Five days Short Term Course (Executive Development)

under

Outreach Program of IIT Kharagpur

on

INTELLIGENT AND PROGNOSTIC MAINTENANCE WITH SMART TECHNOLOGY FOR MINING MACHINERY

(October 11-15, 2023)

Department of Mining Engineering, IIT Kharagpur

Indian Mining Industry is already adapting next generation technologies for its future mining initiatives. The heavy Earth moving machinery technologies have undergone a major shift during the recent past. Automation and remote controls were introduced few years ago. With the advent of Artificial Intelligence and Machine Learning, the manufacturers of Heavy Earth Moving Machinery and mining Machineries are adapting now the next generation of Information and Communication Technology capabilities. This has resulted in rapidly growing smart technologies in machines. Thus maintenance of the high capacity machines are based on appropriate data acquisition and data analytics leading to automated maintenance management systems. These advances have also opened the door of retrofitting of technology to the existing fleet.

This five day's course will provide the basic foundations of advanced maintenance system to the engineers responsible for uptime of the machines. The engineers will be apprised of the present level of technology incorporated in the modern machines. Introduction to the basics of advanced Machinery Management System and Maintenance planned in this course will assist the expected transition from the present level of Condition Based Maintenance and Reliability Based Maintenance to Intelligent maintenance. This will enable the practicing engineers to plan and execute productive and perspective maintenance in mechanized mining.

The lower and middle level maintenance engineers of Excavation and E&M cadre will benefit from the course delivered by number of experienced faculty members with expertise in Mining Machinery, Mechatronics, Artificial Intelligence and Machine Learning, Industrial Engineering and Safety Engineering.

Course Content: The course will include the following broad areas:

1. **Introduction to Industry 4.0 and Technology Management in Surface Mining**
   - Scope of Industry 4.0 in Maintenance and Machinery Management
   - Tackling Machinery Faults with Industry 4.0 applications: Introduction to the machine learning solutions and key aspects
   - Work force skill requirements for emerging technological trends: developments are reshaping the skills needs in workplaces

2. **Modern Instrumentation in HEMM for Safety and Productivity Enhancement**
   - Advances in Instrumentation and monitoring of Mining Machinery: State of the art in automotive industry
   - Instrumentation for intelligent mines: Smart actuators and Smart controllers for monitoring of mining machinery
   - Measuring and monitoring Critical Parameters: Bearing vibration and temperature, Oil Contamination, stress concentrations by photo-elastic stress analysis, thermoelastic stress analysis, brittle coatings or strain gauges
   - Advanced Wire Rope Monitoring and maintenance
   - wireless machine monitoring, detecting plant maintenance requirements, condition monitoring systems beyond preventive maintenance: condition monitoring and predictive maintenance.
   - Digital twin meta verse and multi verse in mining machinery maintenance

3. **Introduction to Data Science and Data Analytics for Mine Management**
   - Statistical learning and Data Management for Industrial decision making.
   - Maintenance Management for HEMM
   - Work Order analysis, required and maintenance spanned analysis, sales and marketing analysis, supplier analysis, general cost analysis, quality and logistics analysis, store and inventory analysis.
   - Visualization and alerts for mining operations
   - Digital twin in mining industry

Course Outcome: Upon successful completion of this course, the participants will be able to

- Identify the recent developments in intelligent and prognostic maintenance that could be useful for their work sites in future and plan how to introduce them
- Define the requirements of smart technology transition for safety and productivity enhancement in mines
- Prepare a preliminary plan or pragmatic wish list for modernization of operation and maintenance of mining machinery
- Explain how to undertake technology and data driven safety and productivity audit in mining

The course will be conducted during October 11-15, 2023 at the Seminar Hall of the Department of Mining Engineering, IIT Kharagpur from 10:00AM to 5:30PM with lunch and tea breaks. Soft copy of the **Course Materials** and **Certificate of Participation** will be available to the participants through a MOODLE platform accessible to the registered participants. The lectures will be delivered by faculty members of Indian Institute of Technology Kharagpur and by experts with experience from India and abroad. The session will be conducted in work shop mode including, lectures, panel discussions and interactive Q &A session. Depending on the participants responses white papers will be developed for each of the themes.

Participation:

The course will be useful for the lower, middle and higher level executives looking after Excavation, E&M, production, raw material supply, health and safety management in mining, mineral, civil and underground space construction and other allied industries.

Accommodation:

Accommodation for the participants is normally booked at the Technology Guest House of lIT, Kharagpur on prior request and on payment basis. Alternatively, there are local hotels available in the town. However, the accommodation in the campus is considered convenient.

Course Fee:

The course fee of this ***non-residential*** programme is **Rs. 30,000.00 (Rupees Thirty thousand only)** per nominated participant from industries. **Additional 18% GST will be levied as per GOI rules.** The course fee is payable by electronic money transfer to "CEP STC IIT Kharagpur" to the account number **95562200002955 of Canara Bank at Branch SRIC IIT Kharagpur (IFSC Code CNRB0019556).** The course fee does not include boarding and lodging charges. IIT Kharagpur is exempted from Income Tax and while sending the course fee no Tax should be deducted. The Tax Exemption Certificate will be provided. ***Please let us know the complete transaction details with date after the payment.***

How to send Nominations:

Please email the nomination letter with the names of your nominated participants, designations, valid email address and mobile numbers to the Course Coordinator as early as possible.

For any other information, or sending nomination please contact:

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