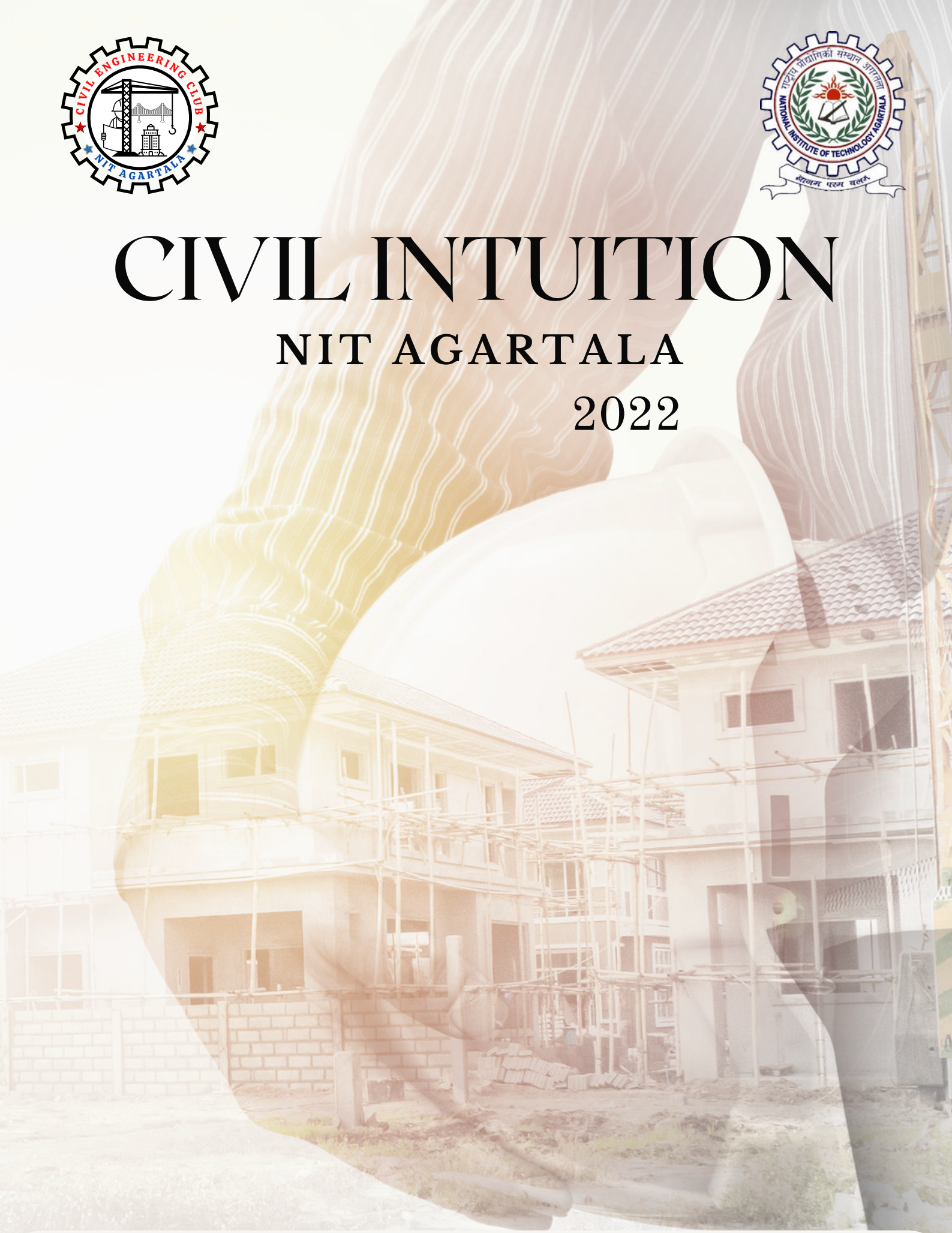


CIVIL INTUITION

NIT AGARTALA

2022

"Discovering New Perspectives on the Challenges of Our Time."
Our magazine aims to offer fresh insights and challenges we face today.

Message from the Magazine Team

We are very happy to share our department's e-Magazine "Civil Intuition" with all of you. The Civil Engineering Department, NIT Agartala, is a vital part of the Institute and also holds national identification. In the pages that follow, we try to give a peek into what the department encompasses, and we hope that this magazine comes to be a worthwhile read to all those who wish to get a quick abstract of the department. We would also like to express our heartfelt gratitude to our respected HoD, Dr. Rajib Saha Sir, including all the staffs and faculty members of our department, who have helped us with their invaluable suggestions. Without them, this magazine could not have taken shape.

We hope the magazine will cater to a broad array of readers' interests. The edition features all the key events that happened during the session 2019-22. A heartfelt 'Thank You' to all the faculty, staff, and students who made this magazine so varied in its contents through their contributions in different forms. While we have tried through all our might to keep the content errorless, the readers may come across mistakes or typographical errors. Kindly accept our profound apologies for the same.

Thanks once again.
Regards.

Dr. Animesh Debnath
Assistant Professor

Bibek Saha
Ph.D. Scholar

Subrata Paul
Ph.D. Scholar

Subhajit Das
M.Tech Scholar

Manish Raj
B.Tech Student

Priyanshu
B.Tech Student

Contents

Message from HOD

Dr. Rajib Saha
Head of Civil Engineering Dept.
NIT Agartala

Message

It gives me immense pleasure and satisfaction in expressing my appreciation to “Civil Intuition”, the e-magazine published by Civil Engg. Department of NIT Agartala. I use this opportunity to congratulate all the stakeholders who have put in sincere efforts for the efficient functioning of the e-magazine, especially the Faculty coordinator, Committee members and the Student members. I sincerely hope that this e-magazine team keeps up the good work and wish them success in their future endeavours. Stay inspired and scale new heights.

Since its foundation, when it was known as Tripura Engineering College (TEC), the Civil Engineering Department has experienced enormous growth. Now, it is regarded as one of the top Engineering Departments in the institute, Tripura state and North-Eastern region. It offers top-notch learning and research, thanks to its diverse faculty members. For people who join the department as faculty or students, we offer very attractive facilities and a setting. Our department is one of the top choices in the nation for Civil Engineering among JEE (Mains) qualified applicants who choose to enroll in the undergraduate (UG) program (B.Tech). This department is one of the most sought-after to join for postgraduate (PG) programs for GATE qualified applicants as well as non-GATE qualified applicants.

I am assured that, the Department will magnify to the new heights of distinction in the years to come with the gruelling efforts of all the stakeholders. In this regard, the e-magazine ‘Civil Intuition’ will play an essential role to strengthen the connection between all stakeholders.

Warm Regards.

Dr. Rajib Saha

Vision, Mission and Background of Civil Engineering Department

Vision:

- Civil Engineering Department is committed to contribute excellence in research, scientific and technical education to the nation.

Mission:

- To impart quality education for fundamental knowledge in engineering science and technology with social responsibilities.
- To develop the engineering background of students towards employability, entrepreneurship and higher learning.
- To undertake collaborative projects to create opportunities for long-term industry-academia interactions.
- To develop continuous improvement in teaching learning process.

Background:

The Civil Engineering Department was established in the year 1965 and is now recognized as one of the leading departments with infrastructure and facilities to match the very best in the country. The Civil Engineering Department of the Institute has produced so many technocrats who are serving the country as well as successfully settled in abroad. The department has been involved with so many research works and produced some excellent outcome.

PEOs and PSOs of Civil Engineering Department, NIT Agartala

Program Educational Objectives (PEOs)

- To empower students for attaining competence in identifying, formulating and solving Civil Engineering problems by applying their knowledge in the field of science and computation skills to meet the challenges, demands and expectations of global society.
- To establish an understanding of professionalism, ethics, quality performance in order to become professional leaders and contributors to the society.
- To initiate program for life-long learning that provides continuous development of the technical abilities and professional skills.
- To develop communication skills in every mode so as to become successful professionals and entrepreneurs.
- To encourage the students in developing public policy, safety and sustainability to be a professional in solving Civil Engineering problems and producing solutions.
- To instill skills to analyze and design systems, specify project methods and manage technical activities in support of Civil Engineering projects.

Program Specific Objectives (PSOs)

- Analysis, Design, investigation of complex problems in ways which are sustainable and environmental friendly.
- Handling of any Civil Engineering projects ethically either as an individual or as a team.

Departmental Faculties

Dr. Rajib Saha
(Associate Professor & Head)
rajib_2s123@rediffmail.com

Dr. Sanjay Paul
(Assistant Professor)
sanjaypaul76@gmail.com

Dr. Umesh Mishra
(Professor))
umishra123@rediffmail.com

Dr. Surajit Das
(AssistantProfessor)
surajit2006r@gmail.com

Dr. R. P. Sharma
(Professor)
richisharma.sharma@gmail.com

Dr. S.K. Biswal
(Assistant Professor)
sushantb69@gmail.com

Dr. S. K. Pal
(Professor)
skpal1963@gmail.com

Dr. Mrinmoy Majumder
(Assistant Professor)
mmajumder15@gmail.com

Dr. Manish Pal
(Professor)
mani_nita@yahoo.co.in

Dr. Lipika Halder
(Assistant Professor)
erlhalder@yahoo.co.in

Dr. Ratul Das
(Professor)
ratulnitagartala@gmail.com

Dr. Gopi Nandan Day
(Assistant Professor)
gopinita@ymail.com

Dr. Rama Debbarma
(Associate Professor)
ramadebbarma@gmail.com

Dr. Joyanta Pal
(Assistant Professor)
j joyantanita@yahoo.com

Dr. Sima Ghosh
(Associate Professor)
simacvl@gmail.com

Mr. Nilotpal Debbarma
(Assistant Professor)
dbnilotpal@gmail.com

Departmental Faculties

Dr. Dipankar Sarkar
(Assistant Professor)
dipankarnita@gmail.com

Mr. Subhajit Deb
(Assistant Professor)
d_subhajitdeb@yahoo.co.in

Dr. Deb Dulal Tripura
(Associate Professor)
debdulaltripura@gmail.com

Mrs. Nabanita Bhowmik
(Assistant Professor)
bhowmik.naba@yahoo.in

Dr. Partha Pratim Sarkar
(Associate Professor)
ps_partha@yahoo.com

Dr. Tilottama Chakraborty
(Assistant Professor)
tilottama86@gmail.com

Dr. Tara Sen
(Assistant Professor)
tarasen20@gmail.com

Mrs. Sadria Begam
(Assistant Professor)
sadria.rubi@gmail.com

Dr. Animesh Debnath
(Assistant Professor)
debnathanimesh@gmail.com

Mrs. Dipika Debnath
(Assistant Professor)
rituu2011@gmail.com

Dr. Dhirendra Kumar Pandey
(Assistant Professor)
dkp.nita@gmail.com

Mrs. Nabina Khanam
(Assistant Professor)
nabinanits@gmail.com

Dr. Sagarika Panigrahi
(Assistant Professor)
panigrahisagarika1@gmail.com

Mr. Debashish Karmakar
(Assistant Professor)
debashishkarmakar05@gmail.com

Dr. Manu S Nadesan
(Assistant Professor)
msn10@iitbbs.ac.in

Mr. Ratnadeep Modak
(Assistant Professor)
ratnadeepmodak@yahoo.in

Workshop/Short Term Course Organized

- Webinar on **'Demolition of Supertech Twin Tower, Noida – A case study: Experience and Challenges'** (Coordinator: Dr. Rajib Saha & Dr. Dipankar Sarkar) on September 15, 2022.

- Seminar on **'Energy Measurement to Standardise SPT'** (Coordinator: IGS Agartala Chapter in association with CE Dept.) on September 9, 2022.
-
- Symposium on **'Soft Measures for Flood and Erosion Control'** (Coordinator: Dr. Rajib Saha) on 26th July, 2022.

- Webinar on **'Importance of Geotechnical and Geophysical Investigation & its advancements'** (Coordinator: IGS Agartala Chapter in association with CE Dept.) on June 24, 2022.

- Short Term Course on **'Capacity Building in Geo-spatial Technology'** (Coordinator: Prof. Umesh Mishra) w.e.f Nov 29 to Dec 19, 2019 & May 25 to June 14, 2022.

- Workshop on **'Recent Advancements & Emerging Economic Aspects of Transportation Geotechnology'** (Coordinator: Dr. Rajib Saha & Dr. Dipankar Sarkar) w.e.f December 20 to 24, 2021.

- International Workshop on **'Ground Improvement: Emerging and Future Developments'** (Coordinator: IGS Agartala Chapter in association with CE Dept.) on September 26, 2020.

- IGS-NABL webinar on **'Importance of testing and evaluation of geotechnical properties for better infrastructure'** (Coordinator: IGS Agartala Chapter in association with CE Dept.) on August 29, 2020.

- Webinar on **'Use of Geogrids in flexible pavements'** (Coordinator: IGS Agartala Chapter in association with CE Dept.) on June 30, 2020.

- Workshop on **'Landslide hazards & Mitigation in Atharamura region of Tripura State'** (Coordinator: Dr. S.K. Pal & Dr. S. Paul) on October 30, 2019.

- Workshop on **'Advanced Seismology, Seismic Hazards & Earthquake Engineering'** (Coordinator: Dr. Sima Ghosh) w.e.f December 12 to 17, 2019.

- Workshop on **'Recent Trends on Water and Wastewater Treatment'** (Coordinator: Dr. Animesh Debnath & Dr. S.K. Biswal) w.e.f August 12 to 16, 2019.

- Workshop on **'Importance of Seismic Microzonation of Indian cities'** (Coordinator: IGS Agartala Chapter in association with CE Dept.) w.e.f June 03 to 07, 2019.

- Workshop on **'Dynamics of Foundation'** (Coordinator: Dr. Rajib Saha) w.e.f June 03 to 07, 2019.

- Conference on **'Geo-Hazards and Future Developments of Civil Engineering'** (Coordinator: IGS Agartala Chapter in association with CE Deptt.) w.e.f November 2 to 3, 2018

Symposium on "Soft measures for flood and erosion control" on 26th July, 2022

A Symposium on **"Soft measures for flood and erosion control"** was organized by Civil Engineering Department NIT Agartala in association with Bramhaputra Board, Agartala Division under Ministry of Jal Shakti, Govt. of India on 26th July,2022. The event was organized in contemplation of celebrating 75th anniversary of India's Independence **'Azadi ka Amrit Mohatsav'.**

The inauguration of the session was started by lightening a lamp by the dignitaries on the stage and a welcome address by HOD Civil Engineering Department NIT Agartala. The session was chaired by Chief Guest- **Prof. H.K. Sharma, Director NIT Agartala**; Chief Engineer (WR), Govt. of Tripura; HOD(Civil Engineering Department); Deputy Chief Engineer (Brahmaputra Board; Government of India and other profound dignitaries.

The symposium was attended by the research scholars, students and practicing engineers from all over the state of Tripura. The expert speakers and other dignitaries stressed on the importance of research in the field of soft measures for flood and erosion control in the basin of river Bramhaputra and other northeastern flood prone areas. Finally, **Er. S.K. Deb, Executive Engineer.** Brahmaputra Board, briefed about the activities and roles of Brahmaputra Board and delivered vote of thanks. They also assured that such events would be organized in bigger forums in future to raise awareness for all stakeholders to frame policy decisions.

SOCIO-CULTURAL ACTIVITIES

3-days Celebration of ‘Azadi ka Amrit Mahotsav’ in Civil Engg. Dept, NIT Agartala w.e.f 13th to 15th August 2022

Three days long event was organized in contemplation of celebrating 75th anniversary of India’s Independence ‘Azadi ka Amrit Mohatsav’ at Civil Engineering department of NIT Agartala. The inauguration of the session was started by national anthem and flag hoisting at the outskirt of the department building on 13 August 2022. The following days were covered by various events like tree plantation, essay competition, drawing competition etc.

Teacher’s Day Celebration in Civil Engineering Department of NIT Agartala on 5th September 2022

Civil Engineering Department Students organized Teacher's Day Celebration in their Department as a token of love and respect for their Teachers. The function started with "Deep Prajjalan" and paying homage to Sri Sarvapalli RadhaKrishnan. The function consisted of Cultural Events and Speeches by Students and Professors. The Professors gave speeches on the Importance of Teacher's Day, life of Dr. Sarvapalli Radhakrishnan, importance of teachers in everyone's life. A new club "Civil Engineering Club" was inaugurated on that day. The club aims the all rounded development of civil engineering students. The Function was thus ended in a good note.

Engineer's Day Celebration in Civil Engineering Department of NIT Agartala on 15th September 2022

Engineers Day is celebrated across the country on 15th September The date of birth of Dr. Mokshagundam Visvesvaraya, popularly known as the Civil Engineer of India. Civil Engineering Department NIT Agartala has also celebrated Engineer's Day in their Department as a token respect for the great visionary. Various events were organized by the department in association with Indian Geotechnical Society (IGS) Agartala Chapter and Civil Engineering Club of NIT Agartala. The inauguration of the session was started by a 'Tree Plantation' program. All the professors including HOD of the civil department have participated in the tree plantation. The evening webinar session of the program was chaired by Chief Guest- Prof. H.K. Sharma, Director NIT Agartala followed by an expert talk on "Demolition of Supertech twin Tower, Noida"- A case study Experience and Challenges by Dr. Anil Joseph. He is managing Director of Geostructures Pvt. Ltd. Kerala. The expert speakers and other dignitaries stressed on the importance of transparency of legal procedure in the field of construction and also elaborated the complex demolition mechanism of multistoried structures. Finally, Dr. Rajib Saha, HOD Civil Engineering Department, delivered vote of thanks. They also assured that such events would be organized in bigger forums in future to raise awareness for all stakeholders.

Vishwakarma Puja Celebration at Civil Engineering department Agartala on 17th September 2022

Civil engineering Department has celebrated Vishwakarma Puja at the outskirt of department building. All the students and teachers have actively participated in the puja. From ‘Pratima Anoyon’; ‘Pushpanjali’ to ‘Prasad vitaran’ the event was celebrated on a high note. The director of NIT Agartala has attended the event.

National/International Collaboration

Research Collaboration with Dr. S. Mathava Kumar, Associate Professor of CE Deptt. IIT Madras

Collaboration with Prof. M.R. Madhav of IIT Kanpur (Retd.)

Collaboration with Prof. Dipanjan Basu of University of Waterloo, Canada

Awards/Achievements

Dr. Rajib Saha

Award: Best Paper Presentation Award
By: Indian Geotechnical Society, Surat
Year: 2019

Nominated: National Member in BIS Codal Committee
For: Framing New IS Code on Piled Raft Foundation
Year: 2022

Award: Best Paper Biennial Award
By: Indian Geotechnical Society, Kochi
Year: 2022

Dr. Animesh Debnath

Award: Top Peer Reviewer 2019
By: Publons
Year: 2018-19

Consultancy & Testing Details

WORK	2019-2020	2020-2021	2021-2022
Consultancy Works (₹):	5,380,510.00	2,560,754.00	1,830,000.00
Testing Works (₹):	889,603.00	522,267.00	880,241.00

Details of Major Consultancy Projects

SL. NO	NAME OF THE WORK	CLIENT'S NAME	AMOUNT (INR)
1.	Structural integrity test of some of the old buildings in ONGC Agartala	ONGC, Agartala	4,72,000.00
2.	Third party quality assurance (TPQA) to stengthen further construction quality of the EMRSS-finalization of TPQA Agency.	Manipur Industrial Development Corporation Limited	7,81,282.00
3.	Vetting of design of stone and liquefaction mitigation with stone column	Denfab Engineers Pvt. Ltd.	1,08,000.00

Major Consultancy Clients

1. Airport Authority of India (AAI)
2. Central Public Works Department (CPWD)
3. National Projects Construction Corporation Ltd. (NPCCL)
4. Telecommunications Consultants India Ltd. (TCIL)
5. Manipur Industrial Development Corporation Limited (MANIDCO)
6. Powergrid
7. Indian Oil Corporation Limited
8. Tripura Urban Development Authority
9. Airport Authority of India (AAI)

Sponsored Research Project Details

SL. NO.	TITLE OF THE PROJECT	PERIOD	FUNDING AGENCY	AMOUNT (IN LAKHS)	CO-ORDINATORS
1	Geoscientific Studies – Geodetic, Geological, Geomorphological and Geotechnical of Active Landslide	2018-20	DST, Government of India	18.54	Prof. Sujit Kumar Pal & Dr. Sanjay Paul
2	Time & Motion study of MGNREGA	2019-21	Rural Development Department, Government of Tripura	25.32	Prof. R.P. Sharma Dr. P.P. Sarkar & Dr. Sima Ghosh
3	Development of organometallic nano-composites and scientific investigation on their functionalization towards improved adsorptive removal of toxic dyes for application in industrial wastewater treatment	2018- 21	CSIR, Government of India	16.50	Dr. Animesh Debnath
4	Hydraulic model study of flow dynamics and bed morphology evolution of the Gumti river of Tripura at the Pitra-Gang confluence	2017-20	DST, Government of India	31.42	Dr. S.K. Biswal
5	Sustainable production of algal biomass for production of bio-fuels: A holistic approach with bioremediation & economical harvesting technique	2019-22	Department of Biotechnology, DST, Government of India	16.00	Prof. Umesh Mishra
6	Knowledge Guided GIS based Hydro-geochemical modelling to understand the sources & control of Arsenic (As) in contamination in Groundwater of Tripura	2019-22	Space technology Incubation ISRO	19.00	Prof. Umesh Mishra & Dr. S.K. Biswal
7	Long term trend in weather parameters and atmospheric chemistry and its effect on tea cultivation over NE India	2019-22	Space technology Incubation ISRO	19.00	Prof. Umesh Mishra
8	Flood Risk Assessment of Barak Basin in Assam State - A geospatial approach	2019-22	Space technology Incubation ISRO	19.00	Dr. S.K. Biswal & Prof. Umesh Mishra
9	Reliability based seismic design of structures incorporating soil structure interaction	2016-20	DST, Government of India	26.51	Dr. Rajib Saha
10.	Mitigating scarcity of stone aggregates in pavement construction using locally available materials & stabilization techniques.	2019-23	DST, Government of India	24.85	Dr. Partha Pratim Sarkar & Dr. Dipankar Sarkar
11.	Developing a methodology for self-cleansing of urban storm water drainage system- a scientific approach for greening smart city	2019-21	ICSSR, MHRD, Govt. of India	04.00	Prof. Ratul Das
12.	Evaluation of a strengthening scheme for hollow compressed earth block wall using fibres, bamboo and steel bars.	2019-22	DST, Government of India	33.40	Dr. Deb Dulal Tripura
13.	Optimal Resource Planning of Agartala Municipality Corporation	2021-23	ISRO-STIC Government of India	16.80	Prof. Manish Pal & Dr. Mrinmoy Majumder
14.	Preparation of State Specific Action Plan	2022-23	North Eastern Regional Institute of Water and Land Management (NERIWALM) and PWD (Water) Tripura	30.00	Prof.Ratul Das, Dr.Mrinmoy Majumder, Dr .S.K. Biswal & Mr .N. Debbarma

Recent Publication Details

SL. NO.	FACULTY NAME & DESIGNATION	PUBLICATION DETAILS (JANUARY 2022 – TILL DATE)
1.	Dr. Umesh Mishra (Professor)	Mallik, Santanu, Abhigyan Chakraborty, Umesh Mishra, and Niladri Paul. "Prediction of irrigation water suitability using geospatial computing approach: a case study of Agartala city, India." Environmental Science and Pollution Research (2022): 1-16. Majumdar, Ria, Umesh Mishra, and Biswanath Bhunia. "Advanced Functional Membranes for Microfiltration and Ultrafiltration." Advanced Functional Membranes: Materials and Applications 120 (2022): 43-71.
2.	Dr. R. P. Sharma (Professor)	Hazari, Suman, Sima Ghosh, and Richi Prasad Sharma. "Total seismic analysis of slope considering logarithmic spiral failure surface." Geomechanics and Geoengineering 17, no. 3 (2022): 959-979. Thapa, Sheetal, Richi Prasad Sharma, and Lipika Halder. "Developing SonReb models to predict the compressive strength of concrete using different percentage of recycled brick aggregate." Canadian Journal of Civil Engineering 49, no. 3 (2022): 346-356.
3.	Dr. S. K. Pal (Professor)	Laskar, Arpan, and Sujit Kumar Pal. "Analysis of 3D Consolidation Settlement of C-ϕ Soil Using PLAXIS 3D Under Different Drainage Conditions." In Dynamics of Soil and Modelling of Geotechnical Problems, pp. 195-205. Springer, Singapore, 2022. Deb, Plaban, and Sujit Kumar Pal. "Structural and geotechnical aspects of piled raft foundation through numerical analysis." Marine Georesources & Geotechnology 40, no. 7 (2022): 823-846.
4.	Dr. Manish Pal (Professor)	Suresh, Machavarapu, Manish Pal, Dipankar Sarkar, and Kaberi Majumdar. "Generation of Electricity Using Piezoelectric Material: Study on Asphalt Pavement Structure on Rural Road." Journal of Materials in Civil Engineering 34, no. 2 (2022): 04021418. Chakraborty, Sukanta, Kaberi Majumdar, Manish Pal, and Pankaj Kumar Roy. "Rapid impact assessment matrix for municipal material disposal for Agartala City-a case study." Materials Today: Proceedings (2022).
5.	Dr. Ratul Das (Professor)	Datta, Akash, and Ratul Das. "Pressure Energy Diffusion Rates in the Wall-Wake Region of Immobile Solid Sphere in Open Channel Flows-Numerical Simulation and Experimental Study." Water Resources 49, no. 3 (2022): 413-421. Ghosh, Mithun, Pritam Malakar, and Ratul Das. "Role of roughness geometry function on spatially averaged form induced shear stresses and pressure energy diffusion rates in gravel-bed stream." ISH Journal of Hydraulic Engineering 28, no. 3 (2022): 313-324.

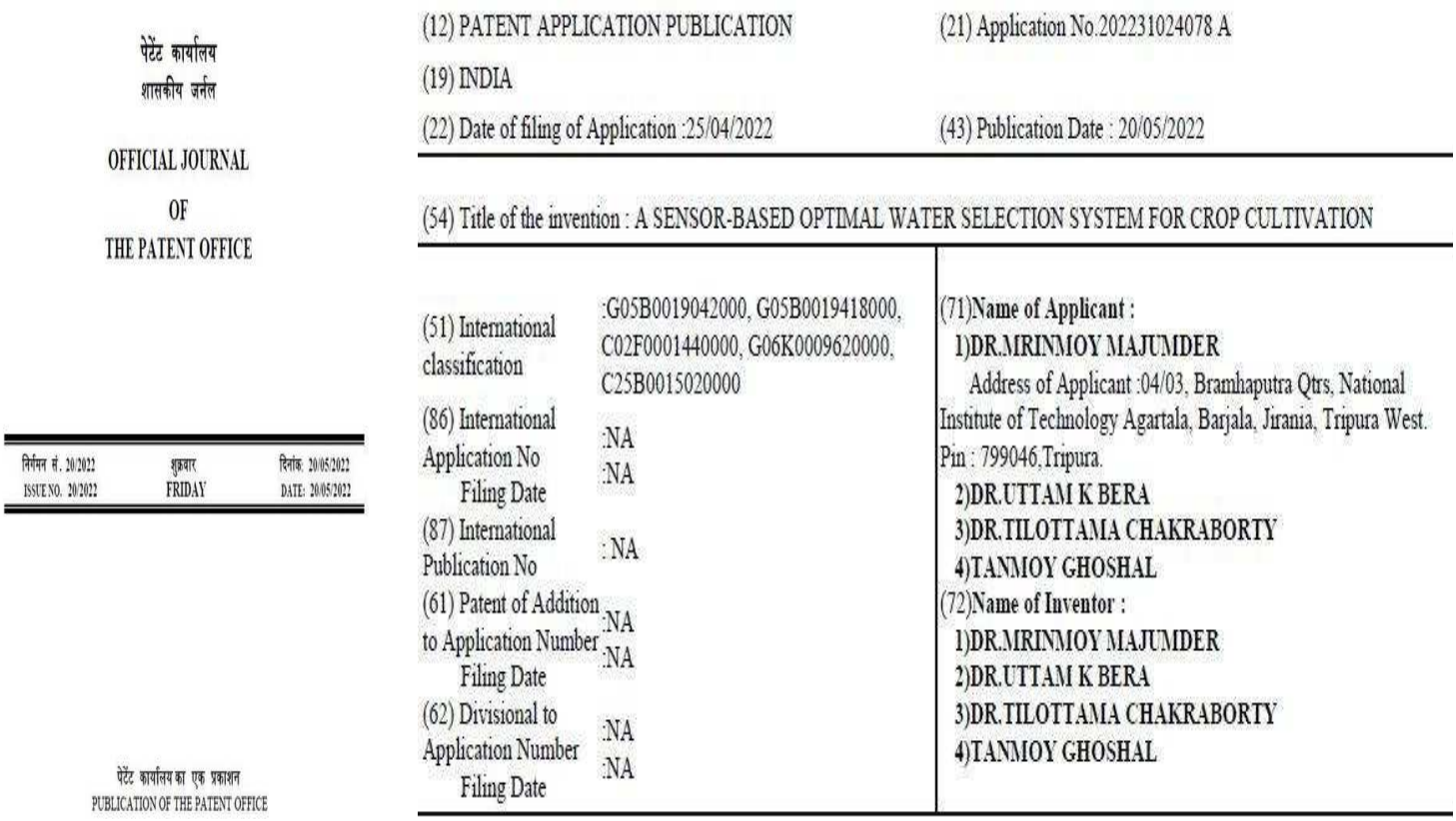
SL. NO.	FACULTY NAME & DESIGNATION	PUBLICATION DETAILS (JANUARY 2022 – TILL DATE)
6.	Dr. Rama Debbarma (Associate Professor)	Ghosh, Rahul, Rama Debbarma, and Subrata Chakraborty. "Magnification required by open ground storey column to mitigate stiffness deficiency of reinforced concrete structures under earthquake excitation." Innovative Infrastructure Solutions 7, no. 5 (2022): 1-16.
7.	Dr. Sima Ghosh (Associate Professor)	Hazari, Suman, Sima Ghosh, and Richi Prasad Sharma. "Total seismic analysis of slope considering logarithmic spiral failure surface." Geomechanics and Geoengineering 17, no. 3 (2022): 959-979.
8.	Dr. Sanjay Paul (Assistant Professor)	Reang, Rai Bahadur, Sujit Kumar Pal, and Sanjay Paul. "Importance of Verticality of PVD in Consolidation Settlement of Prefabricated Vertical Drain-Improved Soft Soils." In Ground Improvement and Reinforced Soil Structures, pp. 391-398. Springer, Singapore, 2022.
9.	Dr. Surajit Das (Assistant Professor)	Gupta, Sonu Kumar, and Surajit Das. "Multiple Damage Identification in a Beam Using Artificial Neural Network-Based Modified Mode Shape Curvature." Arabian Journal for Science and Engineering 47, no. 4 (2022): 4849-4864.
10.	Dr. Sushant Kumar Biswal (Assistant Professor)	Banik, Anirban, Mrinmoy Majumder, Sushant Kumar Biswal, and Tarun Kanti Bandyopadhyay. "Polynomial neural network-based group method of data handling algorithm coupled with modified particle swarm optimization to predict permeate flux (%) of rectangular sheet-shaped membrane." Chemical Papers 76, no. 1 (2022): 79-97.
11.	Dr. Mrinmoy Majumder (Assistant Professor)	Majumder, Priyanka, Arnab Paul, Pratik Saha, Mrinmoy Majumder, Dayarnab Baidya, and Dhritiman Saha. "Trapezoidal fuzzy BWM-TOPSIS approach and application on water resources." Environment, Development and Sustainability (2022): 1-22. Roy, Ritabrata, and Mrinmoy Majumder. "Assessment of water quality trends in Deepor Beel, Assam, India." Environment, Development and Sustainability (2022): 1-21.
12.	Dr. Lipika Halder (Assistant Professor)	Debnath, Pranoy, Lipika Halder, and Sekhar Chandra Dutta. "Damage survey and seismic vulnerability assessment of unreinforced masonry structures in low-intensity Ambasa earthquake of northeast India." In Structures, vol. 44, pp. 372-388. Elsevier, 2022.
13.	Dr. Rajib Saha (Associate Professor & Head)	Debnath, Rajat, Rajib Saha, and Sumanta Haldar. "Assessment of small strain dynamic soil properties of railway site Agartala, India, by bender element tests." Arabian Journal of Geosciences 15, no. 18 (2022): 1-21. Banik, Rajat, and Rajib Saha. "Probabilistic Seismic Response of Soil-Pile Foundation-Structure System: A Substructure Based Analysis." In Dynamics of Soil and Modelling of Geotechnical Problems, pp. 377-388. Springer, Singapore, 2022.

SL. NO.	FACULTY NAME & DESIGNATION	PUBLICATION DETAILS (JANUARY 2022 – TILL DATE)
14.	Mr. Nilotpal Debbarma (Assistant Professor)	Shivam, Agarwal, Choudhury Parthsarathi, Roy Parthajit, and Debbarma Nilotpal. "Flood Modeling in River System Using Gamma Memory." In Sustainable Water Resources Management, pp. 100-109. Springer, Singapore, 2023.
15.	Dr. Sima Ghosh (Associate Professor)	Suresh, Machavarapu, Manish Pal, Dipankar Sarkar, and Kaberi Majumdar. "Generation of Electricity Using Piezoelectric Material: Study on Asphalt Pavement Structure on Rural Road." Journal of Materials in Civil Engineering 34, no. 2 (2022): 04021418.
16.	Dr. Deb Dulal Tripura (Associate Professor)	Kasinikota, Pardhasaradhi, and Deb Dulal Tripura. "Flexural behavior of hollow interlocking compressed stabilized earth-block masonry walls under out-of-plane loading." Journal of Building Engineering 57 (2022): 104895. Raavi, Satya Sai Deep, and Deb Dulal Tripura. "Evaluating the flexural strength and failure patterns of cement stabilized rammed earth wallettes reinforced with coir, bamboo and steel." Materials and Structures 55, no. 2 (2022): 1-18.
17.	Dr. Partha Pratim Sarkar (Associate Professor)	Debnath, Barnali, and Partha Pratim Sarkar. "Application of Nano SiO2 in Pervious Concrete Pavement Using Waste Bricks as Coarse Aggregate." Arabian Journal for Science and Engineering (2022): 1-21.
18.	Dr. Animesh Debnath (Assistant Professor)	Bhowmik, Mahashweta, Animesh Debnath, and Biswajit Saha. "Scale-up Design and Treatment Cost Analysis for Abatement of Hexavalent Chromium and Metanil Yellow Dye from Aqueous Solution Using Mixed Phase CaFe2O4 and ZrO2 Nanocomposite." International Journal of Environmental Research 16, no. 5 (2022): 1-22. Saha, Bibek, Animesh Debnath, and Biswajit Saha. "Fabrication of PANI@ Fe–Mn–Zr hybrid material and assessments in sono-assisted adsorption of methyl red dye: Uptake performance and response surface optimization." Journal of the Indian Chemical Society 99, no. 9 (2022): 100635.
19.	Dr. Tilottama Chakraborty (Assistant Professor)	Das, Debajit, Tilottama Chakraborty, Mrinmoy Majumder, and Tarun Kanti Bandyopadhyay. "Estimation of runoff under changed climatic scenario of a Meso scale river by neural network based gridded model approach." Water Resources Management (2022): 1-17.
20.	Mr. Debashish Karmakar (Assistant Professor)	Karmakar, Debashish, Manish Pal, Kaberi Majumdar, Machavarapu Suresh, and Pankaj Kumar Roy. "Utilization of porous asphalt material in road construction for reducing the vehicular noise." Materials Today: Proceedings 65 (2022): 3602-3609.
20.	Dr. Dhirendra Kumar Pandey (Assistant Professor)	Pandey, Dhirendra K., Sudib K. Mishra, and Subrata Chakraborty. "A tuned liquid mass damper implemented in a deep liquid storage tank for seismic vibration control of short period structures." The Structural Design of Tall and Special Buildings 31, no. 8 (2022): e1928.

SL. NO.	FACULTY NAME & DESIGNATION	PUBLICATION DETAILS (JANUARY 2022 – TILL DATE)
21.	Dr. Sagarika Panigrahi (Assistant Professor)	Panigrahi, Sagarika, Bikash R. Tiwari, Satinder K. Brar, and Brajesh Kumar Dubey. "Thermo-chemo-sonic pretreatment of lignocellulosic waste: Evaluating anaerobic biodegradability and environmental impacts." Bioresource Technology 361 (2022): 127675.
22.	Dr. Manu S Nadesan (Assistant Professor)	SNadesan, Manu S., and Abin Joy. "Production of Lightweight Aggregates for Construction Industry from Industrial Byproducts: A Review." Advances in Sustainable Materials and Resilient Infrastructure (2022): 253-264.

Recently Published Patent Details

TITLE OF THE PATENT	AUTHORS	COUNTRY	APPLICATION NO. (YEAR)
A sensor-based optimal water selection system for crop cultivation	***Dr. Mrinmoy Majumder,*** ***Dr. Uttam K Bera,*** ***Dr. Tilottama Chakraborty,*** ***Mr. Tanmoy Ghoshal.***	**INDIA**	**202231024078 A (2022)**



पेटेंट कार्यालय
शासकीय जर्नल

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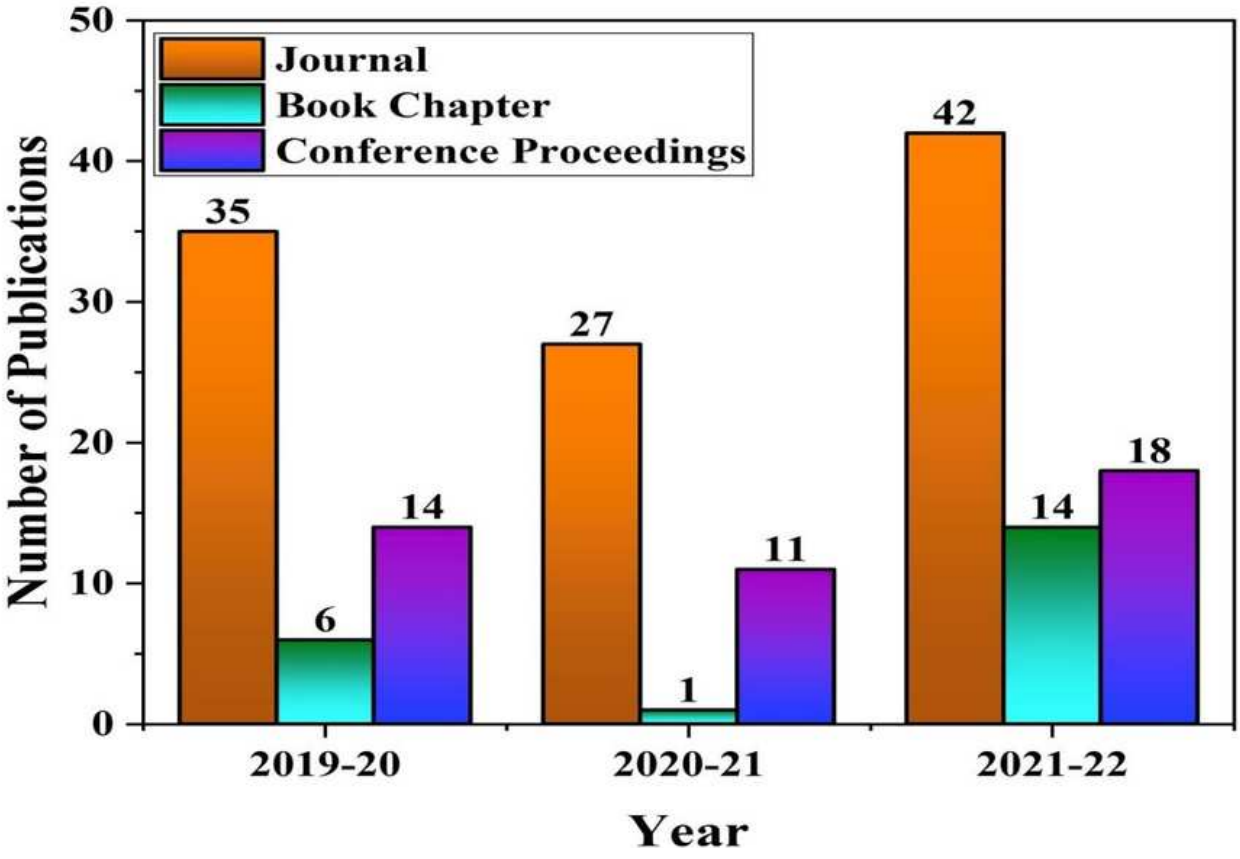
(71)Name of Applicant :
1)DR.MRINMOY MAJUMDER
Address of Applicant :04/03, Bramhaputra Qtrs, National Institute of Technology Agartala, Barjala, Jirania, Tripura West. Pin : 799046,Tripura.
2)DR.UTTAM K BERA
3)DR.TILOTTAMA CHAKRABORTY
4)TANMOY GHOSHAL
(72)Name of Inventor :
1)DR.MRINMOY MAJUMDER
2)DR.UTTAM K BERA
3)DR.TILOTTAMA CHAKRABORTY
4)TANMOY GHOSHAL

Year Wise Growth in Publication

SUMMARY	2019-20	2020-21	2021-22
JOURNAL:	35	27	42
BOOK CHAPTER:	06	01	14
CONFERENCE PROCEEDINGS:	14	11	18
TOTAL:	55	39	74



Ph.D. Awardee list in the year 2022

NAME OF PHD AWARDEE	SUPERVISOR (S)	NAME OF PHD AWARDEE	DATE OF DEFENCE VIVA VOICE
 Dr. Anirban Banik (16EDCER004)	Dr. Sushant Kumar Biswal and Dr. Tarun Kanti Bandyopadhyay	HYDRODYNAMICS AND OPTIMIZATION STUDY OF MEMBRANE BASED SEPARATION PROCESS FOR WASTEWATER TREATMENT.	08.10.2021
 Dr. Sangketa Sangma (15EDCER004)	Dr. Deb Dulal Tripura	AN EXPERIMENTAL INVESTIGATION ON UNSTABILIZED, STABILIZED AND FIBRE REINFORCED COB BLOCKS AND WALLETTES	13.01.2022
 Dr. Diptesh Chanda (16EDCER016)	Dr.Rajib Saha and Prof. Sumanta Haldar (IIT Bhubaneswar)	STATIC AND DYNAMIC BEHAVIOUR OF PILED RAFT FOUNDATION UNDER COMBINED LOADING.	21.02.2022
 Dr. Mahashweta Bhowmik (16EDCER005)	Dr.Animesh Bhowmik And Dr. Biswajit Saha (Physics, NITA)	SYNTHESIS AND CHARACTERISATION OF METAL OXIDE BASED NOVEL NANOCOMPOSITES FOR DYE LOADED WASTEWATER REMEDIATION	20.04.2022
 Dr. PAULAMI DE (11DHE001)	Dr. Mrinmoy Majumder	PERFORMANCE OPTIMIZATION OF SURFACE WATER TREATMENT PLANT WITH THE HELP OF NEURAL NETWORKS	04.07.2022
 Dr. Raavi Satya Sai Deep (16EDCER010)	Dr. Deb Dulal Tripura	AN EXPERIMENTAL INVESTIGATION ON UNREINFORCED AND REINFORCED CEMENT STABILIZED RAMMED EARTHBLOCKS AND WALLETTES	18.08.2022
 Dr. Pritam Malakar (17EDCER006)	Dr. Ratul Das	EFFECTS OF SEDIMENT MOBILITY ON TURBULENT FLOW CHARACTERISTICS OVER IMMOBILE SEDIMENT BED AND GRAVEL BED SURFACE	02.11.2022

Technical Articles

Fabrication of PANI@Fe-Mn-Zr hybrid material and assessments in sono-assisted adsorption of methyl red dye: Uptake performance and response surface optimization

Bibek Saha (PhD scholar)
Dr. Animesh Debnath (Supervisor)

In recent decades, industrial wastewater discharge containing toxic or hazardous manufactured dyes has risen tremendously, creating a serious environmental threat. A new hybrid adsorbent, PANI@Fe-Mn-Zr synthesized by mixing Fe-Mn-Zr metal oxide composite with polyaniline (PANI), was used to study methyl red (MR) dye removal from aqueous solution. The crystalline nature, surface characteristics, and shape of produced nanoparticles were investigated using different characterization techniques such as energy dispersive X-ray (EDX) analysis, scanning electron microscopy (SEM), X-ray diffraction (XRD) pattern, Brunauer-Emmett-Teller (BET) analysis and Fourier transform infrared (FTIR) analysis. The conceptual framework of anionic dye ion sorption onto manufactured nanomaterials was investigated using kinetic and isotherm analyses. Using experimental data on adsorption, mathematical models based on response surface methodology (RSM) were designed to analyse adsorption behavior for correct assessment of MR dye removal efficiencies. Natural water and real wastewater samples were employed to observe the extant of interferences in MR dye uptake capacity with respect to blank or controlled samples. Finally, the performance of the PANI@Fe-Mn-Zr was evaluated by comparing with other studies where several kinds of adsorbents have been used to remove different dye pollutants. The adsorption process was observed to be influenced by the sonication time, dose of PANI@Fe-Mn-Zr, and initial concentration of MR dye.

The following results were obtained by conducting the adsorption experiments:

- At an initial MR dye concentration of 25 mg/L, 0.25 g/L of PANI@Fe-Mn-Zr dose, 15 min of sonication, and pH 7.0, the maximum MR dye adsorption efficiency of 90.34% was achieved.
- Kinetic analysis was performed using five different kinetic models, which shows that the pseudo-second-order kinetic model had the best fit among the five models. The Langmuir isotherm best fits the adsorption experiments at pH 7.0, yielding a significant MR dye uptake capacity of 434.78 mgg-1.
- The most significant adsorption mechanisms that have been observed in uptake of MR dye onto PANI@Fe-Mn-Zr were electrostatic attraction, π-π bond interactions and hydrogen bonding.

- Response surface optimization study was performed for optimizing the experimental conditions from which maximum dye removal of 98.19% was obtained at contact time of 12 min, initial MR dye concentration of 15 mg/L and PANI@Fe–Mn–Zr dose of 0.4 g/L.
- Use of real wastewater and water samples suggest that there is only 6–19%reduction in the dye removal efficiency as compared to the blank orcontrolled experiments conducted with deionized water.

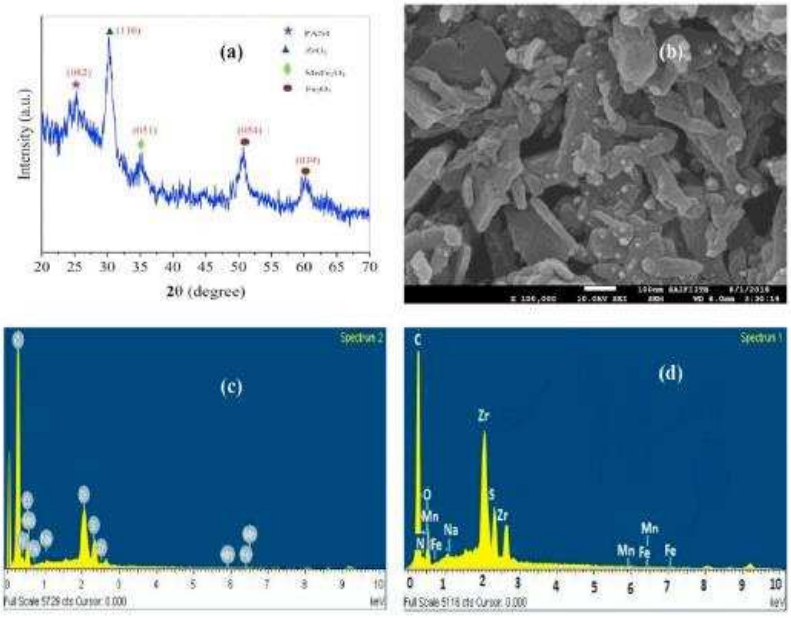


Fig. 2. (a) XRD pattern, (b) SEM image, (c) EDX spectrum of pure PANI@Fe–Mn–Zr, and (d) EDX spectrum of PANI@Fe–Mn–Zr loaded with MR dye.

Fig. 9. Schematic diagram of adsorption mechanism or interaction among anionic MR dye molecules and cationic surface of polyaniline (PANI).

For more details please visit https://doi.org/10.1016/j.jics.2022.100635

Numerical Modeling of Flow Pattern at a Right-angled River Bend Using CCHE2D Model

Animesh Das (PhD scholar)
Dr. Sushant Kumar Biswal (Supervisor)

In this study, the CCHE2D model is used to analyse the flow pattern in a meander reach of the Gomati River. The finite volume method is used by the numerical model to solve the depth-averaged two-dimensional equations with $k - \varepsilon$ turbulence closure. The numerical findings were compared with field data for two different flow rates in order to calibrate the CCHE2D model using various Manning's roughness coefficients. The results show that for the minimum and maximum discharges, a smaller Manning's roughness factor ($0.015 \geq n \geq 0.025$) is more favorable to a higher Manning's roughness factor ($0.030 \leq n \leq 0.040$). The results of the numerical model demonstrated that fluctuations in hydraulic parameters including shear stress, velocity, flow depth, and Froude number in the river bend are greatly influenced by the existence of centrifugal force and helical cells. The linear relationship between velocity and shear stress is presented across the whole study reach, as indicated by the R-square and linear correlation coefficient (r) components. The results of the model show that the flow field within the river bend can be accurately simulated by the computational model. The key findings of the research such as:

- The Manning's roughness coefficient ranges of 0.030–0.040 will have better results, and for medium and high discharges, the roughness coefficient ranges of 0.015–0.025 provide the more accurate result.
- The analysis suggests that the water surface and the maximum velocities in the river arch develop toward the outer bank. The simulation results also indicate that, on average, the average velocity for the discharges of 68 m^3/s and 102 m^3/s in the study reach is 0.56 and 0.77 m/s, respectively.
- Moreover, the average shear stress for the two discharges mentioned above is 27.99 and 35.62 N/m², respectively.
- The results of the study show that the CCHE2D model has the ability to simulate the complex rivers with varying river morphology. Therefore, in the engineering and operational projects of the Gomati River, the results of this numerical model can be trusted and used.

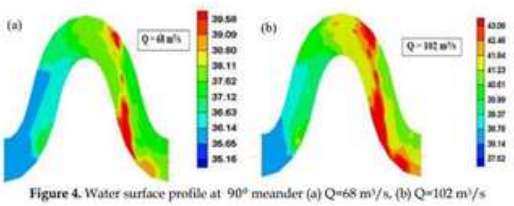
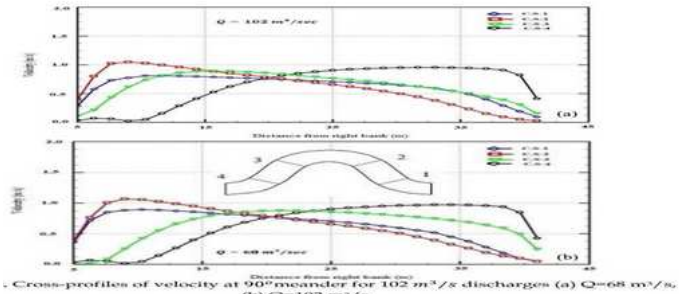


Figure 4. Water surface profile at 90° meander (a) Q=68 m³/s, (b) Q=102 m³/s



Cross-profiles of velocity at 90°meander for 102 m^3/s discharges (a) Q=68 m³/s, (b) Q=102 m³/s

For more details please visit https://doi.org/10.52460/src.2023.005

Study on Cyclic Response of Dry Uniform Soil Deposit using Shake Table Tests and DEEPSOIL Program

Debnath Mondal (M.Tech Scholar)
Dr. Sanjay Paul (Supervisor)

Ground response analysis describes the free-field response of soil deposit to an input ground motion which is used to analyze the instability of soil deposit and surface mounted structures. This paper presents a study of such response of dry uniform soil deposit on bed rock subjected to sinusoidal motion of significant frequency range comparable with typical seismic recordings at geotechnical engineering laboratory, NIT Agartala. For this a series of single-axis shake table tests were carried out on uniform dry silty clay, sand and gravel model subjecting sinusoidal motion of suitable frequency ranges. The length to height ratio of the laboratory soil model was kept about 1.71 for shake table tests. The models were prepared by dry pluviation technique. The height and rate of pluviation were adjusted accordingly to achieve the target relative density of the soil model. An assessment of the one dimensional ground response analysis has been carried out for similar characteristics soil column model subjected to identical ground motion using DEEPSOIL v7.0.

The result obtained from the shake table tests shows the influence of frequency on response of soil model and the variation of strength and displacement parameters at different depth. These results have been compared with the DEEPSOIL assessment to show the relative difference of the parameters to express the cyclic response of dry uniform soil deposit.

Table 1.Physical properties of laboratory soil sample (IS 2720).

Physical Properties	Silty Clay	Sand	Gravel
USCS classification	CH	SP	GP
Specific Gravity (Gs)	2.75	2.67	2.78
Maximum void ratio (emax)	-	0.78	0.49
Minimum void ratio (emin)	-	0.36	0.30
Plasticity Index (IP)	45%	NP	NP

Fig. 1.Soil model container monolithically attached with shake table

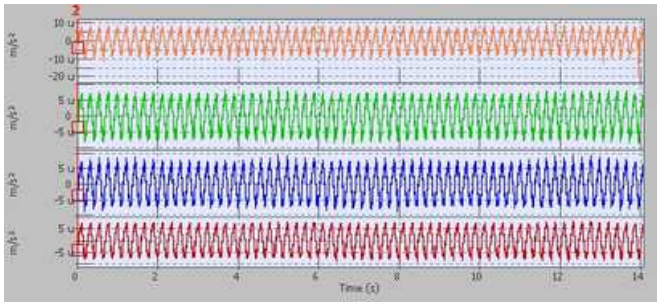


Fig. 2.Typical acceleration time history of UGSM (Uniform Gravel Soil Model) at 4.50 Hz.

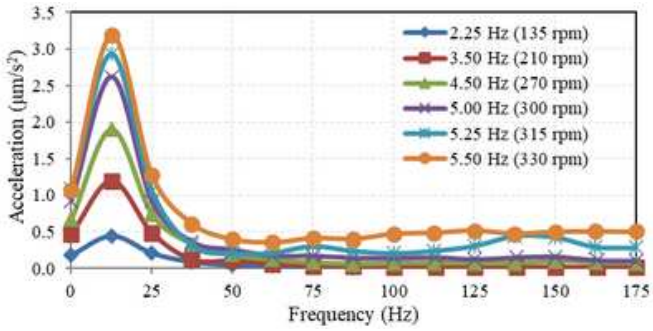


Fig. 3. Influence of frequency on response of UGSM layer at 50 mm from base

. For more details please visit **http://dx.doi.org/10.1007/978-981-33-6564-3_31**

Damage Detection using Artificial Neural Network-based Improved Mode Shape Curvature

Sonu Kumar Gupta(PhD scholar)
Dr. Surajit Das (Supervisor)

Abstract:
Experimentally measured displacement mode shapes are utilized as input data to artificial neural networks (ANNs) and mode shape curvature technique for identifying severity and locations of damages. Frequency responses (FRs) such as displacement mode shapes with varying damage severities are extracted using Bruel & Kjaer instrument with an impact hammer. First, three-mode shapes are considered. It is demonstrated that the measured frequency response (displacement mode shapes) are not sufficient to localize the damage without further analysis. Proper ANN training algorithms are utilized to reduce the measurement error from the measured frequency response (FR) data set. The trained data sets are then utilized to produce mode shapes curvatures for all the damage cases using central difference approximation. Damage locations are identified by analyzing the absolute mode shape curvature (AMSC) differences in different damage scenarios.

Keyword: Frequency response, Mode shape, artificial neural network, modified mode shape curvature

Introduction:
In real prospect, every civil and mechanical structure continuously deteriorates during their service period due to environmental and other sources of impact. Structural health monitoring ensures that condition of the structure remains safe and sound even after the application of frequent extreme loadings. Effective, reliable and cost-efficient damage detection techniques and tools are needed to assess the state of structures during the service period.

Objective of present work:
The key objectives listed out for the present investigation are as follows:

- To investigate the robustness of FR data sets by using the Coherence function.
- To examine the presence of structural damage using the features such as shifts in natural frequencies and abrupt changes in coherence function.
- To train the experimentally obtained FR data sets through an appropriate ANN for extracting error-free FR data and thereby, to obtain error-free displacement mode shapes.
- To construct mode shape curvature using the error free displacement mode shapes.

- The ultimate objective is to find out the location and severity of damage in a cantilever beam.

Experimental setup and materials:

A cantilever beam specimen of length 520 mm. is chosen to measure its dynamic properties. The width and thickness of the beam are 20 mm. and 6 mm. respectively. Mild steel beam material having properties such as density (7850Kg/m3), modulus of elasticity (200GPa) and poison ratio (0.29) are considered for an experiment. One end of the beam is rigidly fixed with a steel platform and clamped tightly to restrict the movement in any direction. The steel platform is fixed to a concrete surface with a bolted connection.

Fig. 1 (a) Bruel & Kjaer module, (b) Beam model

Results:

In Fig. 2 (a, b), the damage location has been detected with high accuracy where the second mode shape curvatures are utilized. In this study, the experimental investigation along with ANN and AMSCD has been validated with two different damage locations in two specimens. Damage location is shown in Fig. 2 (a, b) at the node location 16 and 10 respectively.

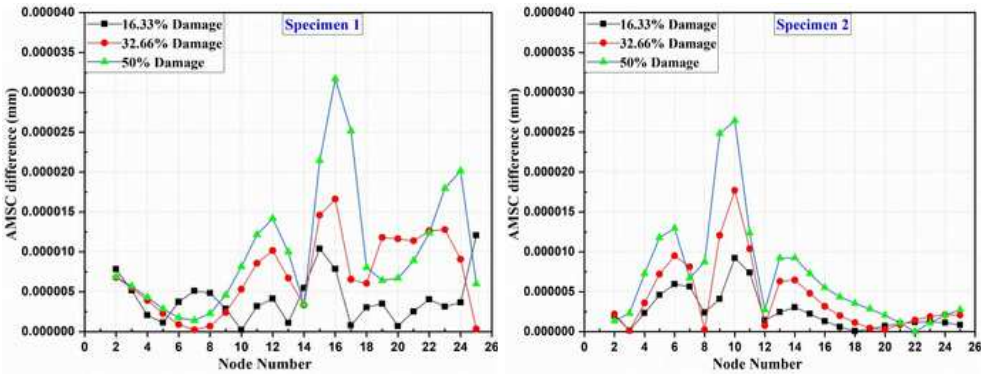


Fig. 2 Second mode shapes curvature
(a) Specimen 1 and, (b) Specimen 2

Conclusions:

This work aims to predict the presence, location and, severity of a single damage in a pair of identical mild steel cantilever beam specimens with different damage locations by utilizing the dynamic frequency responses function. While most of previous works used simulated FR data for structural damage detection, this work obtains a modified set of frequency response data by significantly reducing errors from the experimentally measured FR data by training it through an artificial neural network (ANN). Subsequently, the modified FR data has been utilized to generate mod shape curvatures for undamaged and damaged structures. Finally, the absolute differences are obtained between the mode shape curvatures of undamaged and damaged structures corresponding to same modes.

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Granular Micromechanics and D.E.M – The Problem and it's Solution.

Subham Chowdhury (M.Tech Student)
Dr. Sima Ghosh (Associate Professor)

Granular material constitutes about 50% of the total manufactured products on a global scale. Widespread availability and diverse field of application have made granular media both indispensable and subject to many research works. The theory behind granular materials though had been propounded even before the concept of classical continuum mechanics, it's ability in explaining macro-scale response remains elusive. The study of granular material stands apart from contemporary fields (Elasticity, Gas Dynamics, Hydrodynamics) since there is no fixed mathematical model or constitutive equation which conclusively generalizes the behaviour of the media as a whole. Contemporary research has conclusively pointed out that each granular material has its inherent characteristics - which results in 'Strength-different Effect' behaviour. A granular media shows a significant difference in tension-compression behaviour and thus cannot be modelled by a unique stress-strain curve. This property is in-general ubiquitous for types of granular assemblies.

One of the central problems of research in granular materials is the development of continuum constitutive equations that specify, for example, the relationships between the stresses and the strains, strain rates, etc. These kinds of constitutive relations are needed to close the system of governing conservation equations and enable one to solve boundary value problems.

The study of granular materials poses certain drawbacks:

1. Quantifying the media in terms of an individual particle becomes a challenging task, to numerically generate the output and track the movement of the individual particle itself poses a direct challenge to the efficiency of a computing facility.

2. Granular media are 'Athermal system'. Unlike liquids and gases where thermal agitation plays an important role in achieving local equilibrium, granular media are on a broader scale devoid of such temperature effect owing to particle sizes.

3. The continuum description of granular media is also made difficult by the lack of clear scale separation between the microscopic scale, i.e. the grain size, and the macroscopic scale, i.e. the size of the flow. This lack of scale separation raises questions about the validity of the continuum approach and the definition of an elementary volume for the averaging process.

4. At the grain level, the laws of solid contact between two particles involve non-trivial and highly non-linear phenomena such as friction and inelastic shocks. When grains are further immersed in a viscous fluid, hydrodynamic interactions must also be taken into account. Those also exhibit peculiar features such as divergence at contact, due to lubrication forces, and long-range interaction between particles in viscous flows.

5. Depending on the way it is handled, a granular material can behave like a solid, a liquid or a gas. These different states can also coexist in a single configuration. Thus it becomes very challenging to constitute any particular model which will simulate the material behaviour.

Contemporary experimental works have shed light on the macro-level behavioural aspects of granular media. Numerical analysis has also proved to be an indispensable tool for obtaining nearly accurate global-scale behaviour of the media. A good correlation between the experimental data and numerical study gives a strong viewpoint for a particular granular assembly. Mesh-based methods like Finite Element Method (FEM) for spatial discretization, the Finite Difference method (FDM) for temporal discretization etc. came to be a handy numerical tool to opt for understanding the global behaviour of the media, the analysis being conducted via space discretization of the assembly and understanding it's macro-mechanical response. However, higher computational requirements, bounded parameters within the constitutive model implemented, sparse/limited purview to comment upon the simulation results and correlating the same to micro-level aspect has deemed the method somewhat unreliable.
However, granular materials possess a unique property - the global response exhibited by this media can be wholesomely attributed to its discrete interaction at the grain scale level, i.e they are disordered at the grain level but behave like a solid or fluid at the macroscopic level.
To cope with various experimental shortcomings and drawbacks within the mesh-based numerical modelling approaches in the proper understanding of the granular media, a more robust numerical tool has been developed - DEM. Discrete Element method has been developed by P.A Cundall & O.D.L Strack to perform discrete analysis of blocky mass and further extended to incorporate these postulates into the analysis of granular assemblies.

In the DEM, the interaction of the particles is treated as a dynamic process with states of equilibrium developing whenever the internal forces balance. The contact forces and displacements of an assembly of particles under stressed conditions are found by tracing the movements of the individual particles. Movements result from the propagation through the particle system of disturbances caused by wall and particle motion, externally applied forces and body forces.

The speed of propagation depends on the physical properties of the discrete system in this dynamic process. The calculations performed in the DEM alternate between the application of Newton's second law to the particles and a force-displacement law at the contacts. Newton's second law computes the translational and rotational motion undergone by the assembly under the influence of contact forces. Simultaneously, Force - Displacement law helps to develop the contact forces developing from each contact undergoing relative motions.

2019 Chennai water crisis: A lesson for Indian cities

Dr. Animesh Debnath
(Assistant Professor)

Introduction:

'2019 Chennai water scarcity'. In recent times, this particular topic has gained tremendous attention of common public, scientific community, several NGOs, and State as well as Central Govt. Of course media played a critical role there. Although all of us are aware of this threatening environmental issue, but I have witnessed the severity of this crisis very closely as I am a frequent visitor to IIT Madras, Chennai in connection with my Post-Doctoral Research Program. During my last visit to IIT Madras (May-July 19) the water scarcity in Chennai was in all time high and the situation was really pathetic. Hence, I thought of sharing this particular issue based on some statistical data to provide a clear scenario.

Only 1% of available water is accessible across the globe!!!

According to US geological survey only 3% out of 32 crores trillion gallons of global water resource can be used as drinking water, out of which only 1% is easily accessible. India being the second most populous country uses only 4% of the drinking water available in the world. 70% of world's drinking water is found to be as groundwater, out of which only 24% is stored beneath Indian soil spaces which makes India as one of the top five highest ground water abstraction countries in the world [Fig. 1]. Although India has its significant share of water but due to its growing urbanization and over exploitation of water resources the country has become vulnerable to extreme climatic conditions.

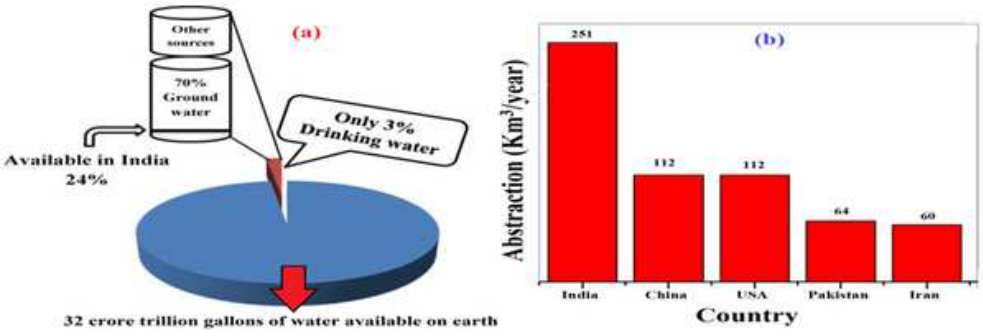

Fig. 1 (a) Distribution of water available on earth and (b) Top 5 ground water abstraction countries in the world as per 2010

2019 Chennai water crisis

The “2019 Chennai water crisis” has been hitting headlines throughout mid-2019 when the capital of Tamil Nadu did not receive a single drop of rain for 200 days at a stretch till the torrid summer this year. Moreover, the rising temperature (above 40 degree Celsius) worsen the situation when four of the city’s reservoirs (Chembarambakkam, Poondi, Puzhal and Cholavaram) which were employed to fulfil 4.64 million population of Chennai city went completely waterless while other reservoirs were left with a very little amount of water which may also get dry very soon if the situation remains the same. With the reservoirs being dried out and consequent running out of water supply options to meet the water demand the officials declared 19 June 2019, as the "Day Zero".

Reasons behind Chennai water crisis

Chennai’s water demand is 130 crorelpcd, among which only 83 crorelpcd of water demand can be fulfilled under the current scenario as the average rainfall in last 25 years has been reduced significantly in the period of 2018-2019 [Fig. 2 (a)].According to Tamil Nadu state action planfor climate change, by the end of the decade the annual average rainfall in Tamil Nadu is most likely to reduce by 9% with the increase in annual maximum temperature by 3.1 degree Celsius which gives an insight of aggravated climatic conditions. 90% ground water resources already went down to critical levels. The situation will become more critical in future as the reduction of ground water level is being expected at a rate of 0.5- 2 meter per year.

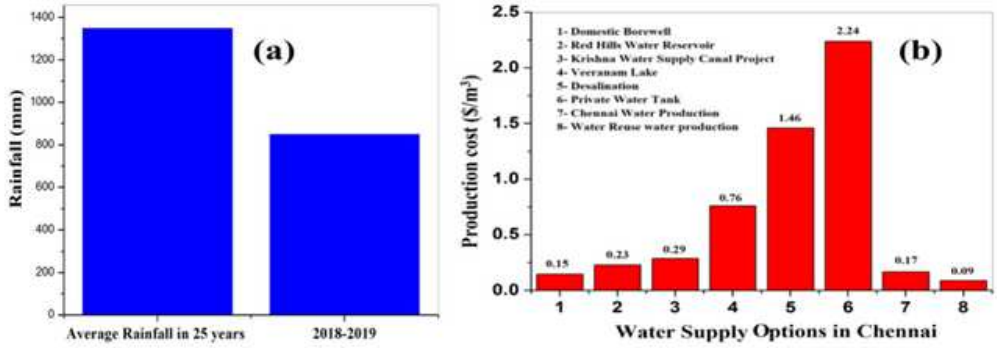

Fig. 2 (a) Average rainfall forecast for Chennai and
(b)Production cost of various water supply options in Chennai

What about Tripura?

North-eastern state Tripura has a population of 0.4 crore with national rainfall and groundwater proportion of 5.5% and 0.6%, respectively. According to NitiAayog's report,around 100% of state urban population has access to drinking water and 40% of them are on charge basis. Although the urban area does not face serious water crisis the rural areas of the state, especially the hilly regions do not get enough access to safe drinking water during non-monsoon period. Although the state does not face a serious water crisis till date, if sufficient actions are not engaged immediately regarding restoration of water bodies, watershed development, on-firm water use, and policy and governance, then there will be time when Tripura will also have to face Chennai like extreme situations.

Conclusion

Water being the most precious resource earth provides to life, plays a vital role in any country's economic growth, social stability and ecological sustainability. ThusIndian cities should learn a lesson from Chennai and start concentrating on improving their freshwater ecosystem without further losing time.

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Students Contribution

ENVIRONMENTAL NOISE ASSESSMENT OF NIT AGARTALA CAMPUS

Gadili Greeshma (19UCE060), Mallika Chakma (19UCE034), Rama Debbarma (19UCE008), Sampari Debbarma (19UCE026)

Abstract

Noise pollution is a major problem in cities around the world. It will continue to increase in magnitude and severity because of population growth, urbanization, and the associated growth in the use of increasingly powerful, varied, and highly mobile sources of noise. Noise adversely affects general health and well-being in the same way as does chronic stress. The main objective of this study is to determine noise levels at different places and intensity of noise pollution within the NIT Agartala area. For this study we will use SLM (SI-4001) to record the noise level in 50 locations according to their function around the NIT Agartala campus. Hospital and library were categorized under silent zone and hostels & faculty-staff quarters under residential zone. While rest of the locations were considered under commercial zone. The highest sound pressure level measured in the residential area was 61.7dB during the daytime. For silence area maximum record data was 48.3dB and 69.3dB was the highest recorded data for commercial area.

Introduction

Noise is all around us. It is an invisible danger. It cannot be seen but it is present nonetheless both on land and under water. Noise pollution impacts millions of people on a daily basis. The most health problem it causes is Noise Induced Hearing Loss (NIHL). Exposure to loud noise can also cause high blood pressure, heart disease, sleep disturbances and stress. These health problems can affect all age groups, especially children. Many children who live near noisy airports or streets have been found to suffer from stress and other problems such as impairments in memory, attention level, reading skill. Since there is no medicine to cure hearing loss, prevention to avert exposure is the only alternative left. It also impacts wildlife. According to the World Health Organization (WHO) noise pollution is the third most hazardous environmental type of pollution after air and water pollution and researchers always face problems while noise monitoring. The objectives of this study noise level at different places in the NIT Agartala campus by collecting noise data surrounding the campus with the help of Sound level meter (SL-4001) and compare with the noise limit given by The Central Pollution Control Board(CPCB).

Table 1: CPCB standard for ambient air quality standards in respect of noise.

Area code	Category of area/zone	Day time limit in dB(A)Leq	Night time limit in dB(A) Leq
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence zone	50	40

Figure 1: NIT Agartala campus area

Methodology

In this project the methodology used for our study of NIT Agartala premises is based on different locations and it's noise level. Where we categorized the locations into commercial, silence and residential zones according to their function. The Sound Level Meter (SL-4001) was used to collect the noise level. The Sound Level Meter (SLM) is first calibrated via internal 94dB generator by sliding " Range Selector" to 50-100 position and then sliding "Fast/Slow selector" to slow position then further sliding "A/C weighting & calibration selector to 94dB CAL" position. After carefully adjusting the calibration VR the display read was within "94±0.2"dB. Distinct 50 locations were selected based on their operations. All the data collected were between the time zone of 9am-6pm.The data is collected of 4 days to make for more precision and accuracy.

Figure 1: NIT Agartala campus area

Result

Table 2: Noise data collection of 4 days in 50 locations around NIT Agartala campus.

NAME OF LOCATIONS	DAY1 (in dB)	DAY2 (in dB)	DAY3 (in dB)	DAY4 (in dB)	MINIMUM (in dB)	MAXIMUM (in dB)	MEAN (in dB)	STANDARD DEVIATION (in dB)
Environmental Lab	48.0	41.5	54.6	59.0	41.5	59.0	50.8	7.7
ECE Department	45.0	48.0	52.5	53.0	45.0	53.0	49.6	3.8
ECE Canteen	63.0	47.1	58.3	50.0	47.1	63.0	54.6	7.3
CSE Department	46.6	48.0	48.3	54.8	46.6	54.8	49.4	3.7
Library	48.3	46.8	42.1	45.0	42.1	48.3	45.6	2.7
Building behind library	47.7	39.8	45.1	53.2	39.8	53.2	46.5	5.6
Civil Department	54.0	57.0	49.9	56.7	49.9	57.0	54.4	3.3
Auditorium	46.7	45.6	45.3	45.1	45.1	46.7	45.7	0.7
Admin block	57.2	54.8	53.2	47.1	47.1	57.2	53.1	4.3
Knowledge Park	51.7	56.7	53.6	48.0	48.0	56.7	52.5	3.6
SAC Building	52.2	63.3	62.7	46.9	46.9	63.3	56.3	8.1
Main Building	46.8	48.3	47.0	49.2	46.8	49.2	47.8	1.1
Science block	56.5	55.9	56.9	47.6	47.6	56.9	54.2	4.4

Rahul Canteen	45.4	46.8	46.0	47.3	45.4	47.3	46.4	0.8
Workshop	59.0	50.7	49.9	56.6	49.9	59.0	54.1	4.5
Shankar Bazaar	49.0	62.1	64.7	56.5	49.0	64.7	58.1	7.0
Jhon Restaurant	56.6	54.7	61.9	58.3	54.7	61.9	57.9	3.1
Samrat Shop	56.1	49.7	52.6	57.6	49.7	49.7	54.0	3.6
Kendriya Vidyalaya	41.4	52.3	47.5	49.3	41.4	52.3	47.6	4.6
State Bank of India	43.8	46.3	42.2	44.2	42.2	46.3	44.1	1.7
South Canteen	59.9	49.7	53.5	61.7	49.7	61.7	56.2	5.6
Aryabhatta Hostel	40.6	44.8	51.2	47.9	40.6	51.2	46.1	4.5
RNT Hostel	44.6	44.8	51.2	50.2	44.6	51.2	47.7	3.5
Residential area near sports complex	38.6	47.6	39.3	61.7	38.6	61.7	46.8	10.7
Sports Complex	41.0	42.6	39.9	57.6	39.9	57.6	45.3	8.3
Faculty Quarter near ganga residence	37.1	41.6	42.0	40.9	37.1	42.0	40.4	2.2
Gargi Hostel	44.0	47.1	46.2	43.0	43.0	47.1	45.1	1.9
RNT Playground	39.6	45.6	40.2	59.1	39.6	59.1	46.1	9.1
NITA Hospital	46.6	42.6	42.6	45.3	42.6	46.6	44.3	2.0
Construction Site near NITA Hospital	61.0	49.1	62.7	60.0	49.1	62.7	58.2	6.2
Maa Cafeteria	68.0	60.1	65.2	63.6	60.1	68.0	64.2	3.3
ECE Parking	43.6	44.5	47.4	55.6	43.6	55.6	47.8	5.5
CSE Parking	45.3	50.0	48.0	51.4	45.3	51.4	48.7	2.6
Electrical Office	42.0	39.7	62.9	50.7	39.7	62.9	48.8	10.5
Guest House	42.2	40.2	54.2	57.6	40.2	57.6	48.6	8.6
Mouchak Apartment	37.4	39.3	41.5	46.3	37.4	46.3	41.1	3.8
Director's Bungalow	45.6	36.5	43.7	47.2	36.5	47.2	43.3	4.7
Coconut Garden	39.0	40.4	40.1	45.0	39.0	45.0	41.1	2.7
Children's Park	36.1	38.4	54.5	47.2	36.1	54.5	44.1	8.5
Ganga Residence	39.6	41.5	44.6	41.9	39.6	44.6	41.9	2.1
TSR front staff quarter	40.4	46.6	55.3	49.5	40.4	55.3	48.0	6.2
TSR Canteen	45.7	38.8	50.5	60.4	38.8	60.4	48.9	9.1

Gramin Bank	44.3	45.5	48.1	48.6	44.3	48.6	46.6	2.1
Shopping Complex	60.4	48.7	69.3	68.7	48.7	69.3	61.8	9.6
3rd Gate	42.2	63.6	46.6	51.5	42.2	63.6	51.0	9.2
TE college school	42.3	40.2	39.6	40.0	39.6	42.3	40.5	1.2
Girls' Amul cafeteria	51.8	55.0	57.9	56.6	51.8	57.9	55.3	2.6
Boys' Amul cafeteria	45.3	42.1	50.1	55.3	42.1	55.3	48.2	5.8
1ST Gate	44.8	42.7	45.7	44.2	42.7	45.7	44.4	1.3

Conclusion

It is observed that the average most of the places in NIT Agartala premises were within the range provided by CPCB norms. There were times when the noise level recorded was above the provided daytime limit which was recorded during the weekend i.e., 69.3dB in shopping complex for commercial area and 61.7 for residential area. For silence zone the date was recorded to be under the limit.

Future Scope

Contour mapping & plotting will be done in ArcGIS software of the collected data with the help geographical coordinates collected by GPS .

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Assessment of air quality changes in Patna city of India during COVID-19 pandemic lockdown

Abhishek Ranjan (19UCE069)
Ankit Raj (19UCE099)
Shravan Kumar (19UCE064)

The state of human health and the environment are closely related to air quality (AQ). This study mainly focuses on the variation of air quality parameters in the vicinity of Patna city, as a consequence of lockdown imposed during COVID 19 pandemic. This article deals with temporal and spatial variations of primary air pollutants at various stations in Patna City. We have considered following primary air pollutants (SO2, CO, CO2, NO, NO2, NO3, SPM) and secondary air pollutants (H2SO4, O3, PAN) in this study. Our main objective was to analyse the air quality index (AQI) of the study area and check the spatial and temporal variation of air quality before, during and after the lockdown period.

Table 1: Sampling stations details of Patna city from where air quality data was collected

Sl. No.	Station Name	Station Code	Latitude	Longitude
1	DRM Office Danapur, Patna	S0	25.586562	85.043586
2	Samanpura, Patna	S1	25.596727	85.085624
3	Rajbansi Nagar, Patna	S2	25.599486	85.113666
4	IGSC Planetarium Complex, Patna	S3	25.5941	85.1376
5	Muradpur, Patna	S4	25.619651	85.147382
6	Govt. High School Shikarpur, Patna	S5	25.592539	85.22715

We have collected the air quality data of Patna city from CPCB portal (https://airquality.cpcb.gov.in/AQI_India/) as mentioned in five sampling stations (Table 1).

Fig 1: Stations of Patna City

After collecting AQI data from January 2019 to October 2020, spatial and temporal variation study was performed. Temporal variation of the AQ data is shown in Table 2.

Table 2: Temporal variations of different AQ parameters in Patna City

Months	CO(mg/m^3)	NO_2(ug/m^3)	Ozone(ug/m^3)	$PM_{2.5}$(ug/m^3)	SO_2(ug/m^3)
Pre-Lockdown Period					
January, 2019	96	75	171	454	35
February 2019	Data not available				
March, 2019	Data not available				
April, 2019	52	41	139	50	55
May, 2019	75	22	205	173	54
June,2019	39	5	103	75	56
July, 2019	31	66	53	46	49
August, 2019	87	101	52	49	61
September, 2019	41	83	58	101	75
October, 2019	63	23	55	84	64
November, 2019	64	108	30	258	71
December, 2019	111	26	11	351	14
January, 2020	35	4	20	317	10
February, 2020	Data not available				
March, 2020	Data not available				

During Lockdown Period					
April, 2020	98	169	19	172	21
Post Lockdown Period					
May, 2020	Data not available				
June, 2020	Data not available				
July, 2020	66	15	17	51	52
August, 2020	44	50	18	79	44
September, 2020	25	12	19	103	21
October, 2020	60	16	11	207	16

On the basis of above table we can interpret that :

- CO, NO2, PM2.5 experienced highest reduction in the month of July, 2020 i.e, post lockdown.
- From the temporal variation of air pollutant it is indicate that the reduction in the average concentration of CO, NO2, PM2.5 and ozone.

Spatial Variations

Table 3: Spatial Variations

Station	CO(mg/m^3)	NO_2(ug/m^3)	Ozone(ug/m^3)	$PM_{2.5}$(ug/m^3)	SO_2(ug/m^3)
Pre Lockdown Period					
S1	29	17	1	275	10
S2	91	150	4	260	25
S3	75	52	15	171	8
S4	79	112	5	163	14
S5	98	49	15	206	16
During Lockdown Period					
S1	39	11	2	70	14
S2	92	168	5	176	21
S3	38	33	30	101	9
S4	31	62	21	86	19
S5	142	30	18	125	14
Post Lockdown Period					
S1	27	10	33	42	9
S2	20	12	21	96	25
S3	29	31	2	60	4
S4	41	41	23	37	4
S5	36	35	13	58	9

Based on the preliminary findings the following conclusions can be drawn:

- As the location category of every station is different like some are commercial or industrial so the relative changes in the primary pollutant amount would be different.

Sustainability in Civil engineering practices

Diptanil Chakraborty
(20UCE011)

Sustainability is an important consideration in civil engineering practices. Civil engineering is responsible for the design, construction, and maintenance of infrastructure and buildings, and as such, has a significant impact on the environment. The goal of sustainability in civil engineering practices is to minimize the negative impact of it on the environment and promote the use of renewable resources.

There are some ways in which sustainability can be incorporated into civil engineering practices:

Use of sustainable materials: One way to promote sustainability in civil engineering is to use sustainable materials in construction. These include using materials that are recycled, locally sourced, or have a low carbon footprint. Some examples of sustainable materials are Bendable Concrete, Mass Timber, Salvage Materials, Bamboo, Mycelium, Precast Concrete, and 3D Printed Concrete. Reducing pollution and the long-term influence on the environment is made possible by improving the efficiency of a project's construction and the materials used. Civil engineering professionals can move away from less effective or occasionally dangerous materials and towards ones that are both safe and renewable, enhancing the long-term prognosis for projects. When done well, sustainability in civil engineering is included into all phases of a project, from planning to development and completion.

Energy efficiency: Buildings and infrastructure consume a significant amount of energy, and promoting energy efficiency can help to reduce their environmental impact. This includes using energy-efficient lighting, HVAC systems, and other equipment.

Water conservation: Civil engineers can promote water conservation by designing and implementing systems that reduce water waste, such as low-flow plumbing fixtures, rainwater harvesting systems, and wastewater treatment systems.

Green infrastructure: Incorporating green infrastructure, such as green roofs, rain gardens, and bioswales, can help to mitigate the negative impact of urbanization on the environment by reducing storm water runoff and improving air quality.

Some examples of Green infrastructure are are Rain Gardens. The word rain garden is generally used to describe planted areas that collect rainwater, Infiltration Basins, Storm water Green streets, Green Roofs, Blue Roofs, Permeable Paving, Subsurface Detention Systems.

Sustainable transportation refers to low- and zero-emission, energy-efficient, affordable modes of transport, including electric and alternative-fuel vehicles, as well as domestic fuels. Civil engineers can also promote sustainability by designing transportation systems that promote walking, cycling, and public transportation, as well as by promoting the use of electric vehicles.

Life cycle analysis: Conducting life cycle analyses of infrastructure and building projects can help to identify opportunities for sustainability improvements throughout the project's entire life cycle, from design to demolition.

Overall, sustainability is an important consideration in civil engineering practices. By incorporating sustainable design principles and practices into civil engineering projects, engineers can help to reduce the negative impact of infrastructure and buildings on the environment and promote a more sustainable future.

We should be focussed on sustainability for future development.

Project

Sreyashi Adhikary
(21UCE117)

The Future of Military Surveillance: Introducing MX-VIPER, an ARDUINO-Based Monster Truck

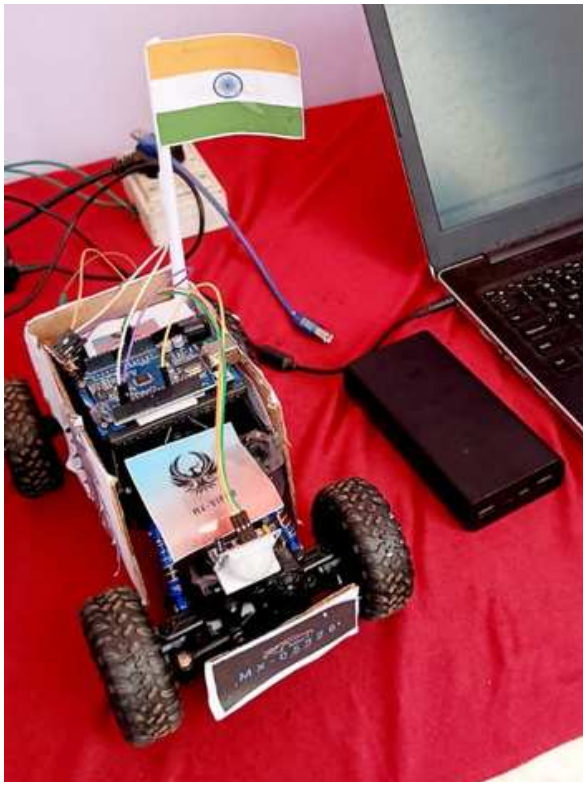
In the world of military technology, keeping a watchful eye on the battlefield is paramount. That's why we're proud to introduce MX-VIPER, an innovative ARDUINO-based monster truck designed to detect the movement of enemies and locate existing soldiers.

Built using ARDUINO IDE, MX-VIPER is a monster truck with a difference. Its sophisticated PIR sensors can detect a specific object, in this case, a human body, within a range of 7 meters. Upon detection, the system is programmed to immediately send a call to our cell phones, alerting us to the presence of a potential threat.

MX-VIPER is more than just a surveillance tool, however. Its versatility and durability make it an essential asset to any military operation. With its rugged wheels and high clearance, the monster truck can traverse all types of terrain with ease, including rocky hillsides and muddy bogs. Its built-in camera system and real-time data transmission allow for seamless monitoring and assessment of enemy movement, as well as the location of existing soldiers.

But that's not all - MX-VIPER is also an open-source project, meaning that other engineers and developers can build on its design and contribute to its ongoing development. This collaborative approach to innovation ensures that MX-VIPER will remain at the forefront of military surveillance technology for years to come.

At its core, MX-VIPER represents the intersection of advanced technology and military strategy. Its use in identifying potential threats and tracking enemy movements has the potential to save countless lives on the battlefield. With its robust features and open-source design, MX-VIPER is poised to become an indispensable tool for military operations around the world.



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In addition to its military applications, the MX-VIPER has a range of potential uses in the domestic sphere. As the project's creators note, the device can be built into any non-suspicious object, such as a toy or machine, making it a versatile tool for home security.

For example, MX-VIPER could be set up to monitor a locker containing valuable items. In the event of a break-in, the PIR sensors would detect the presence of a human body within 7 meters, triggering an immediate call to the owner's cell phone. With the help of a camera attached to the device, the owner could even receive a picture of the intruder.

Of course, some may question the potential for false alarms, particularly if the owner has relatives or other authorized persons who may be accessing the locker. To address this concern, the creators of MX-VIPER emphasize that the device can be activated only when the owner is away from home for work purposes. This ensures that the device is not triggered by authorized users, while still providing valuable security in the owner's absence.

As with any technological innovation, the MX-VIPER raises important questions about the balance between security and privacy. However, its potential to protect both military personnel and private citizens makes it an exciting development in the field of surveillance technology.

Paper Quilling Artwork

Sreyashi Adhikary
(21UCE117)

Preserving one's creative ideas has always been a challenge, especially when using paper as a medium. However, there is an art form that not only allows you to preserve your creations but also creates stunning decorative designs. This art form is called Paper quilling, also known as paper filigree.

The process involves the use of strips of paper that are rolled, curled, twisted, and shaped with various tools to create dimensional shapes and designs. These designs can be used to decorate items like gifts, greeting cards, pictures, boxes, jewelry, and more. Additionally, advanced techniques are used to create figurative arts, miniatures, flowers, dolls, idols, and other 3-D creations.

Different sizes and textured papers are used to give an edge while fabricating the masterpiece and fostering beautiful dimensional interpretation of ideas. The use of solid-colored, graduated, two-tone, and acid-free paper parcels of varying dimensions ranging from 3mm to 10mm, enhances the visual aesthetics of the art form.

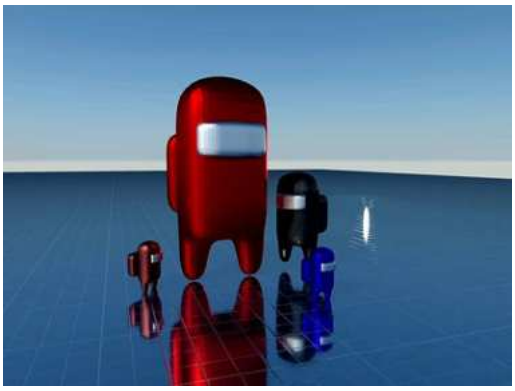
One of the best aspects of Paper quilling is that it is easily accessible to anyone interested in learning. Basic techniques can be learned from various online sources, while more exotic styles can be found in specialized books.

While there are specialized tools involved, one can master this art form with anything that comes in handy and is used in day-to-day life. Tools like a slotting tool, needle tool, tweezers, and crimper tools are commonly used to create intricate designs.

Every paper quilling artist has their unique signature worldwide, which is a reflection of their decorative style and ornamental visual aesthetics. One can adopt any decorative style and ornamental visual aesthetics from any field of art and culture and reflect it in their work.

In conclusion, Paper quilling is a captivating art form that allows anyone to preserve their creative ideas while creating stunning decorative designs. With the accessibility of resources today, it is a form of art that can be learned and mastered by almost everyone.

Designe using AUTODESK AutoCAD



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(21UCE117)

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