

CIVIL ENGINEERING DEPARTMENT



NATIONAL INSTITUTE OF TECHNOLOGY MEGHALAYA

An Institute of National Importance

Civi-Nova

CIVIL ENGINEERING SOCIETY MAGAZINE CIVIL ENGINEERING DEPARTMENT NIT MEGHALAYA

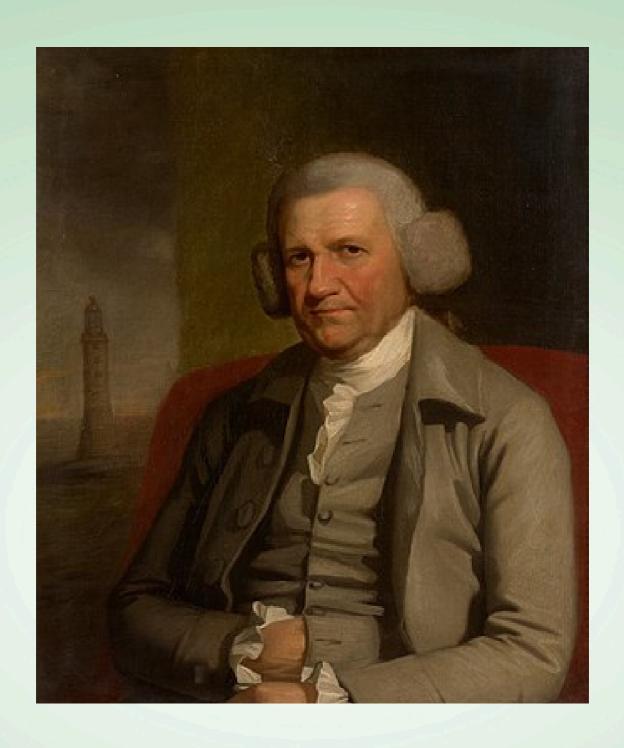
First Edition

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"Civi Nova" combines "Civi," short for "Civil," and "Nova," a Latin word meaning "new" or "star."

Together, "Civi Nova" can be interpreted as "New Civil" or "New Star Civil Engineering." It suggests innovation, fresh ideas, and a forward-thinking approach in the field of civil engineering, making it a great name for a magazine that focuses on the latest trends and breakthroughs in the industry.



"To ascertain the nature and properties of materials in different situations and to apply them with judgment to various uses, constitutes a great part of civil engineering."

-John Smeaton(Father of Civil Engineering)



MEANING OF THE LOGO:

This logo represents the "Civil Engineering Society" of NIT Meghalaya. Here's a breakdown of its components:

1. Silhouettes of Workers:

-Silhouettes of Workers: Represents the hands-on, practical work in civil engineering, highlighting teamwork, construction, and development.

2. Civil Engineering Society:

- Represents the name of the society, emphasizing its role as a dedicated community for civil engineering students and professionals.

3. Excavator:

- Excavator: Symbolizes the heavy machinery used in construction, pointing to the practical aspect of civil engineering involving land preparation, digging, and building.

Overall, the logo visually encapsulates the essence of civil engineering, blending technical elements with the society's identity and institutional affiliation.

SOCIETY STRUCTURE



Dr. Pradeep Kumar Gautam (Chairman)



Dr. Rubi Chakraborty (President)



Saket Pratap Singh (Secretary Academic Affairs)



T Swaroop Kumar (Secretary Event Management)



Rai Kachak Tripura (Designing Head)



Kundan Kumar (Representative-4th Year)

EDITORIAL BOARD



Dr. Smrutirekha Sahoo (Editor-in-Chief)



Dr. Rubi Chakraborty
(Associate Editor-in-Chief)



Rai Kachak Tripura (Editorial Board Head)



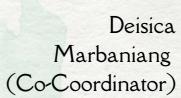
Neelkantha Mandal (Co-designer)

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DIRECTOR'S NOTE PROF. PINAKESWAR MAHANTA



It is my privilege to welcome you all to the Civil Engineering Society of National Institute of Technology Meghalaya. The society is committed to achieve excellence in innovation, research and extension imbibed with professional and ethical values.

Our society has always been a beacon of innovation, collaboration, and excellence. Over the years, we have witnessed remarkable achievements and progress within our field, driven by the collective efforts of our members. From groundbreaking research and sustainable engineering solutions to community outreach and professional development, your contributions have significantly advanced our profession and positively impacted society.

Director's signature

CHAIRMAN'S NOTE DR. PRADEEP KUMAR GAUTAM



It gives me immense pleasure to present the inaugural issue of our department's magazine, a platform designed to showcase the remarkable talents, achievements, and ongoing efforts within the Department of Civil Engineering at NIT Meghalaya. This magazine is a reflection of the dedication and enthusiasm that our students, faculty, and staff bring to their work every day, and I am honored to be part of this initiative.

Since its inception, our department has been committed to providing a robust academic and research environment that fosters innovation and excellence in civil engineering. Through this magazine, we aim to bridge the gap between academia and industry by highlighting the latest trends, technologies, and research breakthroughs in civil engineering. It will serve as a medium to keep everyone informed about the department's achievements, student activities, research initiatives, and the collaborative projects that continue to elevate our standing in the engineering community.

This magazine is not just a publication but a milestone that marks the start of a new journey, where we continuously engage with new ideas, celebrate our milestones, and create a space for creative thought and technical expression. As we move forward, I encourage all students and faculty to actively participate in the magazine's development, contributing their knowledge, perspectives, and experiences.

I extend my heartfelt thanks to the editorial team and all those involved in bringing this first issue to life. Your hard work and vision have created a valuable resource that I hope will inspire, inform, and engage our community for years to come.

Let this magazine be a testament to the strength of our department, and may it grow to become a beacon of knowledge and collaboration. I look forward to seeing the progress we make as we continue to nurture the next generation of civil engineers.

Chairman's signature

PRESIDENT'S NOTE DR. RUBI CHAKRABORTY



It is with great honor and excitement that I address you as the President of our esteemed Civil Engineering Society. It is a privilege to lead a community of such dedicated and talented professionals who are at the forefront of shaping the future of civil engineering.

Civil engineering is at the heart of modern civilization. From the roads we travel to the buildings we inhabit, from the bridges that connect us to the systems that sustain us, our work profoundly impacts every aspect of daily life. As civil engineers, we are entrusted with the responsibility of designing and constructing infrastructure that is safe, sustainable, and resilient.

President's signature

EDITOR-IN-CHIEF'S NOTE DR. SMRUTIREKHA SAHOO



Dear Readers,

It's a pleasure to present the first edition of our Civil Engineering Society Newsletter, Civi-Nova. This quarter has been marked by significant advancements, dynamic projects, and inspiring achievements within our field, and we're excited to share these highlights with you.

Our cover story delves into the ground breaking work being done in sustainable infrastructure. From the integration of green technologies in urban planning to the rise of resilient construction practices, our feature article showcases how civil engineers are at the forefront of creating environmentally friendly and robust structures. This is a testament to the sector's commitment to addressing climate change and resource conservation.

The latest advancements in materials science, including the development of self-healing concrete and smart building systems are also included. These innovations are not only enhancing the durability and efficiency of our projects but also opening new avenues for research and application.

We are proud to highlight the remarkable achievements of our faculty members and students in this edition.

With a line-up of esteemed speakers, interactive workshops, and networking opportunities, few events are also planned in the near future that promises to be both informative and inspiring. Be sure to check our event calendar and register early to secure your spot.

As always, we are grateful for your continued support and engagement. Your contributions and feedback are vital to the growth and vitality of our society. We encourage you to stay involved, share your insights, and continue pushing the boundaries of what's possible in civil engineering.

Thank you for being an integral part of our community. Here's to another season of innovation, collaboration, and achievement.

Editor-in-Chief's signature

S. Saho

ABOUT CIVIL ENGINEERING

The Department of Civil Engineering has been in existence since July 2012. With an intake capacity of 30 students, the Department offers a four years (eight semesters) B. Tech programme in Civil Engineering Discipline. The department has initiated its Ph.D. programme since 2014, in various areas of Civil Engineering viz., Environmental Engineering, Structural Engineering, Water Resources Engineering, Geotechnical Transportation Engineering and Engineering. Since July 2018 onwards, the Department has been offering a two years (four semesters) M. Tech programme in Structural Engineering. The Department is offering a common course for 1st year students on Engineering Drawing.

Additionally, the Department actively encourages curriculum development activities by creation of new courses and up-gradation of existing courses. The Department undertakes consultancy works in various related areas of civil engineering, to provide knowledge and intellectual inputs to the industry and other organizations and also organizes seminars/symposia for professional interaction. The Department also aims to contribute to interdisciplinary academic and research activities of NIT Meghalaya.





Vision of the Department:

To serve the society with state of the art Civil Engineering knowledge and research responsive.

Mission of the Department:

- To develop well balanced and industry oriented curriculum
- To produce manpower with strong Civil Engineering knowledge for serving the society.
- To carry out innovative research projects for the better development of the society and to provide solutions for actual field problems.

ABOUT CIVIL ENGINEERING

Program Education Objectives (PEO):

- To provide high quality technical knowledge to the Civil Engineering students for solving the real field problems
- To prepare the Civil Engineering students for their appropriate employment and pursuing higher education.
- To empower the Civil Engineering students with sense of professional ethics, with ability to work in a team/teams and with appropriate communication skills.

Program Specific Outcome (PSO):

- The Civil Engineering students will able to conduct surveying, prepare layout plans, maps and able to do alignments for various Civil Engineering structures.
- The Civil Engineering students will able to interact with stakeholders effectively, write specifications, analyze, design, estimate, supervise and execute various construction activities related to Civil Engineering by applying necessary tools and maintaining proper qualities.
- The Civil Engineering students will able to provide sustainable environmental solutions for diverse real field problems.





Our HOD's

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CIVIL ENGINEERING SOCIETY

Civil Engineering Society, NIT Meghalaya established on 09 November, 2023 to promote collaboration and knowledge-sharing, to organize technical and non-technical events and to publish a monthly and a bi-annual departmental magazine.

VISION:

- 1. To foster a sense of community and collaboration among students and faculty within the Department of civil engineering, as well as to promote academic and professional growth in the field.
- 2. Opportunities for leadership and personal development for student representatives.
- 3. Showcasing the Department of Civil Engineering's achievements and contributions through regular publications.







Tunnelling in India: Advantages and Challenges -Dr. Prasun Halder

Assistant Professor,
Department of Civil Engineering, IIT Jammu



Tunnelling in India is not a new activity as many historical documents talk about such oldunderground tubes serving as routes, water transport etc. In recent decades, several pioneering tunnels have developed through India's radically different terrains, from the difficult Himalayas to densely populated urban regions, to serve a variety of purposes. Today, India offers a plethora of tunnelling marvels specially in the field of transportation i.e., railway and highway tunnels.

Many hydropower tunnels, buried in the mountains, are also in operation amidst geological, ecological, and societal obstacles. Now, what makes tunnelling unique in Indian setting? The obvious answer is India's varied topography and infrastructural requirements in the urban areas. With this thought, the current article explores the important yet complex trade-offs between India's tunnelling endeavours and its challenges.



Fig 1: Under-construction tunnel at the Sela Pass, Tawang, Arunachal Pradesh

Advantages of Tunnelling:

(a) Improved Connectivity in Hilly Terrain

India's varied topography, full of mountains and valleys, presents a unique challenge for transport infrastructure. Tunnels cross these geographic barriers, provide seamless connections, year-round access to remote areas, promote economic development, tourism, and better living conditions.

(b) Hydropower Potential

India's hilly terrain, especially in the north and northeast, is full of hydroelectric potential. Excavating underground tunnels and caves is essential to harness this energy, with tunnels diverting the flow of rivers to turbines in the caves, transforming potential energy into electricity. Over the last few decades, India has been creating tunnels for hydropower projects showing a massive growth in the hydroelectric sector.

(c) Combatting Urban Space Crunch

India's exploding cities are in dire need of solutions to address the challenges of urban Rapid urbanization crunch. population growth have resulted in increased traffic, and space crunch. In such a condition, the metro tunnels and road tunnels offer an efficient, congestion-free fast. and transportation system in India. The RRTS corridors that are being built, connecting the capital region with nearby cities, are a good example of such system.

(d) Disaster Resilience

Extreme weather events such as floods, landslides etc. often hamper the surface transportation. However, in order to ensure uninterrupted flow of goods and services, the highway and metro tunnels remain operational, emphasizing the role of tunnelling in disaster resilience.

Challenges of Tunnelling:

(a) Challenges of India's Diverse Geology

India's diverse and complex geology often throws a stern challenge to any tunnel construction activity. Additionally, seismic events in certain regions necessitates stringent safety measures and innovative engineering techniques. The activity becomes more complex and difficult when tunnelling is carried out in the mighty Himalayas as the problems like weak fissures, ever- changing geology, water ingress, huge stresses, difficult accessibility etc. come on the way.

(b) Environmental Concerns

Add a little bit of body textAny type of tunnel construction activity might disturb the ecosystems by impacting the local flora and fauna. Additionally, it can alter the existing water tables in the concerned area. So, eco-friendly construction practices need to be employed.

(c) Socio-Economic Impact

Besides, environmental impacts, tunnelling projects can also displace communities and disrupt their way of life. Therefore, steps like community engagement, compensation are key to mitigate these challenges.

(d) Shortage of Skilled Personnels

Tunnelling, undoubtedly, is a complex activity to be carried out in the field. The challenges, involved in such activity, become fatal due to lack of skilled personnels.

The shortage of well-versed engineers and geologists adversely impacts project planning, execution, and monitoring. Therefore, it can be concluded that tunnelling in India, with all the challenges involved in the process, is not only a tale of connecting two points, but also a triumph of geological marvels, engineering ingenuity, and societal well-being.

The Vital Role of Engineering Geology in Hydro Power Projects

-Apratim Das

Deputy Manager (C), O/o Director (Technical) NEEPCO



Imagine constructing a massive structure without understanding the ground beneath it. Such an approach would be incredibly risky. This scenario highlights the critical importance of engineering geology, especially in hydro power projects. Let us explore this fascinating field and its significance.

The Foundation of Civil Engineering:

Every civil structure, from towering dams to intricate tunnel networks, rests upon Earth's crust. Unless we consider floating structures or those suspended by energy forces, the ground serves as the ultimate foundation. This fundamental fact underscores the essential nature of engineering geology.

Hydro Power Projects: A Geological Challenge:

Hydro power projects are inherently complex. They comprise various components such as Head Race Tunnels (HRT), dams, powerhouses, surge-shafts, valve-houses, and penstocks. Each of these elements must be carefully designed to work in harmony with the underlying geology. Two key principles guide this process:

1. KYG (Know Your Ground)

2. NGS (No Ground is Same)

These principles highlight the importance of treating each site as a distinct ecosystem requiring specialized study.

Decoding Site Geology: The Indispensable Role of Engineering Geological Maps.

The Engineering Geological Map (EGM) acts as our geological X-ray, penetrating the surface to expose underlying realities. This revealing document illuminates:

- Lithology (rock types)
- Shear zones
- Rock outcrops
- Bedding and foliation attitudes
- Faults
- Slide zones
- Fold axes
- Water conditions

This wealth of data serves as the foundation for rock mass classification, a critical step in designing safe and efficient structures.

Advancing to 3D: The Future of Geological Mapping

While 2D surface mapping has been the standard, the industry is moving towards 3D-EGM. When combined with borehole fracture mapping, this technique provides a more comprehensive view of the subsurface. It allows engineers to interpolate structural features like faults and joints hidden within the rock mass.

Detailed Examination of Rock Discontinuities

To truly understand the rock mass, geologists employ techniques such as scanline surveys and window sampling. These methods help quantify and characterize discontinuities in the rock:

- 1. **Scanline Survey:** Envision drawing a line across a rock face and meticulously measuring every fracture it intersects.
- 2. Window Sampling: Similar to the scanline, but using a defined area instead of a line. Modern technologies like photogrammetry and LiDAR (Light Detection and Ranging) are also revolutionizing this process,

are also revolutionizing this process, allowing for faster and more accurate data collection.

From Field to Analysis: Processing the Data

Once collected, all this geological data undergoes processing using geostatistical methods. Software packages like Dips help engineers analyse the information and make informed decisions about project design and construction methods.

The Evolution of Rock Mass Classification: Bridging Geology and Engineering in the Digital Age

In the realm of geotechnical engineering, understanding rock mass behaviour is crucial for safe and efficient project execution. At the heart of this understanding lies rock mass classification, a field that has undergone significant transformation in recent years.

Engineering Geological Maps serve as the cornerstone of rock mass classification. These detailed representations of ground conditions provide essential data for various classification systems, including Terzaghi's, Rock Mass Rating (RMR),



Fig 1: An arbitrary scan-line (red coloured) across a rock outcrop

Q-System, and Rock Structure Rating (RSR). The accuracy of EGMs is paramount, as they directly influence critical engineering decisions such as excavation methodology, tunnel alignment, and support system design.

Rock mass classification systems act as interpreters, translating raw geological data into actionable insights. These systems consider various parameters, including rock characteristics, strength, joint groundwater conditions, to provide quantitative assessment of rock quality. This assessment guides engineers in making informed decisions about excavation techniques, support requirements, overall project feasibility.



Fig 2: Use of Brunton compass for measuring Dip
/Strike

Ensuring the accuracy of rock mass classification presents several challenges:

- 1. Distinguishing natural features from humaninduced alterations (e.g., blast-induced fractures)
- 2. Minimizing bias in data collection through rigorous sampling techniques
- 3. Capturing the inherent variability of rock masses across a project site

Recent advancements are reshaping the landscape of rock mass classification:

- **1. 3D-EGM Integration with InSAR:** Enables detection of minute ground deformations, enhancing our understanding of rock mass behaviour over time.
- **2. Artificial Intelligence:** Offers advanced pattern recognition and data analysis capabilities, potentially uncovering insights that might elude human observers.
- **3. Digital Twins:** Allow real-time modelling of rock mass behaviour, facilitating scenario testing and risk assessment.
- **4.** Augmented and Virtual Reality (AR/VR): Provide immersive visualization of geological data, improving interpretation and communication of complex subsurface conditions.

As technology continues to evolve, we can anticipate:

- 1. Increased accuracy in representing real ground conditions
- 2. More dynamic and responsive classification systems that adapt to new data in real-time
- 3. Enhanced integration of diverse data sources for comprehensive rock mass characterization
- 4. Improved predictive capabilities for long-term rock mass behaviour

Rock mass classification stands at the intersection of geology and engineering, playing a crucial role in translating complex ground conditions into practical engineering solutions. As we embrace new technologies and methodologies, the field is poised for significant advancements. These developments promise not only more accurate assessments of rock mass behavior but also more efficient and safer geotechnical projects. The future of rock mass classification lies in the seamless of traditional geological integration wisdom with cutting-edge digital tools, ushering in a new era of geotechnical engineering practice.

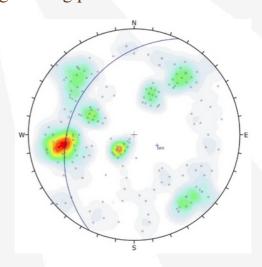


Fig 3: A representative statistical plot of discontinuities in Dips software

mbol Feature		
 Pole Vectors 		
Color	Density Concentrations	
	0.00 - 0.80	
	0.80 - 1.60	
	1.60 - 2.40	
	2.40 - 3.20	
	3.20 - 4.00	
	4.00 - 4.80	
	4.80 - 5.60	
	5.60 - 6.40	
	6.40 - 7.20	
	7.20 - 8.00	
Maximum Density	7.77%	
Contour Data	Pole Vectors	
Contour Distribution	Fisher	
Counting Circle Size	1.0%	
Plot Mode	Pole Vectors	
Vector Count	228 (228 Entries)	
Hemisphere	Lower	
Projection	Equal Angle	

In the realm of hydropower, engineering geology emerges as the crucial bridge between Earth's raw potential and human technological prowess. This field's unique synthesis of time-tested practices and cutting-edge innovations empowers the creation of resilient energy solutions that not only adapt to their geological settings but also thrive within them. By decoding the language of landscapes, Engineering geologists pave the way for hydropower projects that can withstand both long-term environmental changes and immediate geological challenges, thereby safeguarding our bold aspirations for sustainable energy production.

Use of Machine Learning Techniques in Geotechnical Engineering

-Dr. Rana Acharyya, Assistant Professor, Civil Engineering Department, DIT University, Dehradun



In the current trend of research, Machine Learning (ML) techniques have taken considerable place. As a consequence, the field of Geotechnical Engineering is also not retreating from the use of ML techniques. Various ML algorithms specifically, Artificial Neural Network (ANN), Random Forest (RF), Ridge Regression (RR), Multigene Genetic Programming (MGGP), Xtreme Gradient Boosting (XGBoost), Multilayer Perceptron (MLP), and Support Vector Regression (SVR) are considered in the domain of Geotechnical Engineering. It has been observed from research that ML techniques are implemented in the topics specifically, bearing capacity and settlement of the shallow foundation, load-carrying capacity and settlement of pile foundation, lateral load capacity of the pile, hydraulic conductivity of soil. stress-strain characteristics of soil, landslide induced unconfined displacement, compressive strength uniaxial soil. compressive strength rock, and assessment liquefaction phenomenon of soil. important steps are required remembered for performing ML algorithms one is the scaling of data and the second one is selecting hyperparameters.

The hyperparameters are fixed with the support of statistical parameters specifically, the Coefficient of correlation (R2) and mean square error (MSE). It has been seen from the research that 80 % data of the total dataset is considered for training and the rest of the 20% data is considered for validation. In the training dataset, the data is further divided 70% of the data is taken for actual training and 30% data is considered for testing. It is recommended that the validation should not be performed from the same dataset which is considered for training and testing. The dataset from past research should considered for validation. The Coefficient of correlation (R2) is not enough to show the prediction capability of the ML model rather different statistical parameters specifically, Sutcliffe efficiency (NS), Index of Agreement (d), and Modified Index of Agreement (dModified) could also be used to show the fitness of the model. It has been seen in the published papers that only correlation graphs for training and testing are given and mentioned that the ML model is capable enough to predict the outcome. The issue is the implementation of the model outcomes in the real field scenario. It is recommended that the sensitivity analysis of input parameters and the predictive expression of the outcomes should be included in the research. It shall be helpful for the field Engineers as well as Researchers.

Understanding Seismic Risk: Seismic Fragility, Exposure, and Hazard

-Vivek Singh Research Scholar,IIT Mandi (d22041@students.iitmandi.ac.in)



Introduction

Seismic risk assessment is crucial for protecting buildings and infrastructure in earthquakeprone areas. Major earthquakes, such as the 2011 Tōhoku earthquake, the 2001 Gujarat and the 2023 earthquake, Turkey-Syria earthquake, have demonstrated the severe impacts of seismic events, causing substantial loss of lives and property. The North East region of India, including states like Assam, Manipur, and Meghalaya, has faced significant seismic events, such as the 1897 Shillong earthquake and the 1950 Assam-Tibet The 2015 Nepal earthquake earthquake. further highlights the potential devastation of earthquakes. These incidents underscore the importance of understanding and managing seismic risk to protect our communities and infrastructure.

Seismic risk involves evaluating three main factors: seismic fragility, exposure, and hazard. Seismic risk assessment combines hazard analysis, which estimates earthquake probabilities, with models that assess how vulnerable structures are to damage. Effective management includes identifying high-risk areas, improving building codes, retrofitting structures, and developing emergency response Accurate risk assessments strategies. essential for minimizing earthquake impacts and safeguarding lives.



Figure (1) (a) A building collapsed in the Manipur earthquake in -2016 (Rediff.com)

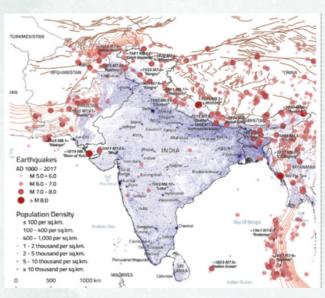


Figure (1)(b) Population density, historical seismicity, and faults in the Indian subcontinent (Rao et al. 2020)

Accurate and comprehensive seismic risk assessments are crucial for minimizing the impacts of earthquakes, safeguarding lives, and reducing economic losses. Fig 1. (a) shows the collapsed building in the Manipur earthquake (2016) and (b) historical seismicity and current population density of the Indian subcontinent.

Seismic Hazard

Seismic hazard refers to the likelihood and intensity of an earthquake happening in a particular area. It's influenced by:

- 1. Earthquake Sources: These are faults or tectonic plate boundaries where earthquakes are likely to occur.
- 2. **Historical Data:** Past earthquake records help predict future events.
- 3. **Ground Shaking:** The potential severity of ground movement during an earthquake.

Seismic hazard assessment is performed using two main approaches: Deterministic Seismic Hazard Analysis (DSHA), which evaluates maximum the possible known earthquake from faults. Probabilistic Seismic Hazard (PSHA), which assesses the probability of different levels of seismic activity over a given period.

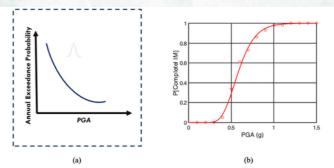


Figure-2 (a) Representative hazard curve (b) representative seismic fragility curve representing seismic vulnerability utilizing ground motion parameter i.e. peak ground acceleration (PGA) and probability of failure

Scientists use models to estimate seismic hazard, producing maps that show areas at high, medium, and low risk of earthquakes. These maps help engineers design structures that can withstand expected ground shaking. Fig 2 (a) shows the representing hazard curve developed using PSHA.

Seismic Exposure

Seismic exposure looks at what is at risk during an earthquake. This includes:

- 1. Buildings: Homes, offices, schools, and other structures.
- 2. Infrastructure: Roads, bridges, water supply systems, and power lines.
- 3. People: The population living and working in the area.

Exposure assessment involves counting and categorizing these elements to understand what might be affected during an earthquake. Higher exposure means more people and assets are at risk.

Seismic Vulnerability

Seismic fragility is used to show how vulnerable buildings and infrastructure are to earthquake damage based on the probability of exceedance of damage over the capacity of the structure. It depends on:

- 1. Building Design and Construction: Older buildings or those not built to modern standards are often more fragile.
- 2. Materials Used: Some materials, like reinforced concrete, perform better under seismic stress.
- 3. Maintenance and Upgrades: Regular maintenance and retrofitting can reduce fragility.

Engineers create fragility curves, which show the probability of different levels of damage for various types of buildings and infrastructure based on the intensity of ground shaking. Fig 2 (b) shows the representing seismic fragility curve.

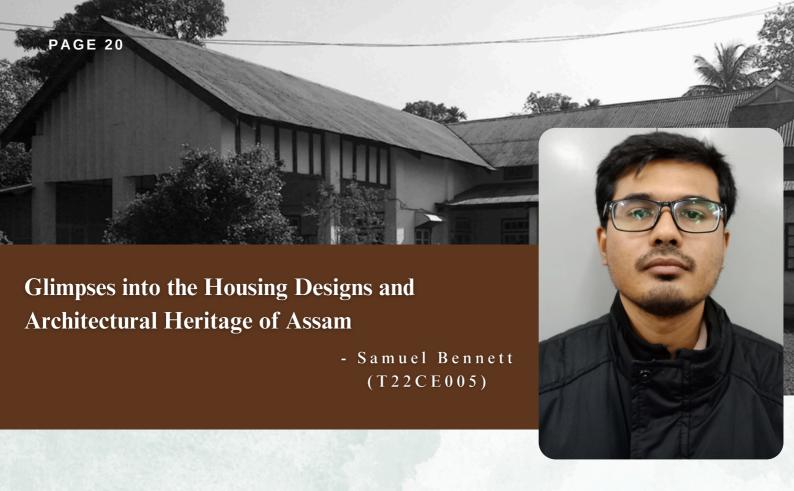
Putting It All Together: Seismic Risk

Seismic risk is the combination of hazard, exposure, and fragility. It answers the question: What is the likelihood of damage and loss during an earthquake? Here's how these components interact:

- 1. High Hazard + High Exposure + High Fragility: This combination leads to a high seismic risk. An area with frequent and strong earthquakes, densely populated with old buildings, is at great risk.
- 2. High Hazard + Low Exposure + Low Fragility: Even in a high-hazard area, if there are few buildings and they are well-built, the risk is lower.
- 3. Low Hazard + High Exposure + High Fragility: A place with rare earthquakes but many old, fragile buildings still face significant risk when an earthquake does occur. Fig 3. shows the components of seismic risk.



Understanding seismic risk through the lenses of hazard, exposure, and fragility planners and helps engineers informed decisions to protect people and property. By analyzing these factors, we design safer buildings, vulnerable structures, and develop effective emergency response plans. This comprehensive approach is essential for minimizing the impacts of earthquakes and enhancing community resilience.



Assam, located in the heart of Northeastern region of India is well known for its natural beauty and rich cultural heritage. From the serene banks of the mighty Brahmaputra to the vibrant markets brimming with diverse cultures, Assam embodies a tapestry of beauty and rich heritage. The state's diverse legacy is manifested in various forms ethnicities, customs of life, occupations, and architectural styles. The topography of Assam is uneven and mostly covered with green vegetation. The climatic condition is mostly humid but cool and cloudy during monsoonal season. Assam and its neighbouring states receive a significant amount of rainfall during the same period.

Housing designs around the world have largely been driven by local demand, available natural resources, cultural practices, and beliefs, depicting the unique identity of each place. Similarly, in Assam and parts of Northeastern region, housing designs and distinct architectural features are mostly driven by these important factors. This knowledge of housing design and building materials has evolved over time and has been passed down through generations. With the passage of time and the introduction of more modern, durable composites like concrete, the long heritage of traditional housing designs is fading away into the pages of history.

Compared to mainland India, Assam has always followed a very different form of vernacular construction practise and architectural design. Some of the notable housing typologies of Assam are Ekra house, Chang Ghar and Chung Bungalow.



Figure: The traditional Ekra or Assam-type House built in 1950 is the ancestral home of Nakul Chandra Bhuyan in the heart of Jorhat town. Source: Wikimedia Commons.



Figure: Chang Ghar, Assam
Source: Journal of Civil Engineering and
Environmental Technology Print ISSN: 23498404. Volume 1, Number 4; August, 2014 pp.

53 - 58

The "Ekra house" is commonly known as the Assam-type house and is primarily used for residential purposes. This 200-year-old construction practice involves wooden frames made from bamboo or Sal wood and Ekra reeds, which grow naturally on the banks of rivers and lakes.

The wooden frame and the wall panels of the superstructure are supported by a basic masonry foundation up to the plinth level. The bricks are generally made locally and baked in small ovens, and surkhi is produced by mixing lime, soil, sand, and jaggery, which is used as a binding material. This is done to avoid the intrusion of moisture and rainwater into the walls. The wall panels are made of bamboo frames filled with the shoots of Ekra reeds, which are plastered from both sides with a muddung mixture. The plastering on the wall was generally done using red soil mixed with lime.

This type of construction technique is known as Wattle and Daub construction. It helps in minimizing heat absorption and makes the structure light. The most common form of roofing technique used in this type of house is a sloping roof, which helps in draining rainwater. The roofing materials were made from thatch and bamboo, which were eventually replaced by galvanized tin reinforced with wooden frames. The layout of the Ekra houses is mostly L-shaped or rectangular, creating spaces for courtyards and better air circulation, making most of the rooms wellventilated and compact. The Ekra houses are commonly single-storey and rarely have two stories.

Chang Ghar or Chang House, also known as the "Stilt house," was originally built by the Mishing tribe of Assam. The Mishing tribe resided on the bank of the river Brahmaputra, and to mitigate the flooding problem during the monsoonal season, raised their houses a few feet above ground level. They also believed that the wild elephants, which are attracted to these grasslands, wouldn't attack houses on stilts. In this type of house, the superstructure rests on raised stilts, and a series of wooden steps are placed at the entrance. By climbing these steps, one can reach the porch and thereby access the house.

The general layout of the Chang Ghar is rectangular and is constructed over bamboo posts and bamboo diagonal bracings, which are tied together to form the stilt areas. However, nowadays, concrete pillars are also used instead of bamboo posts to enhance the durability of the stilted platforms. These houses have a large central kitchen for joint families, and the lower part of the house is used to provide shelter to pets. The floor is specially designed with bamboo flattened strings, nicely trimmed, which acts like a net facilitating the disposal of household waste directly into the basement. This waste is directly consumed by their domesticated pigs and poultry stocked in the basement. The ceiling and roof are tied across the bamboo posts with jute ropes using dowel and tenon joints.



Figure: Chameli Memsaab Bungalow Jorhat, Assam

https://jantreksandtravels.com/assammeghalaya-and-nagaland/

Chung Bungalow an innovative is housing design blends that traditionalism with modernity. These bungalows were built by the British during the 19th century when they came to Assam to start the tea business. The design philosophy behind bungalows was rooted in the colonial ideology of the time, which emphasized the superiority of European culture and the need to maintain control over the colonized population. The bungalows were intended to convey a sense of wealth, luxury, and control, reinforcing the social and economic status of the British colonial rulers and their appointed managers. They are named after the Chung or Central bungalows, which were the largest and most important bungalows on the tea estates.



These bungalows were typically built on pillars or stilts, raising them above ground. The pillars were made of bricks and were usually double-storied. The floors were usually made of wellpolished wood with more ornate designs. The wall panels were mostly made of Ekra and mud, similar to Assam-type houses. The roofs were tiled and often had sloping roofs with overhanging eaves. The interiors are spacious and well-ventilated, with high ceilings and large windows that allow for natural light and air circulation. Several renowned bungalows that have endured over time include, Wathai Heritage Bungalow in Tinsukia. Mancotta Heritage Tea Bungalow in Dibrugarh, Burra Sahib's Bungalow in Jorhat. and Chameli Memsaab Bungalow in Jorhat Assam.

In conclusion. while traditional housing in Assam and the Northeast region faces challenges such as fire proneness and termite infestation, its cost-effectiveness and adaptability to local climates make it a valuable asset. By understanding and addressing these challenges through modern engineering and innovative standards design approaches, we can create a sustainable and resilient housing solution for the region. The revival of vernacular architecture not only preserves cultural heritage but also offers practical solutions to housing problems faced by rural communities. Through scientific evaluation and strategic implementation, traditional housing can play a pivotal role in addressing housing shortages and promoting sustainable development in Assam and Northeast India.

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Environmental Air Quality Decline in Shillong–Meghalaya: A Comprehensive Analysis

- Kumar Gaurav (B20CE008)

The quality of air, a crucial determinant of human health and environmental balance, is heavily influenced by the presence of harmful pollutants. As populations grow and economic activities intensify, there is an increased demand energy, transportation, commerce, industry, and various resources, leading to a surge in air pollutants. These emissions include particulate matter (PM), sulphur oxides (SO x), nitrogen oxides (NO x), ozone precursors, and aerosols, which can cause respiratory illnesses, cardiovascular diseases, and premature death. In response, the Central Pollution Control Board (CPCB) in India has established a comprehensive nationwide monitoring network. Shillong, in the state of Meghalaya, faces rising air pollution due to urbanization, traffic, and commercial activities. Understanding the air quality in Shillong is essential for developing effective pollution control strategies and protecting public health.



The studies identify PM 2.5 as the primary pollutant of concern in Shillong, exceeding the permissible levels set by the National Ambient Air Quality Standards (NAAQS). The primary data source for this study is air quality data from the Central Pollution Control Board (CPCB), encompassing parameters such as PM 10, PM 2.5, NO 2, SO 2, CO, and O 3. The CPCB computes the Air Quality Index (AQI) from this data, providing a color-coded metric that aids in public advisories and pollution control strategies. This comprehensive monitoring and data analysis by the CPCB are crucial for understanding air pollution trends across India.



Findings reveal that PM 2.5 is the main pollutant in Shillong, frequently exceeding the National Ambient Air Quality Standards (NAAQS) [3]. Major pollution sources include vehicular emissions, industrial activities, and construction, especially from December to March. A decade-long analysis of air pollution in Shillong highlights significant challenges in addressing air quality issues in Meghalaya. High PM 2.5 levels in India are linked to numerous premature deaths and reduced life expectancy, with 2017 data showing an average PM2.5 exposure of 89.9 μ g/m³, far above the recommended limit of 40 μ g/m³. Additionally, reliance on solid fuels contributed to 1.24 million deaths that year. Effective air pollution reduction could increase India's average life expectancy by 1.7 years, with northern states seeing gains of over 2 years.[4], [5].

Concern

As the pollutants level in air is significantly increased in the years, gives us the scope to study about it and try to figure out the sustainable solution to control the air pollution in Shillong

RANGE	CATEGORY	IMPACT
0 - 50	GOOD	MINIMAL IMPACT
51 - 100	SATISFACTORY	SLIGHT BREATHING ISSUES
101 - 200	MODERATELY POLLUTED	BREATHING DIFFICULTIES FOR PEOPLE WITH LUNG & HEART DISEASES, CHILDRENS, & OLDERS
201 - 300	POOR	PROLONGED EXPOSURE MAY INDUCE RESPIRATORY DIFFICULTIES
301 - 400	VERY POOR	CAUSE RESPIRATORY AILMENTS & MAY BE EXACERBATED IN INDIVIDUALS WITH PRE-EXISTING CARDIAC CONDITIONS.
401 - 500	SEVERE	RESPIRATORY PROBLEMS IN HEALTHY INDIVIDUALS, THESE HEALTH IMPACTS MAY BE EXPERIENCED EVEN DURING LIGHT PHYSICAL ACTIVITY.

Sustainable solutions for air quality improvement

Utilizing data from reputable sources and rigorous analysis enables precise interventions to reduce emissions and improve air quality, fostering a healthier environment and advancing sustainability.

- ☑ **Identifying Pollution Hotspots:** Mapping contaminant dispersion identifies high pollution areas, allowing targeted emission reduction efforts.
- ☑ Tracking Pollution Trends: Long-term air quality analysis reveals pollution patterns and assesses mitigation strategies, aiding in policy development and accountability.
- ☑ Informing Public Health Decisions: Air quality data guides health advisories for vulnerable populations, including children, the elderly, and those with respiratory issues.
- ☑ Promoting Public Transportation: Encouraging public transport in Shillong can significantly reduce vehicular emissions, supporting sustainable urban development.
- ☑ Enforcing Stricter Emission Standards for Vehicles: Implementing tougher vehicle emission standards reduces harmful pollutants, protecting public health and environmental quality in urban areas like Shillong.
- ☑ Implementing Stricter Regulations for Commercial Activities: Stricter emission limits, pollution control technologies, and enhanced monitoring can effectively reduce harmful atmospheric pollutants.

Future scope and use of AI for air quality analysis

Unlike conventional statistical models that rely on predefined variable relationships, machine learning algorithms can process extensive air pollution datasets to identify complex patterns and correlations often missed by traditional methods. This ability allows machine learning models to adapt to changing emission trends and atmospheric conditions, providing more accurate and timely Air Quality Index (AQI) forecasts. Machine learning-driven AQI predictions not only improve forecast accuracy but also offer real-time updates that help individuals make informed decisions about outdoor activities, reducing exposure to harmful pollutants. Additionally, accurate AQI forecasts guide policymakers in implementing targeted pollution control measures, optimizing resource allocation, and enhancing mitigation efforts.

Conclusion

In conclusion, mitigating air pollution in Shillong, Meghalaya, requires a multifaceted approach. Identifying pollution hotspots and implementing targeted interventions are crucial. Continuous tracking of pollution trends is essential to assess the effectiveness of mitigation efforts and adjust strategies as needed. Promoting public transportation reduces vehicular emissions and traffic congestion. Stricter emission standards for vehicles and stringent regulations for commercial activities are necessary to curb emissions. Integrating artificial intelligence (AI) into air quality analysis can enhance forecasting accuracy and support proactive decision-making. By adopting these strategies, Shillong can achieve cleaner air and sustainable urban development.

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MY EXPERIENCE AS SENIOR ENGINEER

-SALIK AHMAD

Currently, I serve as a Senior Engineer at Larsen & Toubro Limited working on the MAHSR-C4 (Mumbai-Ahmedabad High Speed Rail) project. My first year with the company saw my role evolving continuously; I was responsible for ensuring the safe execution of work compliance with safety and government guidelines, Standard Operating Procedures (SOPs), Quality Control and Quality Assurance, Planning. This diverse responsibilities laid a solid foundation for my current role.

Now, I am primarily responsible for project management and ensuring client satisfaction. My position requires a blend of technical expertise, strategic thinking, and effective communication to ensure that our projects meet the highest standards of quality and efficiency.

One notable observation is that companies like ours have higher expectations from newly hired graduates. Graduates must be highly confident in their core subjects, such as Concrete Technology, Transportation Engineering, Surveying, and Building Materials, etc. to effectively interact with clients like the National High-Speed Rail Corporation Limited (NHSRCL) and T ata Consulting Engineers Ltd., C onsulting Engineers Group Ltd., A arvee Associates Architects Engineers & Consultant Pvt. Ltd. and P ADECO India Pvt. Ltd. (TCAP).



industry schedule The is very different from college days, and one adaptable be to these must conditions. However, for those who persevere, there are significant opportunities for growth. dedication Continued this to company can lead to achieving prestigious designations such as Independent Company (IC) Head, Strategic Business Group (SBG) Head, and even the CEO of this professionally managed multinational corporation.

To sum up, my journey in the engineering industry has been both challenging and rewarding. Our field is always changing, so we need to be flexible, keep learning new skills, and welcome new ideas. I look forward to seeing how new technologies and market demands will the future of our shape industry. My experiences taught me the importance of being resilient, adaptable, and committed to lifelong learning.

CAREER MILESTONE:

-SAPTARSHI PANDA

Internship at NE-SAC

The career of this burgeoning data scientist began with an invaluable internship at the North Eastern Space Applications Centre (NE-SAC). This experience provided a strong foundation, offering exposure to cutting-edge space applications and technologies. The hands-on experience gained during this internship not only honed technical skills but also fueled a passion for data science and its applications in real-world scenarios.



Data Scientist at Earth Analytics India

Building on the foundation laid during the internship, the next major milestone was a role as a Data Scientist at Earth Analytics India. From August 2023 to July 2024, this position involved tackling complex data challenges and contributing to meaningful projects. At Earth Analytics India, the focus was on utilizing data to understand and solve environmental issues, underscoring the importance of data science in addressing global challenges.

Post-Graduation at IIT Delhi

pursuit of academic excellence The continued with enrollment in the Master of Science (Research) program prestigious Indian Institute of Technology (IIT) Delhi in July 2024. This post-graduate program is a significant step towards deepening expertise and engaging in advanced research. IIT Delhi, renowned for its rigorous academic environment and cutting-edge research opportunities, provides the perfect setting to further enhance skills and knowledge.

GATE Qualification

An essential aspect of this journey is the consistent demonstration of academic prowess, evidenced by qualifying in the Graduate Aptitude Test in Engineering (GATE) in both 2023 and 2024. This achievement underscores a solid understanding of core engineering concepts and readiness for advanced study and professional practice.

Conclusion

These milestones collectively paint the a dedicated individual picture of significant committed to making contributions to the field of data science and environmental analytics. From an enriching internship to a critical role in a leading organization, and now advancing academic pursuits at IIT Delhi, the journey is a testament to hard work, continuous learning, and a passion for using data to make a difference.

CAREER MILESTONE FROM CIVIL ENGINEERING GRADUATE TO ASSISTANT MANAGER IN DATA ANALYTICS

-PAUL N GOPAL (B14CE004)



Since graduating from NIT Meghalaya in 2018 and joining Infosys through campus placements, my career has been a journey of continuous learning and growth. Transitioning from a Civil Engineering background to the IT industry was initially challenging, particularly during the training period where I immersed myself in learning new technologies.

After completing training, I embraced my role as a Cloud Support Engineer at Infosys, where I gained invaluable insights into the workings of the IT industry. This experience laid the foundation for my career progression.

In 2021, I embarked on a new chapter by joining Pricewaterhousecoopers as an Associate Consultant specializing in Data and Analytics. Here, I dedicated myself to upskilling in Power BI and Alteryx, tools crucial for modern data analysis.

In recognition of my contributions and leadership potential, I was promoted to Assistant Manager in 2023. In this role, I led numerous automation projects using Alteryx and UiPath, resulting in significant financial savings and operational efficiency for the company. My team and I received accolades for our innovative solutions, underscoring the impact of leveraging technology in business processes.

Throughout my six-year career journey, I've come to appreciate the importance of continuous upskilling and cultivating leadership abilities. I've learned firsthand the significance of understanding business dynamics and financial implications, essential for driving meaningful change within organizations.

Looking ahead, I am committed to embracing new challenges, expanding my skill set, and pursuing opportunities that align with my passion for innovation and efficiency in data-driven decision-making.

MY FIRST JOB EXPERIENCE AFTER COLLEGE

— SHASHANK CHAUDHARY (B17CE029)

I started my career as a civil engineer after completing my B.Tech. in Civil Engineering from NIT Meghalaya in 2021. I got a campus placement at KEC International Ltd. When I started, I was so excited to start my first job. At Construction Company, you will start your career as a Graduate Engineer Trainee in your first year, where they will give you training in every department, whichever is on your project site. There are 5 phases to any project: Initiation, Planning, Execution, Monitoring-Control and Completion. After B.Tech, we all have technical skills, but we don't know how to apply them to site projects. That doesn't mean our studies are not helpful. If you want to become a good engineer, then theoretical knowledge is a must so that you can relate your knowledge to practical site work. Now coming to my journey,

I started working in the quantity surveying department in the initial 2 months, where we have to calculate quantities of structural and finishing work after reading drawings, which will later help us plan things accordingly. After completing 2 months, I got transferred to the Execution Department, where my work was to make the Daily Progress Report (DPR), which helps managers plan things accordingly if we are lagging behind, and Tool Box Talk, which is for safety purposes, which we have to give to our labour daily because nothing is more important than anyone's life. In Execution, I applied my surveying skills to the excavation of the substructure with the help of Auto-level and Height-ofthe Instrument method, which I studied in the 2nd year of my B.tech. When it comes to footing and column casting, I again used my surveying

skills and Total station to mark the coordinates of the footing on the PCC bed as per the drawing. After that, I made a Bar-Bending Schedule (BBS) of steel for the footing and column. Remember one thing: our column should always stay in the centre. For that, we use a plumb bob before and after casting to check the verticality of the column. After completing 4 months of execution, I got transferred to the Quality Assurance/Quality Control Department for 4 Months, where I used to learn a lot of IS codes so that we could check our materials like aggregate, sand, cement, etc. regularly site inspection before casting of anything.

We have to check the shuttering and steel as per drawing for every stage we are having Checklists. Sometimes we have to conduct Non-destructive tests if our client has any doubts in the quality of our work. Layer wise Backfilling of soil in the substructure as per IS 1200. We have to conduct two tests on site before casting of any structural elements first one is Slump cone test(IS 1199) which is used to check the workability of concrete and another one is Compressive strength test (IS 516) where we cast cube moulds. So here I completed 10 months of training now for last 2 months I got transferred to Planning & Billing Department. Now the work of the Planning Department is to plan the project scheduling, where we have to fix the timing of each stage, which will help us to complete the project on time. For scheduling, we have two of the most famous software in the market right now: Primavera and MS Projects. Primavera is used for small projects of about 9-10 crores. And for bigger projects, most of the planning managers use MS Projects.

The second is the Budgeting part, here we calculate the budget of our whole project and then we compare that with our tender price to check the overall profit of our project which includes Zero Cost, JCR, procurement, Vendor Finalization, Negotiation etc. Now coming to Billing department, we have divisions: client billing subcontractor billing. Client billing involves taking money from our clients every month. We put up a bill for whatever work we did in the last month. And for our subcontractor; we have to release payment for their work whatever they have done in the last month. So. here I successfully completed my training period. After that my Line Manager/Project Manager fixed me in one of the department as per the recommendation of the department managers or my personal interest. I was promoted to Project Engineer. So this has been the experience of my training period. I hope you will find it useful. Best of luck!!





INTRODUCTION

On 26th April 2024, 29th April 2024 and 30th April 2024, the third and fourth-year B.Tech Civil Engineering students of NIT Meghalaya undertook an industrial visit to the Umiam Dam repair site. The purpose of the visit was to provide practical insights into dam repair techniques, specifically grouting methods, quality inspection processes including permeability tests, and the operational aspects of infiltration galleries. This report provides a comprehensive overview of the visit, highlighting the key learnings and observations made by the students.

The main objectives of the industrial visit were:

- 1. To understand the practical application of dam repair techniques, particularly grouting.
- 2. To learn about quality inspection processes, especially the permeability test.
- 3. To observe and comprehend the functioning and significance of infiltration galleries in dam maintenance.



Overview of Umiam Dam

Umiam Dam, also known as Barapani Dam, is a gravity dam located in the state of Meghalaya. It is primarily used for hydroelectric power generation and is a crucial infrastructure component for the region. The dam has been undergoing repair to address issues related to seepage and structural integrity.

Key Learnings and Observations

1. Dam Repair by Grouting Technique:

Grouting is a process used to fill gaps and voids in concrete structures to enhance their strength and reduce permeability. The students observed the following during the grouting process:

01

MATERIALS USED:

Different types of grout materials were introduced, including cementitious and chemical grouts.

02

INJECTION PROCESS:

The method of injecting grout under pressure into the dam's foundation and body to fill voids and cracks.





03

EQUIPMENT AND SAFETY MEASURES:

The various tools and machinery used in the grouting process, such as grout pumps, mixers, and injection rods. The importance of adhering to safety protocols to prevent accidents during the grouting operation.

2. Quality Inspection by insitu Pressurized Permeability Test

Permeability tests are crucial in assessing the water tightness of repaired sections of the dam. The students learned about: Steps involved in conducting permeability tests, including preparing test sections, measuring water flow, and recording data Understanding the significance of test results in evaluating the effectiveness of the repair work. The tools and instruments used for measuring permeability, such as permeameters and pressure gauges.

3. Infiltration Galleries

Visit to infiltration galleries and understand the inspection techniques. Infiltration galleries are horizontal or gently inclined tunnels constructed at the foundation of dams to collect and drain seepage water.

During the visit, the students observed:

Q (a) Design and Construction:

The structural design of infiltration galleries and their placement within the dam structure.

Q (b) Functionality:

How infiltration galleries help in reducing water pressure on the dam foundation by draining seepage water.

Q (c) Maintenance:

Regular inspection and maintenance procedures to ensure the effective functioning of infiltration galleries.

Conclusion:

The industrial visit to the Umiam Dam repair site was an invaluable experience for the third and fourth-year B.Tech Civil Engineering students of NIT Meghalaya. It provided them with a practical understanding of critical dam repair techniques, quality inspection processes, and the role of infiltration galleries in dam maintenance. The knowledge gained during this visit will undoubtedly enhance their academic learning and prepare them for future professional challenges in the field of civil engineering.

Acknowledgements:

We extend our sincere gratitude to the authorities at Hydro Planning and Hydro Construction, MePGCL for giving permission to visit the site. Mr. Manik Toi, Executive Engineer and the onsite team for taking time from the busy schedule for sharing their expertise. Special thanks to the Director, NIT Meghalaya, for motivating to visit the site and giving providing necessary guidance in this regards, HOD Civil Engineering Department, and faculty members of the Civil Engineering Department for organizing and guiding the students throughout the visit.

Civil Engineering Society



FIRST TECHNICAL EVENT

The Civil Engineering Society (CES) of NIT Meghalaya organized its first webinar (an online Lecture) from 5.00-6.00 PM on 23.02.2024.

Speaker Details:
Dr. Suman Kumar
Scientist, HSS Group,
CSIR-CBRI Roorkee, Uttarakhand.

Topic: Various Aspects of Building Demolition: Through the Demolition of the Supertech Twin Tower, NOIDA

Venue: Lecture Hall (LH)

Time: 5.00- 6.00 PM Date: 23.02.2024

Organized by:
CIVIL ENGINEERING SOCIETY,
NIT MEGHALAYA







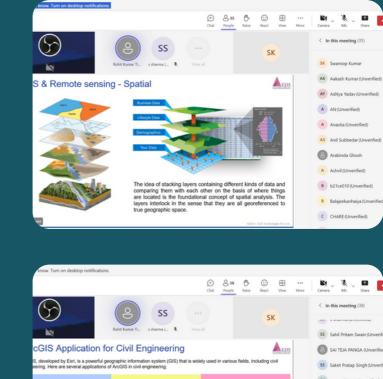
SECOND TECHNICAL EVENT

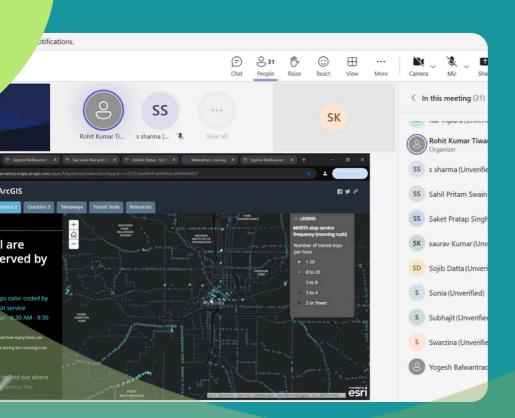
Webinar - "GIS & Remote Sensing Applications for Environmental Science & Civil Engineering"

Scheduled on- 6th June, 2024 at 11:30 AM.

Mode - Online

Taken by - Mr. Rohit Kumar Tiwari, a GIS Specialist at EDS Technologies Pvt. Ltd.







MERA PHELA VOTE DESH KE LIYE: ENCOURAGING FIRST-TIME VOTERS AT NIT MEGHALAYA

In a concerted effort to fortify the spirit of democracy and empower first-time voters, the Ministry of Education and Ministry of Youth Affairs launched the "Mera Phela Vote Desh Ke Liye" campaign. This initiative ran from February 28, 2024, to March 14, 2024, and included a series of events and activities organized at NIT Meghalaya. Our Civil Engineering department whole-heartedly participated and contributed to the success of this event. The campaign aimed to highlight the importance of voting and ensure that young citizens understood and exercised their democratic rights. Let's have a glance at the wonderful events organized by NIT Meghalaya.



To promote electoral literacy, various selfie points were strategically placed across the temporary campus at Shillong and the permanent campus at Sohra. Students took pictures and shared them on social media to spread awareness among their peers.

2. Voter's Pledge:

An offline voter's pledge was administered during the campaign, with students encouraged to also take the pledge online via the mygov.in website(https://www.mygov.in/mera-pehla-vote/? target=webview&type=campaign&nid=0).



3. Reels Competition:

An inspiring reel-making competition was held to motivate young voters to create and share content promoting the importance of voting.







4. Drawing and Poetry Competition:

A drawing competition on the theme of "Chunav ka Parv" (Festival of Elections) and a poetry competition on "Chunav: Mera Desh ka Garv" (Election: My Country's Pride) was organized to help students express their thoughts and feelings about the electoral process through art and poetry.

5. Educational Documents, Election Guide Book, and Guidance Lectures:

Throughout the campaign, educational documents were shared with students via email. Short lectures were organized to discuss the electoral process, how to use the voter guide, and the importance of downloading the Voter Helpline app.

Students are the future of a nation. The faculty and staff at NIT Meghalaya hence decided to engage their students in the progress of the promising future of our nation. The "Mera Phela Vote Desh Ke Liye" campaign successfully engaged students at NIT Meghalaya, instilling a sense of responsibility and enthusiasm towards voting. The various activities and competitions not only educated first-time voters but also created a supportive community that encouraged civic participation. By pledging to vote and promising to motivate their friends and family to do the same, these young citizens contributed to the democratic process and the development of India.





Figure 5: Snapshots of guidance lecture and sharing of hard copies of Voter's Guide to Class Representative, soft copies distributed by mail.



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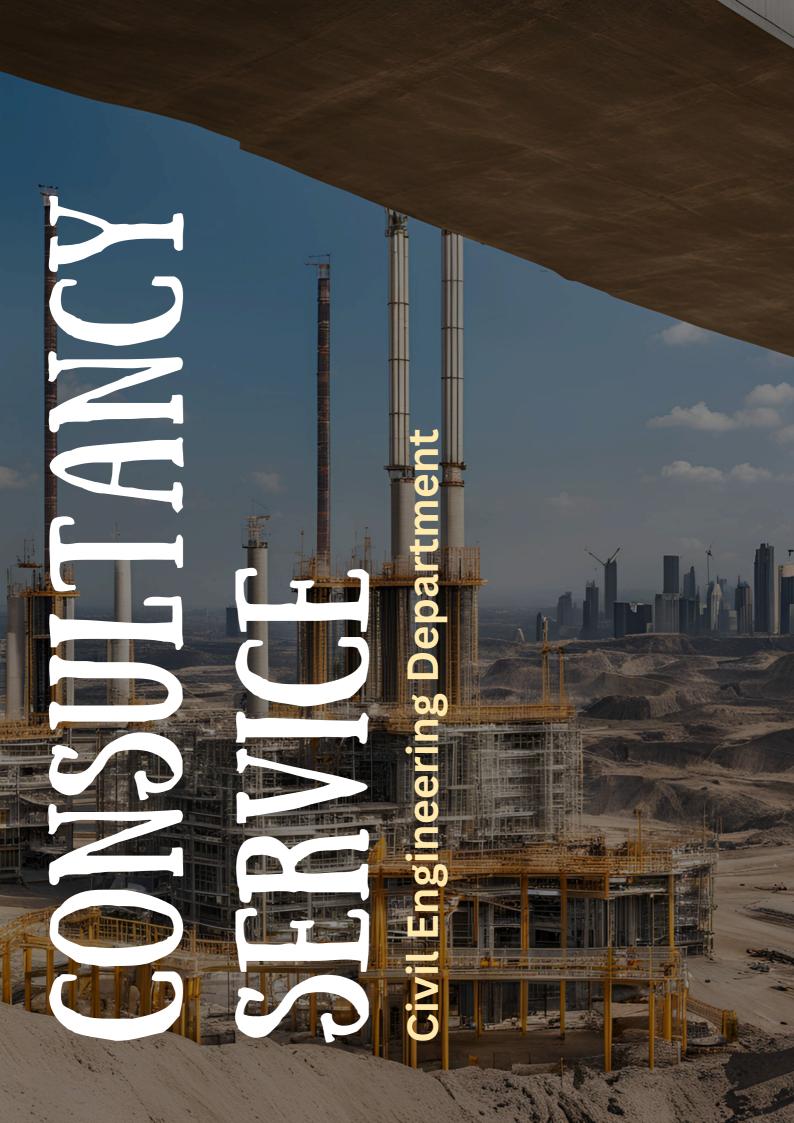
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- 13. Salim Barbhuiya, Bibhuti Bhusan Das, Dibyendu Adak, Advancements and perspectives in engineered cementitious composites (ECC): a comprehensive review, Magazine of Concrete Research, 2024, 1-46.
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- 2. A.Goswami, H. M. Kalita, A SemiCoupled Numerical Model for 1D Morphodynamic Flow Simulation, InternationalWater Conference for Sustainable Development Goals-2024, Maulana Azad National Institute of Technology Bhopal, March 22-23, 2024



Consultancy Services at the Department of Civil Engineering, NIT Meghalaya: Driving Innovation and Solutions

The Department of Civil Engineering at NIT Meghalaya is proud to offer a comprehensive range of consultancy services aimed at addressing the challenges and needs of the civil engineering industry. Leveraging the expertise of our faculty members and state-of-the-art laboratories, The Department deliver high-quality solutions in various domains of civil engineering. Our consultancy services are designed to benefit government agencies, private industries, and public sector organizations, contributing to the infrastructure development of the region and beyond.

Our Key Consultancy Areas

1. Structural Engineering:

Department provide expert consultancy in structural design, analysis, and optimization. Our services include evaluation of existing structures, design of infrastructure, structural monitoring, and advanced solutions for structural complex problems using technologies modern such as nondestructive testing (NDT).

2. Transportation Engineering:

With experience extensive in transportation planning and design, The Department offer services such as pavement design, traffic analysis, road safety audits, and transportation systems optimization. Our team works developing efficient, safe, and sustainable transportation networks that cater to growing urbanization needs.

3. Geotechnical Engineering:

Our geotechnical consultancy services investigations, cover soil foundation slope stability, and earth analysis, structures. The retaining Department specialize in offering solutions for difficult landslide-prone terrains. areas. earthquake-resistant designs, ensuring the stability and longevity of infrastructure projects.

4. Environmental Engineering:

As environmental sustainability becomes more critical, our department provides consultancy services focused on water and management, air quality waste management, and pollution control. The Department assist industries municipalities in implementing environmentally sound practices and meeting regulatory standards.

5. Water Resources Engineering:

Our expertise in water resource management includes hydraulic analysis, flood management, drainage systems design, and watershed management. The Department assist in sustainable water resource development, ensuring efficient use of this vital resource.

6. DPR Vetting & Third-Party Audits:

Our department offers vetting services for Detailed Project Reports (DPRs) and conducts third-party audits to ensure compliance with standards and best practices. These services help in identifying and mitigating risks at an early stage, improving the overall success rate of projects.

7. Non-Destructive Testing (NDT) of Structures:

The Department is specialize in NDT methods to assess the integrity and durability of concrete and steel structures without causing damage. This service is essential for maintenance, retrofitting, and ensuring the safety of structures such as bridges, buildings, and industrial installations.

Our consultancy services are driven by cutting-edge research. of a team experienced faculty, and advanced technical facilities. The Department strive to provide solutions that are costeffective, efficient, and sustainable, tailored to meet the specific needs of each client. Our approach is based on scientific principles, modern technologies, and realworld experience, ensuring that our clients receive reliable and innovative solutions.



DAUGHTERS OF INDIAN SOIL

DR. SMRUTIREKHA SAHOO



Smrutírekha Sahoo

I am Dr Smrutirekha Sahoo, currently working as an Assistant Professor in the Department of Civil Engineering at NIT Meghalaya since 2015, and also a mother of two lovely children (a 7-year-old Son, Master Shivansh Sasmal, and a 4-year-old daughter, Miss Saanvi Sasmal).

I was born in a small town in Keonjhar, Odisha, on 27th April 1988. Since my parents worked in different towns, I stayed with my mother till I was five years old and then stayed with my father to have my schooling at Jhadeswar Nodal U.P. School, Odisha. When I was in Class 5, I got selected through the Jawahar Navodaya Vidyalaya Selection Test (INVST) conducted by CBSE to have my further studies from class 6 to 12 in Jawahar Navodaya Vidyalaya Hadagarh (JNV Hadagarh), which is a free of cost and fully boarding school. Then, I did my BTech in Civil Engineering from BIET under BPUT Rourkela, Odisha, in 2009. As I qualified in GATE 2009 and had Geotechnical Engineering as my favorite subject during BTech, I decided to join MTech in Geotechnical Engineering at NIT Rourkela, Odisha. Immediately after my MTech in 2011, I joined for PhD in Geotechnical Engineering in July 2011 at IIT Delhi under the guidance of Prof Bappaditya Manna and Prof K G Sharma to strengthen my knowledge and get better career opportunities. On 2 November 2015, I joined NIT Meghalaya after finishing the experimental and numerical works and while writing my PhD thesis. There were a few ups and downs on my personal and professional fronts since then for a few years, and finally, I got my PhD on 22nd June 2017 (i.e., thesis titled "Seismic response of steep nailed soil slopes – shaking table tests and analysis").

At NIT Meghalaya, I have been associated with several academic and administrative responsibilities assigned to me from time to time and extended contributions to various outreach activities whenever I got an opportunity to do so. I have completed three sponsored R&D projects amounting to 38 lakhs (approx.), including the prestigious Early Career Research Award from SERB, DST and 13 consultancy projects amounting to 39 lakhs (approx.). I have received several awards and recognitions from various agencies and organizations and delivered several invited talks at various Institutes. I have guided 11 BTech and MTech projects to date and am currently guiding 3 Ph.D. scholars, one of whom is about to submit her thesis. I have published 26 research articles in various reputed national and international Journals, book chapters, and conferences. I have been the reviewer of various national and international Journals. I have also attended and participated in various national and international conferences, workshops, and short-term courses to enhance my knowledge and broaden my expertise in interdisciplinary research.

For the young girls of India: Nothing can stop you from achieving something great if you believe in yourself and give your sincerest effort. And don't forget to take care of yourself.

A woman's real success and happiness is having a good career-family balance, which is only possible if she can have a supportive environment from her family.

DR. SUSMITA SHARMA



Susmita Sharma

I am Dr. Susmita Sharma, currently serving as an Assistant Professor in the Department of Civil Engineering at NIT Meghalaya. As the daughter of a Civil Engineer with 40 years of experience in the field, I was exposed to civil engineering from an early age. The unwavering support and encouragement from my parents have played a crucial role in shaping my educational and professional journey. I completed my early education in Guwahati, Assam, India, and went on to graduate from Assam Engineering College. Subsequently, I pursued my post-graduation degree at IIT Bombay.

My time at IIT Bombay was truly inspiring. Mentoring by Prof. DN Singh and receiving care from Ritu Maam from the very beginning were memorable experiences that significantly influenced my life. The initiation of my Ph.D. in the ENVGEO lab marked a turning point when Prof. DN Singh posed intriguing questions about the philosophy behind soil characterization and its response to anthropogenic influences. This led me to specialize in geoenvironmental engineering, exploring the impact of activities like waste disposal and leaching on soil properties. The experience broadened my understanding of the physical, chemical, mechanical, and durability changes in soil, posing challenges to engineering applications. An unexpected opportunity to investigate the impact of microbes on soil properties and engage in DNA extraction from soil came through a Fellowship from the European Commission via the Marie Curic IRSES GREAT at the University of Strathclyde Glasgow.

Transitioning to NIT Meghalaya brought about a unique experience. The state, adorned with majestic rivers and lush hills, also faced challenges, notably landslides and the impact of waste dumps on soil and water. My work involved examining changes in the land surface due to rapid urbanization, revealing that each landslide case is unique. The quality of waste disposal is a particular challenge due to seasonal tourism and the socio-economic conditions of the local population. Engaging in research, consulting, and teaching, I've worked in Meghalaya, Assam, and Manipur. My primary areas of interest in geotechnical engineering include bio-cemented soil characteristics, soil-water-pollutant interaction, and valorization of waste.

As a consultant/technical member, I was appointed by the Central Pollution Board to review environmental reports related to waste management and groundwater quality evaluations of SPCBs. Additionally, I serve as the Vice Chair of the Technical Oversight Committee (TOC) of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE).

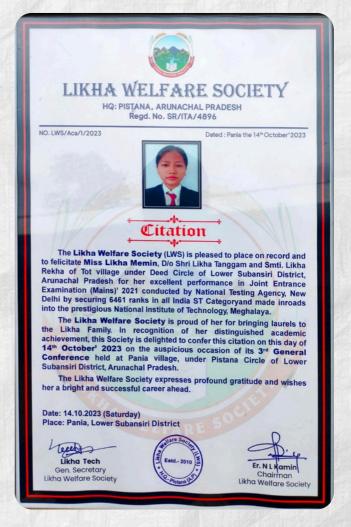
LIKHA MEMIN RECEIVES ACADEMIC EXCELLENCE AWARD FOR JEE PERFORMANCE

On October 14, 2023, Likha Memin was honored with an Academic Excellence Award for her outstanding performance in the Joint Entrance Examination (JEE) conducted by the National Testing Agency, New Delhi. Likha Memin secured an impressive 6461st rank in the All India ST category.



The award ceremony, organized by the Likha Welfare Society, took place in Pania village, under Pistana Circle of Lower Subansiri District in Arunachal Pradesh. The event celebrated Likha Memin's achievement and highlighted the potential within the community.

Members of the Likha Welfare Society expressed their delight in conferring the citation, commending Likha Memin for her perseverance and commitment to education. This recognition serves as an inspiration to students in the other region, underscoring the importance of academic excellence.



5TH RESEARCH CONCLAVE 2024

Awarded prize for the outstanding paper presentation at the prestigious "5TH RESEARCH CONCLAVE 2024" event organised by the NIT Meghalaya.



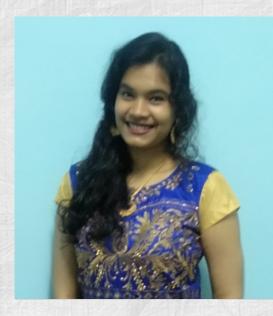
The research titled "Landslide susceptibility mapping for East Jaintia Hills region, Meghalaya, India". This study maps the landslide susceptibility with 121 landslide inventory locations and nine conditioning factors such as Slope, LULC, distance to road and drainage, geomorphology, geology, NDVI, aspect and rainfall. The study's findings specify that 18.5% of the geographical area under high to very high susceptible zonesand roadside regions are exceptionally vulnerable to recurrent landslides. This research recommends local authorities prioritize areas in high and very high vulnerability zones. Before beginning building projects in high susceptibility zones, it is essential to do thorough stability studies for critical slope sections.



AVISHEK GOSWAMI (P21CE006)

Best paper award under theme'Hydrological Modelling and Forecasting' in IWCSDG 2024 International conference organised by MANIT Bhopal, M.P.





ANJALI KUMARI PRAVIN KUMAR PANDEY (P21CE007)

Best poster award at 5th research conclave hosted by NIT Meghalaya





LABORATORY

STRUCTURAL ENGINEERING LAB

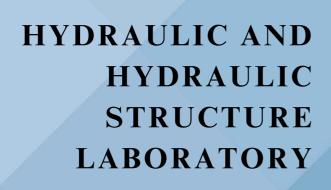


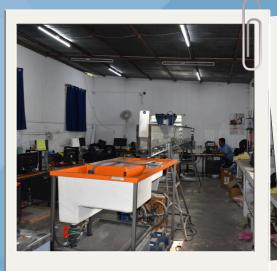


TRANSPORTATION ENGINEERING LAB

GEOTECHNICAL ENGINEERING LAB









ENVIRONMENTAL ENGINEERING LAB

DRAWING HALL

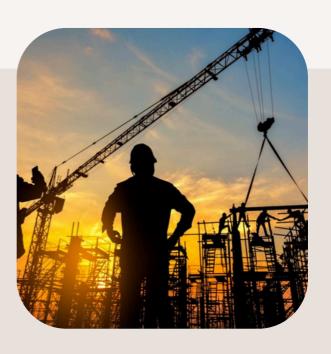






FACULTIES







DR.COMINGSTARFUL MARTHONG

PH.D, IIT GUWAHATI
PROFESSOR

RESEARCH INTEREST

Retrofitting and Rehabilitation of RC structures, Earthquake Resistant Design of Structures, Seismic vulnerability study of Structures, Masonry structures.

HEAD OF DEPARTMENT

DR. PRADEEP KUMAR GAUTAM

PH.D, NIT JAIPUR

ASSISTANT PROFESSOR

RESEARCH INTEREST

Highway Materials, Performance analysis of pavement containing waste materials, Sustainable use of waste as construction and building materials, Low cost roads.







DR. HRIDAY MANI KALITA

PH.D, IIT GUWAHATI

ASSISTANT PROFESSOR

RESEARCH INTEREST

River flow modeling, Shallow water flow, optimization techniques

DR. DEBABRATA PODDER

PH. D., IIT KHARAGPUR

ASSISTANT PROFESSOR

RESEARCH INTEREST

Structural analysis and design, Welding induced deformations, and residual stresses, Fatigue behaviour of welded structures.

DR. DIBYENDU ADAK

PH.D, JADAVPUR UNIVERSITY

RESEARCH INTEREST

Structural Engineering and Material, Design of concrete structures, Concrete Science and Technology.







DR. G C DHAL

PH.D. (IIT BHU), M.TECH (IIT GUWAHATI)

ASSISTANT PROFESSOR

RESEARCH INTEREST

Air Pollution Control, Water and wastewater treatment, Solid Waste Management, Environmental Impact Assessment, Application of Catalysis in Environmental Protection.

DR. NEEDHI KOTOKY

PH.D. (IIT GUWAHATI)

ASSISTANT PROFESSOR

RESEARCH INTEREST

Large Scale Experimental Testing of Structures under Lateral Loads; Seismic Retrofitting and Performance Assessment of Buildings and Bridges; Usage of Advanced Materials for Improved Seismic Performance

DR. M. L. PATTON

PH.D, IIT GUWAHATI

ASSOCIATE PROFESSOR & ASSOCIATE DEAN P&D

RESEARCH INTEREST

Thin-walled structures; Concrete filled Steel tubular structures; Steel structures; Composite Steel and Concrete Structures





DR. RUBI CHAKRABORTY

PH.D. (IIT GUWAHATI)

ASSISTANT PROFESSOR

RESEARCH INTEREST

Stability and Stabilization of Slopes, Seismic behaviour of Retaining Structures, Probabilistic geotechnical site characterization, Probabilistic study of geotechnical structures, Landslide Susceptibility Mapping

DR. SUSMITA SHARMA

PH.D, IIT BOMBAY

ASSISTANT PROFESSOR

RESEARCH INTEREST

Geomaterials Characterization, Soil-contaminant interaction, Biogeotechnology, Ground Improvement Technique, Water pollution and treatment, Valorization of Waste

DR. SMRUTIREKHA SAHOO

PH.D, IIT DELHI
ASSISTANT PROFESSOR

RESEARCH INTEREST

Geotechnical Engineering based Model Testing, Finite Element Method application in Geotechnical Engineering, Ground Improvement Techniques, Geotechnical Earthquake Engineering, Slope stability, Instrumentation, Real Time-Monitoring and Remediation of real field conditions.



BTECH 22-26 BATCH

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DR. G C DHAL



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- Gilleon Khonglah Ropmay (B20CE002)



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- Alfie Doreen Nongsiej (B20CE005)



- Bannangshai Herschelle Lyngdoh (B20CE006)



- Embhahlang Biam (B20CE007)



- Kumar Gaurav (B20CE008)



- Bachallakura Sai Upendhar (B20CE009)





- Willy Reade Jaba (B20CE010)



- Mebanjop Dkhar (B20CE011)



Ardari I ka Suiam (B20CE012)



- Nathaniel Rymbai (B20CE013)



- Richard Puwein (B20CE014)



- Balajiedlang Kharwanlang (B20CE015)



- Maybryan Wahlang (B20CE016)



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- Utkarsh Vaish (B20CE018)



- Kristi Singhania (B20CE020)



- Amit Kumar (B20CE022)



- Lalnunthasili Darnei (B20CE023)



- Amit Kumar Patel (B20CE026



- Yuvraj (B20CE027)



- Utkarsh Ranjan (B20CE029)



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BTECH 21-25 BATCH

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-Rangkynsai Mylliem Umlong (B21CE009)



- Mirazul Haque Laskar (B21CE010)



- Dawanbiang Shangpliang (B21CE012)



- Manish Kumar Bishnoi (B21CE013)



- Likha Memin (B21CE014)



- Dapborlang Sohtun (B21CE015)



- Willson Snaitang (B21CE016)



Narendra Kumar (B21CE017)



- Y Mhathung Patton (B21CE018)



- Ankit Choudhary (B21CE029)



- Tappeta Swaroop Kumar (B21CE019)



- Shweta Singh (B21CE031)



- Apphiralang Syiemiong (B21CE022)



- Dibelson Lyngkhoi (B21CE032)



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- Jenny Fersha Dhar (B21CE033)



- Damemanbha Lyngdoh Lyngkhoi (B21CE024)



- Vasundhara Singh (B21CE035)



- V.Shyam Sundar (B21CE025)



- Kundan Kumar (B21CE036)



- Purlemla Longkumer (B21CE027)



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- K Lalrindika (B22CE013)



- Neelkantha Mandal (B22CE014)



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- Saurav Kumar (B22CE029)



- Ajmire Harshada Nitin (B22CE030)



- Dathrangki Shylla (B22CE032)



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-Biandik Bianchisa D Sangma (B23CE004)



- Raunak Prabhakar (B23CE005)



- Gaurav Kumar Singh (B23CE006)



- Imlitongzuk Aier (B23CE007)



- Deisica Marbaniang (B23CE008)



-Wanrisuk Khyriem (B23CE009)



-Govindam Kumar (B23CE010)



- Noanchi R Marak (B23CE011)



- Ridahun Nongkhlaw (B23CE012)



- Hiyashree Sarma (B23CE013)



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- Binnada Yamuna (B23CE015)



-Freddy Kharkylliang (B23CE022)



-Iahunlang Kharmynthon (B23CE016)



- Mewantei S. Marbaniang (B23CE023)



- Manish Kumar (B23CE017)



- Antonia Charliza Lyngdoh (B23CE024)



- Mukesh Kumar (B23CE018)



- Nakalasengkyrhai Lyngdoh Kynshi (B23CE025)



- Mebanker Khongstia (B23CE019)



-Saksham (B23CE026)



- Satyam Singh (B23CE020)



- Da I Barisha Lyngkhoi (B23CE027)



-Badaaihun Snaitang (B23CE021)



- Saloni Singh (B23CE028)



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- Priyanchi A Sangma (T22CE004)



- Samuel Bennet (T22CE005)





- Ralsan Vensley Laitthma (T23CE001)



- Pynkmenlang Lytan (T23CE002)



-Daphihun Pyngrope (T23CE003)



- Aibok Khasain Shabong (T23CE004)



- Gabriel Handell Sohkhlet (T23CE005)



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