

Sponsored by Scheme for Promotion of Academic and Research Collaboration (SPARC), Government of India



About the Course

India has a long history of coal mining covering nearly 220 years starting from 1774. India has the fourth-largest reserves of coal in the world. Commercial primary energy consumption in India has grown by about 700% in the last four decades and therefore coal is the most important and abundant fossil fuel in India, which accounts for 55% of the country's energy needs. The coal-based thermal power plants support approximately 80% of the total power requirement in India. The consequence of massive coal mining is the generation of mine overburden of quantity double the amount of coal mined. The requirement of usable or forest lands for storage, dust and plume gas from stockpiles, acid mine drainage, occasional landslides of dump slopes, and environmental hazard in terms of air, water and land contamination, are a few problems associated with mine overburden. Large heterogeneity in gradations and complex mineralogical compositions are major impeding factors for its utilization.

Aim of Course

This online course aims at research needs addressing a comprehensive solution to important Geoenvironmental and Geotechnical issues with a major focus on coal mine overburden and mine tailings.

It provides a premier interdisciplinary platform for researchers, practitioners, and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Geoenvironmental and Geotechnical Engineering.

Who can Participate ?

The course module is formulated with twelve lectures delivered by the eminent National and International Faculty and Industry experts via online covering a wide range of topics relevant to the course theme. The course will be highly beneficial for the academicians, scientists, practitioners, industry personnel, master students, and doctoral research scholars.

Registration

http://bit.ly/SPARC-registration



Certificate of Participation will be issued for the participants attending the full course. However, participants are free to select topics of their interest.

Organized by

Department of Civil Engineering, Indian Institute of Technology (ISM) Dhanbad, Jharkhand, India

FREE

Department of Civil, Materials, and Environmental Engineering, University of Illinois at Chicago, USA

Contact for more information: Dr. Lohitkumar Nainegali M:+91-9471192372, E: lohitkumar@iitism.ac.in Prof. Sarat Kumar Das M: +91-9437390601, E: saratdas@iitism.ac.in

Indian Convener



Engineering,

IIT(ISM) Dhanbad, India



Prof. Krishna R. Reddy Department of Civil, Materials & Environmental Engineering, UIC, USA

Dr. Lohitkumar Nainegali Department of Civil Engineering, IIT(ISM) Dhanbad, India

Coordinator

International Virtual Short-Term Course on



Futuristic Prospects of Geoenvironmental and Geotechnical Issues of Coal Mine Overburden and Mine Tailings 15th to 18th March 2021

Sponsored by Scheme for Promotion of Academic and Research Collaboration (SPARC), Government of India

SPEAKERS AND TOPICS

Day 1: 15th March 2021

Time: 06:00 PM to 06:25 PM, Inaugural

Lecture 1



Speaker: Prof. Torsten Wichtmann, Head of Soil Mechanics, Foundation Engineering and Environmental Geotechnics at the Ruhr University, Bochum, Germany.

Time: 06:30 PM to 07:30 PM (IST)

Time: 07:35 PM to 08:35 PM (IST)

Topic: Investigations on the seismic slope stability for planned residual lakes in opencast mines

Abstract: This lecture presents parts of an ongoing research dedicated to the dumps of the opencast mines in the Rhenish lignitemining area in Germany. The deposited soils in the dumps will form the embankment of developed lakes after termination of mining. Since the mining area lies in a region with seismic activity the seismic slope stability and particularly the liquefaction resistance of the deposited soils are of interest. The results of a parametric study on the liquefaction resistance of granular soils from the dumps using undrained cyclic triaxial tests is presented. Numerous tests on more than 50 sands from the dumps are analyzed with respect to the influence of the grain size distribution curve. A sophisticated constitutive model is calibrated based on the results of the laboratory tests. Its application in dynamic finite element simulations, using a model considering the dump and it's under laying natural soil as well as a seismic loading applied at the rock bed, is presented. The results of the simulations are discussed with respect to the excess pore water pressures and deformations within the dump.

Lecture 2



Speaker: Dr. Jorge Macedo, Assistant Professor, Geosystems Engineering, School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, USA.

Topic: Recent tailing dam failures and the role of mine tailings mechanical properties

Abstract: The static liquefaction of mine tailings has caused numerous recent failures, e.g. the 2014 Mount Polley disaster in Canada, the 2015 Fundao failure in Brazil, the 2018 Cadia failure in Australia, and the 2019 Brumadhino failure in Brazil. Such failures of tailings storage facilities (TSFs) have caused unprecedented devastating consequences for the environment, infrastructure damage as well as human losses. For example, the Fundao failure is considered the largest environmental disaster in Brazil, and the Mount Polley failure in Canada is one of the worst disasters in modern Canadian history. The content of this presentation is motivated by the recent TSF failures worldwide, and it will discuss trends on the mechanical-based properties of mine tailings and its influence on the assessment of static liquefaction.



Abstract: This presentation will focus on the constitutive models PM4Sand and PM4Silt that have been developed to capture the response of sands and low-plasticity silts and clays in geotechnical earthquake engineering applications. The models follow the critical state compatible, stress ratio-controlled, bounding surface plasticity framework of the Dafalias and Manzari (2004) model. The presentation will introduce their framework and generalized calibration with example stress-strain responses under a range of loading paths relevant to earthquake applications. The new user-defined model strain rate-dependent model PM4SiltR will also be introduced followed by a numerical modeling example of undrained creep rupture for a hypothetical tailings dam using the two-dimensional finite difference program FLAC. The numerical modeling approach and constitutive model will be shown to provide reasonable approximations of undrained creep behaviors that can be important for static slope stability evaluations.

International Virtual Short-Term Course on Futuristic Prospects of Geoenvironmental and Geotechnical Issues of Coal Mine Overburden and Mine Tailings 15 th to 18 th March 2021 Sponsored by Scheme for Promotion of Academic and Research Collaboration (SPARC), Government of India			UIC		
Day 2: 16 th March 2021			frei en		
	Lecture 1		Time: 10:30	AM to 11:30 AM (IST)	
Speaker: Prof. Krishna Reddy, Professor, University Scholar and Distinguished Researcher, Department of Civil, Materials, and Environmental Engineering, University of Illinois, Chicago, USA.Topic: Coal mine refuse and coal ash disposal sites: Groundwater management zones & remediation options					

Abstract: This presentation will describe two case studies, a coal refuse disposal site and another coal ash disposal site, where the groundwater has been contaminated by the infiltration of undesirable constituents from coal refuse or coal ash. The site conditions, including site hydrogeology and the groundwater contamination, will be described. Groundwater flow and contaminant transport modeling performed to assist in defining the extent of groundwater contamination and to establish Groundwater Management Zones will be presented. Finally, sustainable technologies to remediate the groundwater contamination at these sites will be discussed.

Lecture 2	Time: 11:35 AM to 12:35 PM (IST)
Speaker: Dr. Luis Alberto Torres Cru University of the Witwatersrand, Johan Topic: Critical state line of non-plastic	z, Senior Lecturer, School of Civil and Environmental Engineering, nesburg, South Africa. tailings

Abstract: The assessment of liquefaction potential is one of the main concerns related to the operation of tailings dams. Some of the most-commonly used approaches to assess liquefaction potential are anchored on critical state soil mechanics (CSSM). The use of these approaches requires characterising tailings deposits in terms of the critical state line (CSL). However, given that particle size distribution varies significantly within a single tailings deposit, the CSL also varies. This raises the question that this presentation will address: How can we select samples from a tailings deposit in order to disclose the variability of the CSL? The focus will be on non-plastic tailings. The argument will be made that limiting void ratios provide a useful first-order indicator of CSL variability. Notwithstanding, the uncertainty in the underlying correlations imply that formal laboratory determination of the CSL remains essential. Some of the practicalities of CSL determination will also be discussed.

Lecture 3

Time: 12:40 PM to 01:40 PM (IST)



Speaker: Dr. Partha Narayan Mishra, Adjunct Lecturer, School of Civil Engineering, The University of Queensland, Australia.

Topic: An overview on mine tailings and tailings storage facilities: Geotechnical properties, processes and challenges

Abstract: Based on a critical appraisal of the literature data available in the public domain, this presentation will begin by discussing some of the key geotechnical properties of mine tailings and hydro-mechanical processes that dictate the fate of tailings disposed in tailings storage facilities (TSF). It will then draw attention to the challenges that contribute to failure of tailings dams, and conclude with a case study on a recent TSF failure.

	International Virtual Short-Term Course on Futuristic Prospects of Geoenvironmental and Geotechnical Issues of Coal Mine Overburden and Mine Tailings 15 th to 18 th March 2021		
Sponsored by Scheme for Promotion of Academic and Research Collaboration (SPARC), Government of India			
Day 3: 17 th March 2021			
Lecture 1		Time: 06:30 PM to 07:30 PM (IST)	
Speaker: Mr. Greg Smith, Carbon Footprint Disposal, Picton, Ontario, Canada.Topic: Electro kinetic application to bolster earthen tailings pond dams			

Abstract: Expelling water from the tailings addresses two of the failure mechanisms: 1) overtopping of the dam and 2) increasing the height of the dam. Expelling water from the tailings also has the added benefit of improving the tailings pond capacity. Observations from the application of electrical fields on water-saturated materials showed dewatering while improving shear strength from thixotropic materials, rendering them useful for construction material. A variety of applications of this methodology will be discussed. In addition, discussion will also focus upon application of electric fields in site specific engineering approach to strengthen the earth fill and reduce seepage. The goal is to reduce risks from future dam failure and provide increased measurable safety to the existing geotechnical structure.

Lecture 2	Time: 07:35 PM to 08:35 PM (IST)
Speaker: Dr. Robert Bachus, Senior Pr Topic: Geotechnical characterization influence design and construction	rincipal Engineer, Geosyntec Consultants, Inc., Georgia, USA. and engineering properties of coal combustion residuals that

Abstract: The 22 December 2008 failure of the dredged cell at the Tennessee Valley Authority (TVA) Kingston Fossil Plant in Harriman, Tennessee had a significant impact on the coal-powered energy generation community. Specifically, regulations were developed to dictate that the most common coal ash disposal practices in the southeastern U.S. (i.e., wet disposal of coal combustion residuals (CCRs) including fly ash) are no longer permitted. Furthermore, the newly promulgated regulations require that owners of existing CCR disposal facilities "close" the ponds... at considerable expense, utilization of resources, and construction difficulties. After the Kingston incident, a research study was completed by Geosyntec Consultants and the Georgia Institute of Technology on behalf of the Electric Power Research Institute (EPRI) to characterize the engineering properties of ponded fly ash to help understand the cause of the failure and to provide insights regarding challenges facing designers and contractors responsible for closing the existing facilities. This presentation will present a summary of the key findings from the EPRI study and will identify and address the unique challenges that these materials present during excavating and processing the CCRs during closure of the former ash ponds.



Topic: Tailings governance and management system: Owner's perspective

Abstract: The Global Industry Standard on Tailings Management (GISTM) requires the mining companies strive for zero catastrophic failures of their tailings storage facilities (TSFs). To achieve this objective, the mining companies need to develop and implement tailings governance systems that enhance the stability and safe operations of their TSFs. This presentation will provide a tailings engineer's perspective on key governance systems and how their implementation can provide increased assurance to the stakeholders.

	International Virtual Short-Term Course on Futuristic Prospects of Geoenvironmental and Geotechnical Issues of Coal Mine Overburden and Mine Tailings 15 th to 18 th March 2021			
Sponsored by Scheme for Promotion of Academic and Research Collaboration (SPARC), Government of India				
	ATT DE LA C	Day 4: 18 th March 20	21	
	Lecture 1		Time: 09:30 AM to 10:30 AM	A (IST)
	Speaker: Dr. Mayu Tinco	opa, General Manager, Con site investigation in tailings	e Tec, Peru, Lima Peru. dam	

Abstract: During the last few years, we have used the conventional drilling system and SPT to characterize the tailings and soils. However, nowadays-direct push technology is being used to characterize tailings and soils with greater rigor, precision and greater detail. The objective of this presentation is to qualitatively and quantitatively compare the conventional drilling and SPT system with the direct push system for the purpose of characterization of the tailings, based on the geotechnical investigations conducted at two tailings dams. An average performance has been estimated in the site investigation of tests and drilling. However, the performance of tests with the direct push system reduces the average time of soil characterization by 2 to 3 times and allows more information on the ground for better decisions.

Lecture 2	Time: 10:35 AM to 11:35 AM (IST)
Speaker: Prof. Devendra Narain Singh Topic: Mission IBPs: Valorisation of in	n, Professor, Department of Civil Engineering, IIT Bombay, India. ndustrial byproducts

Abstract: Disposal and utilization of hazardous and toxic wastes (read industrial byproducts) is a matter of great national and international concern. The Mission IBP, being championed by DNS, aims at creating a platform to promote the interaction between the industry-academia-policy makers and aid scaling up of the existing laboratory technologies/methodologies along with the development of practical and need-based research ideas. This initiative is in line with the "Swachh Bharat Mission", which is the flagship project of the India government. To further this agenda the concepts pertaining to Circular Economy will be applied to create an online platform to realize the resource value embedded in the IBPs in addition to bringing together providers of: recycling, upcycling, reuse, design, consulting and repair services under one digital "roof". Technology will facilitate generation of livelihoods, promote transparency as well as help to mitigate the adverse effects associated with climate change. Economic instruments can also be conceptualized to reward stewardship efforts of companies and by recognizing their participation through measurable outcomes.

Lecture 3	Time: 11:40 AM to 12:40 PM (IST)
Speaker: Dr. Oznur Karaca, Assoc University, Canakkale, Turkey. Topic: Environmental issues related remediation options	iate Professor, Geological Engineering, Canakkale Onsekiz Mart I to mining: Problems with mining sites, characterizations, and

Abstract: In this presentation, problems related to mining sites will be described. There are various types of wastes and tailings related to mining which have different kinds of adverse effects on the natural environment. Characterization and environmental effects of these wastes will be explained. Acid mine drainage (AMD) will be described. Then opportunities of some technologies for the remediation of mining sites will be explained. Finally, some examples of these methods will be given.

Time: 12:40 PM to 01:00 PM, Closing Remarks, and Feedback

Contact for more information: Dr. Lohitkumar Nainegali, M:+91-9471192372, E: <u>lohitkumar@iitism.ac.in</u> Prof. Sarat Kumar Das, M: +91-9437390601, E: <u>saratdas@iitism.ac.in</u>