automation and practical skills in artificial intelligence and other digital technologies used in the mining industries.

Units	Course Content	Contact hours (Lecture)	Learning Outcomes
1	Essential Elements of an Automated System, Automation in Mine Production System, Principles and Strategies of Automation, Introduction to Automation Productivity. Autonomous mining systems - Autonomous haulage systems, Automated drilling systems, Fleet Management Systems: TDS, CMMS, ERP for Mining Industry, Mining Remote Operations & Control: Robotics & Armchair Mining	9	The automation system in mine production and available system.
2	Automated Communication and Tracking Technologies: Proximity Systems, GNSS/UPS, Radar Systems, RFID and Geo-fencing, CCD camera, Image Processing, SCADA, etc.	6	The sensors and automation tools for implementing automation in mine.
3	Virtual Reality Applications: Mining Equipment Concept development, Mine Safety Applications, Mining operation simulations	4	Visualisation of the mining process for safe mine operations.
4	Descriptive Statistics: Probability Distributions and Inferential Statistics: Hypothesis tests, Regression & ANOVA. Machine Learning: Introduction and Concepts.	9	They are learning descriptive statistics and machine learning to implement automation and analytics.
5	Supervised Learning: Neural Networks, Deep learning. Unsupervised Learning and Challenges for Big Data Analytics: Clustering.	12	Develop an understanding of supervised learning and deep learning algorithms to analyse big data for decision-making.
6	Application of Big Data Analytics and Artificial Intelligence (AI) in Mining	2	Application of Big Data and AI in Mining
	Total	42	

Textbooks

- 1) Hastie, Trevor, et al. The elements of statistical learning. Vol. 2. No. 1. New York: Springer, 2009.
- 2) Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010

Reference Books

- 1) G. Almgren, U. Kumar, N. Vagenas: Mine Mechanization & Automation 1st Edition
- 2) J. O'Shea M. Polis: Automation in Mining, Mineral and Metal Processing (1st Edition), Proceedings of the 3Rd Ifac Symposium, Montreal, Canada 18-20 August 1980
- 3) João Moreira, Andre Carvalho, Tomás Horvath: A General Introduction to Data Analytics, Wiley, 2019
- 4) Thomas A. Runkler, Data Analytics: Models and Algorithms for Intelligent Data Analysis, Vieweg+Teubner Verlag, 2012