CE - ಸಮಂಯ

Annual magazine - 2021

INDIAN ORIGIN CEOs LEADING THE WORLD

Edition 1

Department of Civil Engineering

MIT Thandavapura

CONTENTS

MANAGEMENT, MET

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ABOUT THE COLLEGE

MITT is situated at a beautiful, enchanting and sprawling landscape. The institute is founded by a group of eminent people recognised for their eminence in the field of science and engineering technology. Many of them have served at the highest levels of AICTE and University.

The college is equipped with all modern learning aids to make teaching-learning process a pleasure. The highly qualified staff is its asset.

If you are interested in a quality, Maharaja Institute of Technology Thandavapura is the place for you. MIT Thandavapura is a career-focused college that will provide you with a comprehensive educational experience in a variety of growing areas of employment.

HIGHLIGHTS

- **Built by renowned professors.**
- **IIT qualified Principal.**
- **ISO 9001:2015 & ISO 21001:2018**
- **Experienced & trained faculties.**
- **Day boarding system.**
- **Placement training from first year.**
- **Transport facility in and around Mysuru.**
- **50% waiver of tuition fee for topper of the branch.**
- **Regular interaction with parents.**
- **State of the art laboratories.**

Programs offered

B.E in CIVIL ENGINEERING

B.E in MECHANICAL ENGINEERING

B.E in COMPUTER SCIENCE & ENGINEERING

B.E in ARTIFICIAL INTELLIGENCE & DATA SCIENCE

B.E in ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To be recognized as an institution known for its academic excellence and innovation towards creating future leaders in respective fields.

MISSION

- Imparting quality education with state of the art skills.
- Conducting research and development activities.
- Contributing technical and managerial services to the society.
- Adapting to ever-changing educational and societal

.

DEPARTMENT OF CIVIL ENGINEERING

VISION

To flourish as a centre of excellence which delivers quality Civil engineers with sound knowledge, professional skills and ethical values to serve the society.

MISSION

- To impart comprehensive knowledge of Civil Engineering through learner-centric teaching methodologies and industry-institute interactions.
- To conduct research & consultancy and inculcate spirit of entrepreneurship to succeed in wide range of careers with an emphasis on lifelong learning.
- To inculcate the highest standards of moral conduct and ethical behaviour for positive development of individual and society.

PEOs

- To acquire the knowledge of Civil Engineering practices to compete and match with the research and industrial requirements.
- To attain technical and professional skills in the field of Civil engineering for sustainable infrastructural development.
- To instil ethical approach and social awareness towards continuous development and growth of society.

PRESIDENT'S DESK

Dear Readers,

I am happy to note that department of Civil Engineering of Maharaja Institute of Technology Thandavapura is coming out a department magazine called CE-Samaya. If you read straight away this it looks to me ಸಿಹಿ ಸಮಯ means sweet time.

Yes, time is so sweet during student age. We elders always feel best part of our life was college days and that is ಸಿಹಿ ಸಮಯ. Early to the college days, school days were also sweet but it is system driven by parents and school. Post college days are hectic and driven by many like organization you work, family, environment, society etc. The best time for any one could be these years of college.

There is great liberty for students to choose their career, choose right friends, right hobbies, right thinking etc hence this time is so sweet. Congratulations to all those students and staff who have contributed to make this magazine so sweet.

With best wishes,
Dr. S Murali

JOINT SECRETARY'S DESK

"You can boost happiness and positive emotions through the use of your talent, whether it can be singing, dancing or writing skills."

I am pleased to know that the Department of Civil Engineering is coming out with the first department magazine by name "CE -Samaya". I extend my greetings and blessings on this and congratulate the Editorial team for coming out with the magazine which is need of the day.

The magazine reflects the holistic development of the department. Today the role of the department is not only to pursue academic excellence but also to motivate and empower its students to be lifelong learners, critical thinkers, and productive members of an ever-changing global society.

Each student is an inherent talent that needs to be honed over time to become more refined. The magazine provides a platform to students to share their hidden talents - their creativity, self-expression, and learning experience. The good thing about the magazine is, it is not limited to students but also extended to teaching fraternity who can share their overall achievements.

All contributors and students deserve an applauded and congratulations. I hope in future other students will also feel inspired and motivated to build up their writing and presenting skills.

I congratulate the staff and the students for the commendable achievements.

I wish you all Happy reading….

With best wishes,
Dr. Chethan H K

PRINCIPAL'S DESK

Dear Readers,

It brings me great joy to present the annual magazine of Department of Civil Engineering, MIT Thandavapura, a window into the dynamic and enriching journey we have undertaken together over the past year. As the Principal of this esteemed institution, I am immensely proud of the collective achievements and unwavering spirit that define our college community.

Education is the cornerstone of progress, and at MIT Thandavapura, we have embraced this principle wholeheartedly. Our college stands as a cradle of knowledge, innovation, and transformative experiences, where students are encouraged to dream big, think critically, and explore their true potential.

Within the pages of this magazine, you will discover a tapestry of success stories, academic triumphs, and co-curricular accomplishments that showcase the outstanding talents of our students. As they strive for excellence, our dedicated faculty members have played an instrumental role in guiding and nurturing their growth. The enduring bonds between our faculty and students exemplify the essence of mentorship and the power of meaningful education.

We firmly believe in nurturing compassionate, responsible, and socially conscious individuals. Through various outreach programs, community engagement, and social initiatives, our students learn the value of empathy and the transformative potential of their actions. They are not only future professionals but also agents of positive change in society.

The success of our college is a collective endeavour, and we are deeply grateful for the unwavering support of our alumni, industry partners, and well-wishers. Their guidance, contributions, and belief in our vision have strengthened our resolve to create a nurturing ecosystem that fosters excellence in every domain.

As you flip through the pages of this magazine, I hope you are inspired by the achievements, camaraderie, and aspirations of our college community. Whether you are a student, a parent, a faculty member, an alumnus, or a friend, this magazine reflects the essence of [College Name] and the profound impact it has on shaping lives.

May this magazine serve as a catalyst for even greater aspirations and accomplishments, as we continue to march forward in our pursuit of knowledge, enlightenment, and societal progress.

With best wishes,
Dr. Y T Krishnegowda

HOD'S DESK

Welcome to the Civil Engineering Department's annual magazine! It gives me great pleasure to present to you the Volume 1 of “CE-Samaya”, a compilation of the remarkable events, achievements and significant contributions made by our faculty, staff, and students over the past year.

The world of Civil Engineering is constantly evolving, driven by advancements in technology, emerging challenges, and the need for sustainable development. In this fast-paced environment, our department takes pride in nurturing young minds and preparing them to be future leaders and problem solvers in the field.

At our department, we have created a vibrant learning ecosystem that fosters creativity, critical thinking, and practical skills. Our dedicated faculty members, with their extensive knowledge and experience, strive to deliver quality education, imparting both theoretical and practical knowledge to our students. We are committed to developing a strong foundation of engineering principles and encouraging a multidisciplinary approach to problem-solving.

One of the key highlights of our department is the state-of-the-art infrastructure and well-equipped laboratories that facilitate hands-on learning experiences. From structural analysis to geotechnical engineering, from transportation planning to environmental sustainability, our students are exposed to a wide array of specialized areas within the Civil engineering discipline. We believe in providing a comprehensive education that prepares our students to tackle the complex challenges of the real world.

In addition to academic pursuits, the Civil Engineering Department encourages active student participation in extracurricular activities, technical events, and professional societies. These activities provide a platform for students to showcase their talents, enhance their leadership skills, and develop a strong network within the industry.

As we reflect on the accomplishments of the past year, we are filled with pride and gratitude for the unwavering support of our students, faculty, staff, and alumni. Their collective efforts have propelled our department to new heights and strengthened our position as a centre of excellence in Civil engineering education.

I extend my heartfelt appreciation to the editorial team for their diligent efforts in bringing together this magazine, showcasing the remarkable achievements of our department. I hope this compilation inspires and motivates all our readers to pursue excellence in their chosen paths.

I invite you to delve into the pages of the first volume of our annual magazine and witness the ingenuity and passion that define the Civil Engineering Department. Together, let us continue to build a better future for our society through the transformative power of civil engineering.

Dr. B C Nagendra Prasad
Head of the department

EDITORIAL BOARD

Dr. Y T Krishnegowda
Principal / Editor-in-chief

Mr. Rohith Jain
Assistant Professor / Editor

Chandan S Raj
Student

Sahana B
Student

Jashwanth Gowda
Student

Nikhil B M
Student

Ruthik Singh
Student

STAFF DETAILS

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Mr. Chethan M B
Assistant Professor

Mr. Harshith M
Assistant Professor

Non teaching staff	1. Chandra S – Instructor 2. Puneeth Kumar – Lab Asst	3. Manu Y P – Attender 4. Naveen Kumar - Attender

TECHNICAL PUBLICATIONS

- Manjunatha M C, Siddaraju M S and Basavarajappa H T, "High Resolution Digital Elevation Model for Chamundi Hill of Mysuru city, Karnataka, India using Geospatial Technology", Research Inventy: International Journal of Engineering and Science, Vol 10, Issue 10, Pp 64-71, Oct 2020.
- Basavarajappa H T, Abrar Ahmed, Manjunatha M C, Maruthi N E, Siddaraju M S, "Hyperspectral Signatures and Petro-chemical study on Steatite deposits around Vadrahalli village, Dharwar Craton, Karnataka, India", JETIR, Vol 7, Issue 12, Pp 1148-1157, Dec 2020.
- B C Nagendraprasad and Savitha A L, "Ground water vulnerability assessment of Mahadevapura zone, Bangalore city - A GIS based drastic modeling", RScopus activity journal, Vol 819.21.38041, Pp 962-969, 2021.
- Manjunatha M C, Maruthi N E, Siddaraju M.S and Basavarajappa H T, "Pre-monsoon Groundwater Trend Analysis in Mysuru taluk of Karnataka State, India using Geospatial Technology", Journal of Chemical, Biological and Physical Sciences, Vol 11, No. 1, Pp 51-60, Jan 2021.
- Manu S Gowda and B C Nagendraprasad "Feasibility of domestic reclaimed wastewater for the production of concrete using different types of sand", Seybold report, Vol 25, Issue 9, ISSN 1533-9211, 2021.
- Manjunatha M C and Basavarajappa H T, "Geospatial approach for Mapping of Dynamic LU/LC Classification in Piriyapatna taluk, Karnataka, India", International Advanced Research Journal in Science, Engineering and Technology, Vol 8, Issue. 1, Pp 19-26, Feb 2021.
- Manjunatha M C, Abrar Ahmed, Basavarajappa H T, "An Approach to delineate land use/land cover classification analysis through Geospatial technology: A case study of K R Nagara taluk of Karnataka State", International Journal of Science, Engineering and Technology, Vol 9, No. 2, Pp 2-9, April 2021.
- Manjunatha M C & Basavarajappa H T, "Hyperspectral & Geochemical signatures study on late Archeaen of Indian High grade Manganese

deposits in Halekal band of Bhahaddurghatta-Hosahatty village, Chitradurga Schist Belt (CSB), Karnataka, India", Journal of University of Shanghai for Science and Technology, Vol 23, Issue 5, Pp 603-610, May 2021.

- Manjunatha M C and Basavarajappa H T, "ASTER Spectral reflectance for lithological discrimination in Central parts of Chitradurga Schist Belt (CSB), Karnataka, India", International Journal of Geology and Mining, Premier Publishers, Vol 7, No. 1, Pp 355-366, May 2021.
- Manjunatha M C and Basavarajappa H T, "Artificial Recharge Structures for Groundwater sustainability in Krishna Raja Nagara taluk of Karnataka State, India using Geospatial Technology", International Advanced Research Journal in Science, Engineering and Technology, Vol 8, Issue 7, Pp 355-366, July 2021.
- Manjunatha M C and Basavarajappa H T, "Comprehensive Model on Major litho-units in Central Parts of Chitradurga Schist Belt of Dharwar Craton, Karnataka, India for Indian Spectral Library Generation", International Journal of Geo-informatics and Geological Sciences, Vol 8, Issue 2, Pp 89-105, Aug 2021.
- Manjunatha M C and Basavarajappa H T, "Forest mapping and its change detection analysis in Molkalmuru taluk of Karnataka state, India using Geospatial Technology", International Advanced Research Journal of Science, Engineering and Technology, Vol. 8, Issue 8, Pp. 513-521, Aug 2021.
- Manjunatha M C and Basavarajappa H T, "Geospatial approach in Land classification analysis for Hunasuru taluk of Karnataka state, India", International Advanced Research Journal of Science, Engineering and Technology, Vol. 8, Issue 8, Pp. 566-574, Aug 2021.
- Rohith Jain, Chirdeep N R, N C Balaji and G S Suresh, "Studies on the behaviour of Gabion Wall subjected to Lateral Monotonic Loading", Springer, Lecture Notes in Civil Engineering, Sustainability Trends and Challenges in Civil Engineering, Vol 162, ISSN 2366-2557, Pp: 415-429, 2021.

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- Manjunatha M C and Basavarajappa H T, "Urbanization Threat on Mysore-Betel Leaf Extinction in Mysuru City of Karnataka State, India using Geospatial Technology", Journal of Remote Sensing, Environmental Science & Geotechnical Engineering, ManTech Publications, Vol 7, Issue 1, Pp 1-12, Nov 2021.
- Rohith Jain, Nallaval Chinnaswamy Balaji, Chirdeep N R and G. S. Suresh, "Comparative study of Gabion wall using experimental and analytical methods", International Conference on Civil Engineering Trends and Challenges for Sustainability (CTCS 2021), ISSN 2366-2557

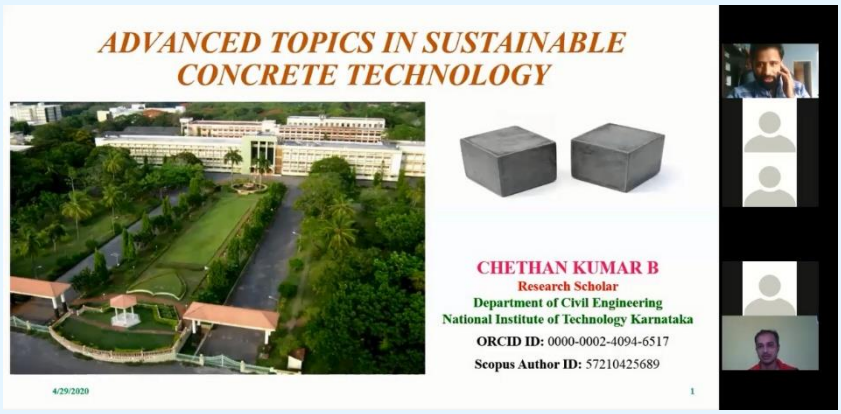
CONSULTANCY

The department of Civil Engineering, MIT Thandavapura has a consultancy wing wherein the faculty of the department conduct consultancy works around Karnataka. The department conducts soil testing, building material testing, water and sewage quality testing, surveying, structural stability checks, analysis and design of structures and much more.

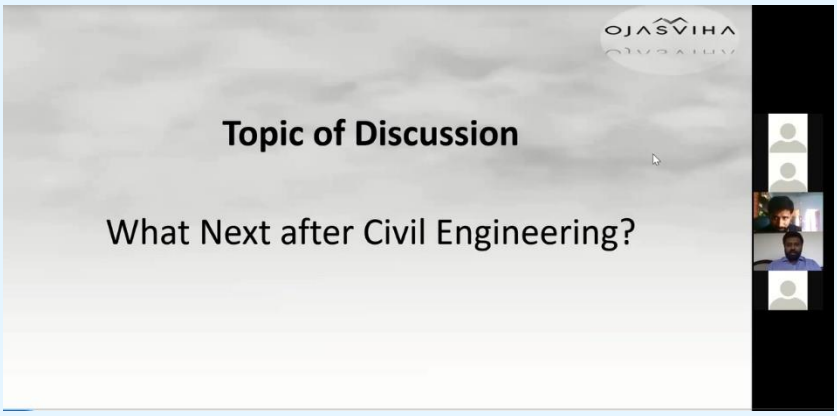
The following projects are successfully conducted in the year 2021.

Sl. No.	Project type	Number of projects
1	Tests on aggregates, bricks, tiles etc.	6
2	Tests on cement, concrete etc.	7
3	Test on steel reinforcement	5
4	Soil testing	3

CAPTURED MOMENTS



Webinar on "Advanced topics in sustainable concrete technology"



Webinar on "What next after Civil Engineering"

Mr. Sainath Habalkar, Alumini spoke on Entrepreneurship

CAPTURED MOMENTS

Site visit to L&T C-TEA Precast Units

Site visit to Sarala Industries

Seminar on "Estimation and billing in construction industry"

MOUs

BARUNI
Civil
Consultants

Internships
Site visits
Placements

SHATHAYU
Constructions &
Consultants

Internships
Site visits
Placements
Consultancy

Inner Voice
CAD
Academy

Software training

YASHASWI
Consultants

Internships
Site visits
Placements

EVENTS

1. A talk on Concrete Technology was delivered by Er. Raja K, Plant Manager, Sarala Industries to students of 5th semester on 8th January 2021. The lecture enriched the knowledge of students with respect to Principles of Concrete Mix Design on High Strength Concrete and Self Compacting Concrete which are trending materials in the field of construction.
2. An online webinar on "Advanced topics in sustainable concrete technology" was conducted to students of 4th, 6th & 8th semester on 3rd May 2021. The speaker Mr. Chethan Kumar B, Research Scholar, NITK delivered a lecture on importance of Geopolymer Concrete - Concrete without cement. The speaker enlightened about the sustainable development of concrete with reduction of Carbon-di-oxide in future to the students.
3. A webinar on "What next after Civil Engineering" by Er. Ranjan Kumar L G, Ojashiva Design and Construction Firm, Bangalore was organized on 10th May 2021 for 8th semester students. The speaker enlightened the students regarding opportunities in the field of Civil Engineering after the completion of their graduation to build their carrier.
4. Mr. Sainath Habalkar, Alumni of Department of Civil Engineering, MIT Thandavapura addressed the students of 8th semester to enrich the knowledge of Entrepreneurial skills on 21st June 2021. The talk helped the students gain the knowledge regarding Entrepreneurship and enlightened about the various government schemes which supports Entrepreneurship.
5. Students of 8th semester visited an ongoing project on residential building at Vijayanagar, Mysuru on 30th of June 2021. Er. Chiranthan Y, Baruni Civil Consultants explained students about the process of work execution in site. This helped the students to gain practical knowledge with respect to construction of a residential structure.
6. Students of 4th and 6th semester visited L&T C-TEA Precast Units on 27/07/2021. Mr. Dileep, Plant manager guided about process of raw

material procurement, plant equipment and their functioning procedure to the students. Students gained knowledge about precast structural components manufactured in C-TEA precast units. Students were also enlightened about the quality of production.

7. Mr. Ranjith E M, Partner, Shathayu Civil Consultants presented seminar on "Estimation and billing in construction industry" as exposure to finance in construction industry to the students of 7th semester on 15/12/2021 which was conducted in association with Builders Association of India. Speaker explained the key concepts of estimation and billing with respect to item of work to students. Students were also emphasized on preparing detailed estimates, bill of quantities, variations and claims, cost control and monitoring and legal aspects of estimation and billing.
8. 2-Day Hands on training on "Analysis and Design of Multi-storey RCC Building" by Prof. Rohith Jain was conducted to 7th semester students from 15/11/2021 to 16/11/2021. The students were trained to model, analyse and extract the responses of a multi-storey RCC building by using STAAD Pro software. Also, students were guided to design the structural members as per IS456 using the responses obtained from the software.
9. Prof. Raghavendra A and Prof. Mahadev Prasad N conducted hands on training on total station surveying to the students of 5th semester on 18/11/2021. The motto of the training was to make students learn to carry out surveying using total station which would help them in their future and extensive survey project.
10. A seminar on Safety in construction was carried out to students of 5th semester on 07/10/2021 by Prof. Raghavendra A. The purpose of the seminar was to make students aware about the risks during construction and safety measures to be taken. The speaker emphasized on personal protective equipment (PPE), hazard identification, equipment maintenance, communication, and emergency response. The speaker

provided practical tips and advices for students to implement these safety measures effectively.

11. Students of 5th and 7th semester were taken to Sarala Industries located in Adakanahalli Industrial area for industrial visit on 06/10/2021. Mr. Rajath, Plant manager explained about raw material procurement, equipments used for block production and their functioning procedure. Technical specifications of 6″ and 8″ solid blocks were explained to the students. Plant used Columbia Vibration Technology which enabled them to produce high quality block which was witnessed by the students.
12. A lecture on Structural steel material was arranged for students of 6th semester on 06/10/2021. The lecture focused on structural steel material, its types commonly used in the construction industry and manufacturing process. It highlighted about manufacturing process such as preparation of raw materials by removing impurities, iron making, steel making, casting and finishing of steel products.

ACADEMIC ACHIEVERS

ODD SEMESTER 2020-21

7th semester		
Topper	Tejashree K P	9.33 SGPA
2nd topper	Sushma N S	9.04 SGPA
3rd topper	Navyashree G M	8.88 SGPA
5th semester		
Topper	Bhoomika K	9.72 SGPA
2nd topper	Mohammed Junaid	9.12 SGPA
3rd topper	Chandana S Raj	8.92 SGPA
3rd semester		
Topper	Varun Kumar M K	9.38 SGPA
2nd topper	Nikitha A	8.92 SGPA
3rd topper	Sanjay M R	8.79 SGPA

EVEN SEMESTER 2020-21

8th semester		
Topper	Navyashree G M	9.80 SGPA
2nd topper	Madhuchand K M	9.70 SGPA
3rd topper	Damini S	9.45 SGPA
6th semester		
Topper	Bhoomika K	10.0 SGPA
2nd topper	Mohammed Junaid	9.00 SGPA
3rd topper	Chandana S Raj	9.00 SGPA
4th semester		
Topper	Ishwarya B	10.0 SGPA
2nd topper	Varun Kumar M K	10.0 SGPA
3rd topper	Nikitha A	9.0 SGPA

BAMBOO REINFORCED CONCRETE

Nature's material, bamboo, has been widely used for many purposes. Mainly as a strength bearing material. It has been used for building shelters from an earlier time. Bamboo is biodegradable and renewable in nature. It is energy efficient as it is of natural origin and environmentally sustainable in nature. These properties have forced us to use this in the construction field for centuries. Even though the existence of bamboo has been found for centuries, bamboo as reinforcement material is an innovation in the civil engineering construction field. A glance of properties of bamboo reinforcement, mix proportion of concrete, design and construction technique with bamboo reinforced concrete is discussed in this article.

Construction of bamboo reinforced concrete

Bamboo reinforced concrete construction follows the same design, mix proportions and construction techniques as used for steel reinforcement. Just steel reinforcement is replaced with

bamboo reinforcement. The material used as a reinforcement in concrete should show all the essential properties to make the element structurally active under load. In the case of steel, we manufacture steel to the desired proportion and test for the basic strength values as a quality check. Similarly, the process must be done for bamboo too. Bamboo is found in nature; they have different species. Each species differs in their characteristics, texture, thickness and strength. Hence it is essential to know which species is best for reinforcing and which is not.

Properties of bamboo reinforced concrete

The factors that play important roles in the bamboo reinforcement are

- Water absorption property of bamboo.

The main requirement of bamboo when used in reinforcement is the concern for water absorption. The water absorption capacity was studied in various species. Among which Dendrocalamus giganteus, known simply as DG and Bambusa vulgaris hard, BVS are the ones which absorbed less water. The rate of water absorption can also be reduced by certain treatments.

- Bamboo's strength towards bonding.

As in the case of steel rebar with ribs in it, which facilitates proper bonding with the concrete, bamboo too should have proper adhesion with the concrete. The bonding strength is based on this adhesive property of cement and the compressive forces that are formed on the surface of the reinforcing bars.

- Durability of bamboo material.

Its property of being a natural product makes it more exposed to environmental agents and insects. A remedy against this is to undergo bamboo curing. The curing process enables the treatment of humidity content and the starch within it, which is the main reason for insect attraction. The curing is effective only if the chosen bamboo is the right one. As mentioned in the selection of bamboo. The treatment must be done when the bamboo is in a dry state so that the penetration undergoes in the right way. The preservation treatment done on bamboo to take care of durability factor should have no effect on the chemical composition. The treatment itself

should last, without being washed away under high water conditions if any. Durability is a major concern for bamboo material. The physical and chemical properties of bamboo are found high with low content of humidity within it. This low content would keep away molds in bamboos.

- Material property of bamboo.

Bamboo is by its origin an orthotropic material. It possesses fibers within it. It gains high strength along the fibers and low strength in the transverse direction. The bamboo has a structure of a composite material with cellulose fibers aligned acrossthe length. It has high thick fibers near to the outer length of the bamboo, which is the reason why they resist huge wind forces.

- Selection of Bamboo for Reinforced Concrete Construction.

Selection of bamboo for reinforcement can be done based on these factors:

Color and Age - Employ bamboo having an evident brown colour. This shows the age of bamboo to be at least 3 years.

Diameter - Use the one with long large culms.

Harvesting - Try to avoid those bamboos that are cut either during spring or summer seasons.

Species - Among 1500 species of bamboo, the best one must be checked, tested to satisfy the requirement as a reinforcing material.

Design of bamboo reinforced concrete

The design of bamboo reinforced concrete is like the design of steel reinforced concrete. Procedure and equations for the design of steel reinforced concrete can be used for the design of bamboo reinforced concrete by using the mechanical properties of bamboo reinforcement in place of steel reinforcement in the calculation. Bamboo in flexural members such as beams and slabs develops some cracking under normal service loads due to its low modulus of elasticity. If such cracks in bamboo are not tolerable for structural members, then the structural design can be carried then steel reinforced designs or designs based on unreinforced sections are required. Bonding between concrete and bamboo as reinforcement is a must for design. Split bamboo provides better bonding with concrete than whole culms when used as reinforcement. Bamboo

should be split and provided in more compact reinforcement layers for better bonding with concrete.

Steel as a reinforcing material is a demand that is increasing day by day in most of the developing countries. There are situations when production is not found enough to face the demand for steel. Hence it is essential to have an alternative that is worth compared to steel. Bamboo is found in abundant; they are resilient and hence these can face the demand as a reinforcing material and become an ideal replacement for steel. In this generation of increased pollution bamboo reinforced concrete would be a great initiative to adapt to nature friendly environment which was always there in our mankind's history.

By,
Varun Kumar H K

BURJ KHALIFA

A modern marvel of Engineering - The Burj Khalifa stands tall and proud on the Dubai skyline. It defines the limit of human imagination. As the world's tallest building, it represents triumph of human engineering architecture brilliance. This architectural marvel has captured the attention of people worldwide and has become an iconic symbol of Dubai's futuristic vision.

Construction and design

The Burj Khalifa's construction commenced in 2004 and was completed in 2010, spanning a total of 6 years. This skyscraper was designed by the Chicago based architectural firm, Skidmore, Owings and Merril, with Adam Smith as the chief architect. The structures design draws inspiration from Islamic architecture, incorporating traditional motifs while comprising a contemporary aesthetic.

Height and Structural features

Soaring to an impressive height of 828 meters (2717 feet), the Burj Khalifa holds the title of world's tallest building. Its towering presence is made possible by the indigenous structural design that includes a reinforced concrete core and a perimeter exoskeleton. The exoskeleton,

composed of steel and aluminum, provides strength, stability and flexibility to the building, enabling it to withstand Dubai's extreme weather conditions.

Interior space and facilities

The Burj Khalifa houses have a variety of spaces, including luxurious residential apartments, corporate offices, World-class restaurants and high-end hotels. The observation deck, named "At the Top," offers breathtaking views of Dubai's skyline and the vast Arabian Gulf. The building also features the Armani Hotel, designed by fashion icon Giorgio Armani, which exudes elegance and sophistication.

Technological Innovations

The Burj Khalifa incorporates cutting-edge technology to enhance its functionality and sustainability. The building's facade is adorned with solar-reflective glass, which minimizes heat gain, reduces energy consumption, and provides natural light to the interiors. Additionally, it employs a state-of-the-art condensate collection system that collects moisture from the building's cooling system and uses it for landscape irrigation, reducing water usage.

Records and Achievements

The Burj Khalifa, apart from being the tallest building, holds various other accolades, including the highest occupied floor, highest outdoor observation deck, the longest elevator travel distance. It also boasts the world's highest nightclub, the highest installation of an aluminum and glass facade. The Burj Khalifa is more than just a skyscraper, it is a testament to human ingenuity and a symbol of Dubai's progress. Its breathtaking height, innovative design, and technological advancements have captivated the world's attention. The Burj Khalifa represents the boldness of architectural aspirations and serves as a reminder of what humanity can achieve when it dares to dream big.

By,
Harshitha P

SHAHBERI TWIN BUILDING COLLAPSE

Shahberi was primarily an agricultural land that had been notified by the Greater Noida Authority in 2008. The area had initially been acquired under the urgency clause and even leased out to builders, but the acquisition process stalled following a Supreme Court Order in 2011. No fresh acquisition took place after the court order, but the villagers who had been given compensation during the earlier process did not return the money and sold the land to builders at low price. Since the concerned authorities left the place unchecked, the builders started constructing the houses without licence and approved plans. Illegal structures are being developed in the area without following building codes or obtaining mandatory approvals.

INCIDENT

The building collapse incident happened in Shahberi village of Greater Noida on 17th July 2018 around 9:30 p.m. There were two buildings, 4 storey completely constructed building was two-year-old, and another was 6 storey under construction. The buildings stood next to each other on the marshy land and were separated by a 5 feet wide road.

The building under construction tilted into the older building, whose left side was the first to cave in and crumble into rubble due to water logging in foundation and too much of moisture in the walls of the basement of the collapsed buildings. The older building also disintegrated and caved in, barring a part of its right edge. One fell in pancake form and the other tilted to its side. Beams and slabs fell on the occupants of the building, sandwiching people and leaving all the occupants dead. Some bodies were pierced by iron rods and concrete and other were trapped under several layers of concrete. In all, 9 people died being trapped in the debris.

The twin buildings collapsed due to unapproved construction going on at that site. Local residents mentioned that the place where collapse has taken place had some water body which was filled to construct residential flats. The land of this area is not hard enough to withstand heavy construction and in absence of proper system of disposal of sewage and garbage the soil has become swampy because of water logging resulting weakening of foundation of building. Most of the buildings in that area are over five-storey and that too in water inundated land. Unplanned construction is rampant in the area over stepping all safety norms. The construction took place without any design by qualified engineers and reinforced concrete-framed structure.

The other reason for collapse was that the construction is done with the sub- standard building material including fly-ash bricks and pillars developing cracks even before any

substantial construction took place. And the moment six-storey under-construction building collapsed on fully constructed and occupied adjacent building, it leads to a complete fall.

LESSONS LEARNT

Densely populated illegal construction in Shahberi village with several multi-storey buildings along with furniture market in the vicinity has raised the serious safety issues of residents which needs to be addressed immediately otherwise there are more disasters of the kind waiting to happen. Some of the lessons we have learnt for timely action are:

- The constructed/under-construction building should be surveyed from hazard and vulnerability point of view.

- A strict action should be taken instantaneously on illegal/unauthorized construction to avoid the incidents.

• Concerned authorities should check the licence and approved plans before any construction take place by builders.

• Officers who overlook everything should be held responsible and strict action should be taken against them.

• The builders should not get benefitted by the lack of administrative action.

• The blind eye of administration against the complaints lodged regarding illegal construction encourage builders to use inferior construction material which eventually leads to the tragedy. It should be taken care of and administration must deal with the complaints pertaining to unauthorised construction and alterations to buildings.

• Strict measures need to be implemented for encouraging the builders/owners to follow NBC codes like soil testing, construction material etc.

• Structural audit of building should be done by the competent authorities. Unauthorized construction needs to be taken up as a punishable offence.

• Strict action should be taken against those involved in illegal constructions.

• Accountability of officials should be fixed who are violating the rules and they should be booked.

• The accountability of civil engineer and architect need to be fixed for the construction quality of building along with the builder.

• Occupancy without compliance should be made punishable.

By,
Yashika C V

CORROSION PROTECTION FOR UNDERWATER PILES

Corrosion protection of underwater pile is essential in aqua construction. Eliminating this corrosion problem is very hard, the corrosion is control by using corrosion protection methods.

Protective Coatings for Underwater Piles

Protective coating for underwater piles is necessary as it causes corrosion of piles. The Corrosion protection of underwater pile methods provides a great solution to corrosion of underwater piles.

When the surface of pile comes in contact with water, corrosion in piles forms. To protect the piles from coming in contact with water, the pile is cover with non-porous material which is anti-corrosive. There is some non-corrosive chemical materials use in corrosion of underwater piles. Several chemical coatings are used for corrosion protection.

The different types of coatings employ for underwater piles are mentioned below:

- High build Epoxy coatings
- Zinc Rich epoxy primer
- FRP composites
- Inorganic zinc silicate primers

- **High Build Epoxy Coatings**

These epoxy coatings are abrasion and chemical resistant. These epoxy coatings provide a high level of service and more tolerant ambient weather conditions. And most effective in maintaining the damage area and breakdown of a coating system.

- **Zinc Rich Epoxy Primers**

Zinc Rich epoxy primer is a mixture of Inorganic Zinc Silicates Primer and High Build Epoxy Coating. It provides a high level of service and more tolerant ambient weather conditions. And most effective in maintaining the damage area and breakdown of a coating system.

- **Application of FRP Composites for Corrosion Protection of Underwater Piles**

FRP a mix of wet concrete is economic to repair on substructure parts. Repair of this parts requires the enlargement to accommodate new ties. Completely corroded part of the elements should remove by using FRP. Spreading of corrosion to other piles are protected by FRP. The aesthetics of FRP repair is one of its unheralded benefits.

- **Inorganic Zinc Silicates Primers**

The structure below the splash zone always immerse in water are commonly not coat with cathodic protective layers. There are numerous types of anti-corrosive pigment primers in which inorganic zinc silicate is the best. It arrests rust creep or undercutting of the coating surrounding.

By,
Mahesh Kumar S

ECO FLOATING HOMES

The concept of floating buildings is not new, as they can be found all over the world, especially in traditional Asian villages. Although with modern civil engineering knowledge, these structures—and the infrastructure needed to make them sustainable—are gradually becoming more reliable and easier to maintain. However, introducing this concept in urban environments with large populations will prove to be somewhat tricky, as structures being built within or on above-ground water sources could impact environments negatively by disturbing the natural state of the land beneath bodies of water (e.g., lake bottoms or the ocean floor).

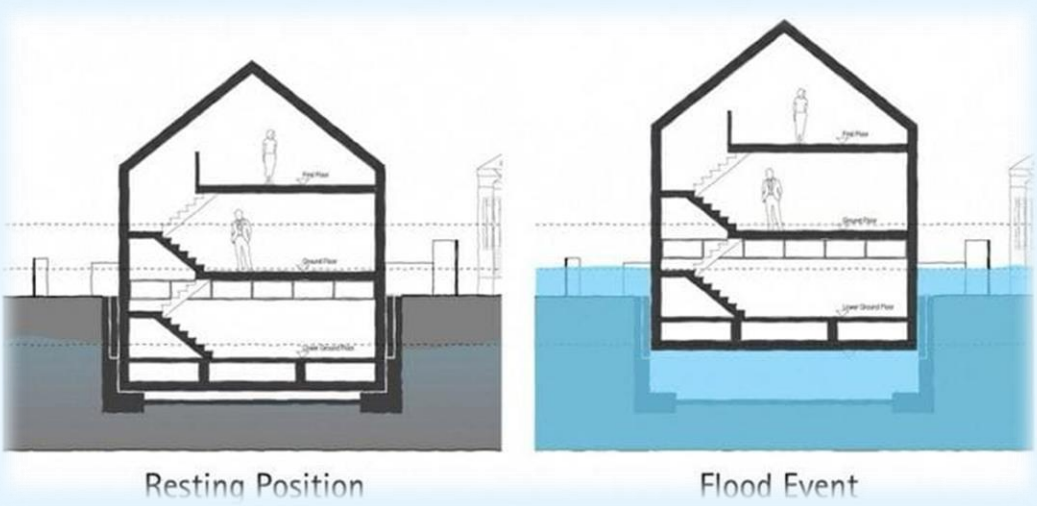
The effect of humans on the environment should not be underestimated either, so civil engineers will need to remain focused on creating systems that inhibit floating houses and their residents from disrupting local water ecosystems, while improving the viability of this technology for use in low-income areas.

Need of Floating Houses

In low lying country like Holland, planning was focused on separating and maintaining the division between land and water by reclaiming land from the sea by building dams and

heightening dikes. But the need to construct safe and economic houses where two-thirds of the population lives below sea-level, Dutch planners started looking to make use of water as a resource itself. The problem became further acute in the last decade due to global warming leading to rising water coupled with several unusually dry summers. The sea level is said to have risen by 20 centimeters in the last century and is expected to rise by three times that amount in the 21st century. Therefore, floating houses are becoming a necessity in the coming years.

Basic principles of construction



Generally, there are two basic principles for making floating houses. First is the pontoon principle in which one makes a solid platform, lighter than the water and the other based on the ship in which a hollow concrete box is created which is open on the top. The pontoon principle has the benefit of its use in shallow water, compared to the hollow concrete box while the concrete box has the benefit of higher space utilization within as a part of the building.

Both types of floating houses relate to a flexible connection to the quay, so the houses can rise with the water when the tide changes. When needed the floating system can be moved elsewhere at short notice without leaving any scar to the environment. Instead, a new house can be placed into the old situation which makes it the most sustainable and durable way to build. The floating house the floating houses built by +31 architects are based on a hollow concrete box.

Floating homes are almost permanently docked on the water. They are indefinitely moored and are connected to the city sewer and water. That means homes owners can't just cruise around in their home whenever they feel like it.

Floating houses may be the need for the future in coastal areas and flood prone areas in India also and thus researchers, architects and engineers should have capacity in designing and building such houses to meet the challenge of coming time. The concept of transportable ready-built houses should also be started particularly for row houses and for government aided schemes which would prove to be quality expandable homes and can be constructed in quick time as per the budget availability.

By,
Rekha S

ELECTRO KINETIC ROAD

As we all know, renewable energies are considered as proper alternative energy, which reduces carbon dioxide emission. This means renewable energy like wind energy, solar, tidal, biomass, geothermal which are not harmful for environment can be used as alternative. As a car passes over a speed breaker most of kinetic energy is wasted as heat in it. In this paper we will see that the speed-breaker at streets where, huge number of vehicles kinetic energy is wasting there. By conserving this kinetic energy and generating electricity we can supply this energy to the urban and remote areas for lightning purposes. In June 2009, one of the devices was installed in the car park at a Sainsbury's supermarket in Gloucester, United Kingdom where it provides enough electricity to run all the store's cash registers. The ramp was invented by peter Hughes, an electrical and mechanical engineer who is employed by Highway Energy System Ltd. This company says that under normal traffic conditions, the apparatus will produce 30 KW of electricity. Other proposed applications for the road ramps include powering streets and traffic lights, heating roads in the winter to prevent ice from forming and ventilating tunnels to reduce pollution.

First, we need to know about the concept of this technique. If we want to use the kinetic energy which is to be converted in electrical energy, we must make a mechanical mechanism to rotate a generator. And kinetic energy will come from the vehicles of the road.

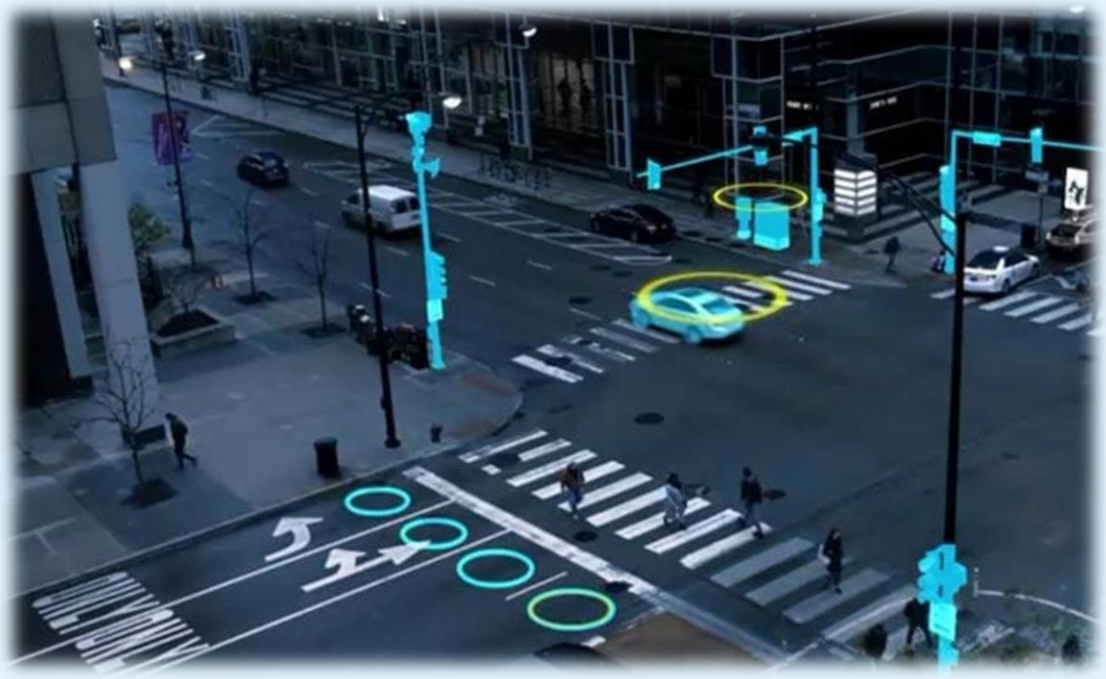
The idea was dismissed as Talk of 'kinetic energy plates' is a total waste of energy in the Guardian by David MacKay, the professor of natural philosophy in the department of Physics at the University of Cambridge. MacKay wrote, "The savings from parking at the green car park thus amount to one four-thousandth of the energy used by the trip to the supermarket."

Methodology

- Road Power Generation (RPG) is a system designed to capture waste and kinetic energy from all vehicles. This device converts the kinetic energy of the vehicles into electric energy. This is done by pressure plates installed on the ramp.
- The first moving car passes over the ramp. Due to vehicle load pressure plates present on the ramp will be pressed down.
- All pressure plates are connected to the shaft using Rack and Pinion mechanism.
- Rack and Pinion mechanism convert the linear motion of pressure plate into angular motion and rotates shaft.
- The shaft is connected to Gearbox. This Gear Box is connected to the flywheel and DC alternator.
- Alternator converts the rotational energy to electrical energy.
- As a result, it produces electricity. And it stored in batteries.
- Whenever needed DC energy is converted into AC energy with the help of inverter and passed on.
- Overall, the overall Energy Ramp system is a combination of both software as well as hardware model. The information given below will describe the features of both the models.

Advantages

- Generation of power without polluting the environment.
- Simple construction, mature technology and easy maintenance.
- No fuel transportation required.
- no consumption of any fossil fuel which is non-renewable source of energy.
- Electricity generated from one vehicle around 8.175Watt which can be used for various energy of automobiles that drive over ramp.
- No external source is needed for power generation.
- Energy scarcity is the main problem in our country, so this may solve the problem to some extent.
- Energy produced from this ramp is pollution free and maintenance of ramp is more, so it can be used in Toll Plaza streetlights etc.
- We can get 24x7 supply of electricity without harming and polluting the environment.



Uses

- To create electrical energy for running our appliances which are used in day-to-day activities.
- To utilize freely available renewable resources for generating energy rather than using exhaustible non-renewable resources.
- Such ramps can be designed at every highway as an alternative source of energy the increasing demand of energy.
- This energy can be used for the lights on the either side of the roads and thus much power that is consumed by these lights can be utilized to send power to these villages. No external source is needed for power generation.
- Electricity generated from one vehicle around 8.175Watt which can be used for various purpose.
- Simple construction, mature technology and easy maintenance.
- Energy scarcity is the main problem in our country, so this may solve the problem to some extent.
- This technique is used to produce electricity which can be used in traffic lights and powering streets.

For development of country/world and for meeting up the day-to-day demand of energy electricity is common source 0f energy. For getting non pollution and economical source of energy the focus now is shifting more towards renewable source of energy which is essential now a day. So, using road transportation energy can be produced, stored, where the ramp is used for tapping the energy and generating power as a power generating unit. In which we can get 24x7 supply of electricity without harming and polluting the environment. The pressure plate is main mechanism used for generating the electricity.

By,
Bhanu Prasad H S

GREEN BUILDING

The building construction industry produces the second-largest amount of demolition waste and greenhouse gases (35-40%) the major consumption in a building is during construction of various amenities like lighting and air conditioner system they provide comfort to the occupants but consume an enormous amount of energy and add pollution. By switching to sustainable architecture not just for nature's sake but for us we could not only save the environment but also reduce our total ownership costs. Green building is also known as green construction or sustainable building, these include efficient use of energy specifically renewable energy, such as solar energy, water, and other resources, pollution and waste reduction measures, enabling of re-use and recycling, good environmental air quality indoor, use of non-toxic and sustainable materials, the environment-friendly design construction and operation design that allows adaptation to a changing environment and most important consideration of the quality of life of occupants, it eliminates negative impact and creates a positive impact on climate and life. The construction materials used in green building are wool brick, sustainable concrete, solar tiles.

TECHNICAL ARTICLES

Sustainable tools and technologies used in green construction are solar power, biodegradable materials, green insulation, cool roofs, and sustainable resource sourcing. Green building includes rainwater harvesting, solar energy, and produces less waste compared to conventional buildings. By promoting green buildings, the benefits are environmental, economic, and social. Environmental benefits include enhancing the ecosystem improving air and water quality, social benefits are enhanced occupants health and comfort whereas economic benefits include reducing operating costs and improving occupants' productivity. As of date, there are 5975 projects equivalent to 7.55 sq. feet of green building - Suzlon energy limited-Pune, ITC green centre-Gurgaon are some of the projects in India. With 'Americans spending nearly 90% of their time indoors,' it is not surprising that the WHO estimates 30% of all buildings will have IAQ concerns during the facilities occupancy. Environmental material used in green building or system assessment evolution has low toxicity, minimal emissions, low walk assembly, recycled content, resource efficient. By implementing green construction, we can reduce 25-40%of energy usage,37%of CO2 emissions,40%of water usage, and 70% of solid waste.

By,
Vinayaka

INTERIOR DESIGNING

Interior design is the art and science of enhancing the interior of a building to achieve a healthier and more aesthetically pleasing environment for the people using the space. An interior designer is someone who plans, research, coordinates, and manages such enhancement projects. Interior design is a multifaceted profession that includes conceptual development, space planning, site inspections, programming, research, communicating with the stakeholders of a project, construction management, and execution of the design. Interior design is defined as the professional and comprehensive practice of creating an interior environment that addresses, protects and responds to human needs.

Interior designers

Designers craft spaces that anticipate our needs and appeal to our emotions while pulling from a broad set of skills and technical knowledge. Interior design has changed dramatically since the early 20th century when it was just beginning to emerge as a profession.

Interior designers are expected to have knowledge of:

- Textiles, materials, color, space planning, sustainability, and more
- Software applications for 2D & 3D computer-aided design (CAD) and building information modeling (BIM)
- Structural requirements, health and safety issues, and building codes.

Today, interior designers work with contractors, architects, engineers, craftsmen, furniture dealers, and businesses and homeowners. To become a successful interior designer, you need a well-rounded education and the skills to work within many disciplines (architecture; graphic design; decorative arts; and textile, furniture, and lighting design).

Specialties in Interior designing

Residential

Residential design is the design of the interior of private residences. As this type design is specific for individual situations, the needs and wants of the individual are paramount in this area

of interior design. The interior designer may work on the project from the initial planning stage or may work on the remodeling of an existing structure. It is often a process that takes months to fine-tune and create a space with the vision of the client.

Commercial

Commercial design encompasses a wide range of subspecialties.

- Retail: includes malls and shopping centers, department stores, specialty stores, visual merchandising, and showrooms.
- Visual and spatial branding: The use of space as a medium to express a corporate brand.
- Corporate: office design for any kind of business such as banks.
- Healthcare: the design of hospitals, assisted living facilities, medical offices, dentist offices, psychiatric facilities, laboratories, medical specialist facilities.
- Hospitality and recreation: include hotels, motels, resorts, cruise ships, cafes, bars, casinos, nightclubs, theaters, music and concert halls, opera houses, sports venues, restaurants, gyms, health clubs and spas, etc.
- Institutional: government offices, financial institutions (banks and credit unions), schools and universities, religious facilities, etc.
- Industrial facilities: manufacturing and training facilities as well as import and export facilities.[30]
- Exhibition: includes museums, gallery, exhibition hall, especially the design for showroom and exhibition gallery.
- Traffic building: includes bus station, subway station, airports, pier, etc.
- Sports: includes gyms, stadiums, swimming rooms, basketball halls, etc.
- Teaching in a private institute that offers classes of interior design.
- Self-employment.
- Employment in private sector firms.

Colors in Interior designing

Color is a powerful design tool in decoration, as well as in interior design, which is the art of composing and coordinating colors together to create a stylish scheme on the interior architecture of the space.

It can be important for interior designers to acquire a deep experience with colors, understand their psychological effects, and understand the meaning of each color in different locations and situations to create suitable combinations for each place.

Combining colors together could result in creating a state of mind as seen by the observer and could eventually result in positive or negative effects on them. Colors can make the room feel either more calm, cheerful, comfortable, stressful, or dramatic. Color combinations can make a tiny room seem larger or smaller. So, it is for the Interior designer to choose appropriate colors for a place towards achieving how clients would want to look at, and feel in, that space.

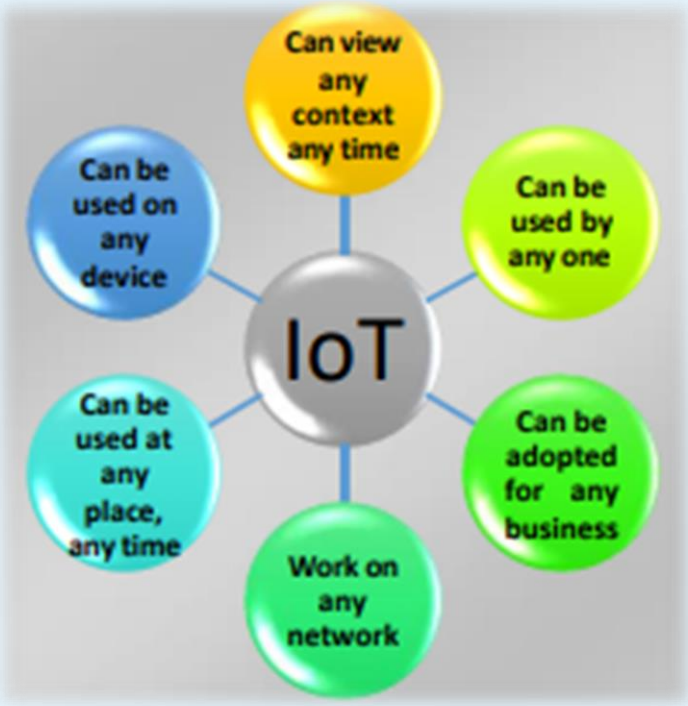
Design of interior spaces, closely related to architecture and sometimes including interior decoration. The designer's goal is to produce a coordinated and harmonious whole in which the architecture, site, function, and visual aspects of the interior are unified, pleasing to mind and body, and appropriate to the activities to be pursued there. Design criteria include harmony of color, texture, lighting, scale, and proportion. Furnishings must be in proportion to the space they occupy and to the needs and lifestyles of the residents. The design of such nonresidential spaces as offices, hospitals, stores, and schools' places clear organization of functions ahead of purely aesthetic concerns.

By,
Ankith Gowda

INTERNET OF THINGS (IOT) APPLICATIONS IN CIVIL ENGINEERING

In general, the construction industry lacks the change resistance due to which, there is no improvement in the innovative style of construction, control over the assets, and optimization of the construction process for better energy usage, resource allocation, and assets management. Digital transformation is an ongoing challenge in the construction industry. The future is the Internet of Things which will transform the real-world object into the virtual world object. The main aim is to identify different technologies in IoT to support Civil Engineering. Utilization of IoT applications to achieve smart design, Real-time control, Safety working environment.

INTERNET OF THINGS (IoT): The networking capability that allows information to be sent to and received from objects and devices using the Internet.



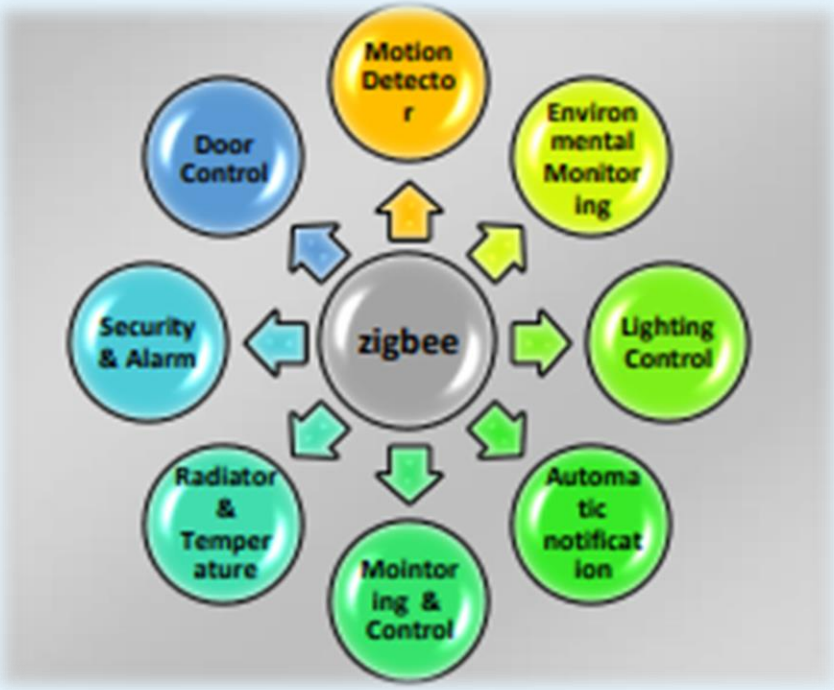
SMART CONSTRUCTION: Smart construction is building structure, design, construction, and task that make full utilization of computerized advancements and industrialized technical strategies to enhance profitability, reduce life cost, increase sustainability and expand client benefits.

A) Building Information Modelling: It can provide information of plan in 3D (width, height, and depth) and further dimensions such as 4D (time), 5D (cost), and even 6D (as-built operation).

B) Primavera: It is primarily project management software, which can exchange ideas among the project participants. It is easy to operate and use the information of scheduling and resource allocation in construction projects. It is mainly used for Planning, Monitoring, Controlling, and Reporting a project. It is used by project managers in the Construction field.

C) Global Positioning System (GPS): It is used in many aspects of the construction industry. It comprises satellites, ground control stations, and client collectors. It can give 3D arranges including focuses, lines, and planes in a quick, precise, and productive route under every single climate situation, it has been broadly used in various fields, e.g., geodesy, photogrammetric, marine looking over, and mapping.

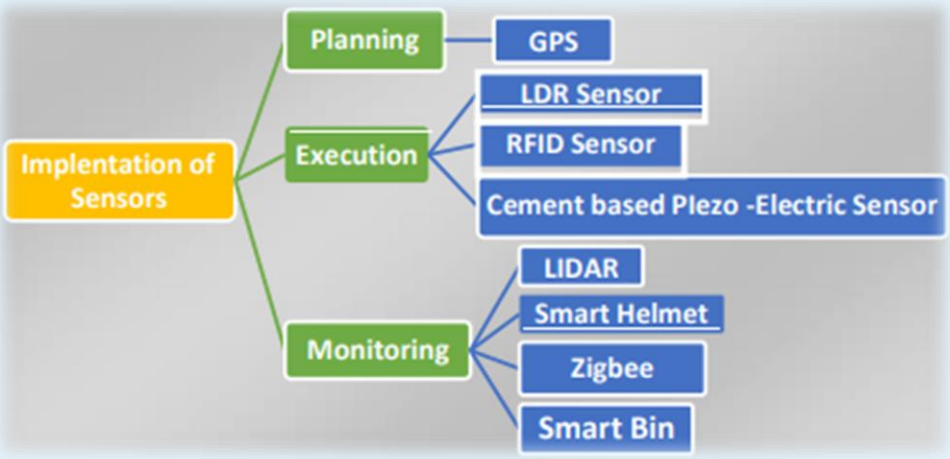
D) Wireless ZigBee module: ZigBee is a new two-way wireless network technique. ZigBee is particularly targeting low complexity, low power, low transition speed, low data rate, wireless sensor, and low costs. ZigBee wireless mesh technology was developed for self-configuring and self-healing networks that provide a simple, effective cost and battery life for an applications.



E) Cement-Based Piezo-electric Sensors: A new cement based piezoelectric composite sensor was introduced with the latest performance, particularly concentrating on AE signals. Such sensors were installed in the foundation of reinforced concrete frames during construction and used to monitor the damage of the concrete structures.

IMPLEMENTATION OF SENSORS IN DIFFERENT PHASES OF CONSTRUCTION:

IoT is the latest technology in which many things are connected through the internet. All these technologies tools and sensors are used in construction some of them are BIM, GPS, ZIGBEE, etc. The construction industry utilizes 60% of available materials of which 33% of wastage is generated and produces 45% of co2 emissions. So, by using available IoT technologies and sensors we can control the cons in the industry.



By,
Sagar Habalkar

LIGHT EMITTING CEMENT

Light-emitting cement is a green construction material designed to illuminate highways, roads, and bicycle lanes without using electricity. Light-emitting cement absorbs solar energy during the day and radiates light at night. This innovative cement was developed by Dr. Jose Carlos Rubio from the Michoacan University of Saint Nicholas of Hidalgo in Mexico. The research focused on modifying the microstructure of cement to absorb solar energy and emit light in darkness.

Light-emitting cement follows the principle of absorbing solar energy during the day and emitting lights at night. Light-emitting cement is a combination of sand, alkali, silica, industrial waste, and water.

Principle of light-emitting cement

Cement is an opaque material that does not allow light to pass through its interior. When water is added to cement, crystal flakes are formed because of hydration reaction. These crystals block the absorption of solar energy. The researcher's main objective was to modify this microstructure of cement to eliminate the crystals so that the incoming light can penetrate deep into the cement or concrete structure. The cement is also made phosphorescent so that the solar

energy is absorbed and released. The light-emitting cement, when combined with water, changes completely to gel form so that it absorbs solar energy and releases it in the form of light.

In the daytime, the light-emitting cement structure acts as a storage device. During this time, the whole mass is soaked in sunlight, and the electrons within the mass are in an excited state. During the night, these electrons return to their original state due to which light is emitted. This cement can provide light continuously for 12 hours without the use of electricity.

Most fluorescent materials made from plastic normally have a life of three years. They decay with the absorption of ultraviolet rays. But Dr. Rubio claims light-emitting cement is a sun-resistant cement that has a life of 100 years. When used on highways, the intensity of light emitted by the cement can be regulated to avoid unnecessary glare for the drivers and cyclists.

Composition of Light-emitting cement

Light-emitting cement is made from sand, silica, industrial waste, alkali, and water. To give it the light-emitting property, the materials go through a polycondensation process performed at room temperature.

The chemical reaction between these raw materials produces a strong mixture that looks like a gel. It also gives fewer amounts of unwanted crystal flakes. The only residue left after its production is steam. Hence, the product and its manufacturing are an eco-friendly process. The material is currently manufactured in green or blue. During the manufacturing, the scientists add certain additives to alter the optical properties of the material so that it converts to a

phosphorescent material. Hence, the microstructure changes to a non-crystalline structure that is like glass which allows the passage of light.

The light-emitting cement has garnered the attention of several countries, which shows the commercial demand for the material. Currently, the research is being carried out to move into a commercialization stage. The inclusion of light-emitting cement with plaster and other construction products is also under research and development. Adding certain additives during manufacturing, scientists modified the optical properties of the material to make it phosphorescent. However, it is manufactured like ordinary cement, but the change in the microscopic structure creates a nanocrystalline structure identical to the glass that allows passage of light inside. This helps to save on electricity costs. It can be used to light up the footpaths, swimming pools, interior rooms, roadways, etc., which are essential in this and future engineering.

By,
Praveen Nayak

OTHER ARTICLES

ಅಮ್ಮ

ಪ್ರೀತಿಯ ಕೈತುತ್ತು ಕೊಟ್ಟವಳು ಅಮ್ಮ

ತಾಯ್ತನದ ಆಸೆ ಕಂಡವಳು ಅಮ್ಮ

ಮುದ್ದಿನ ಕೂಸೆನ್ನುವಳು ಅಮ್ಮ

ಕೊನೆಯಾಗದಿರೊ ಬಂಧವೇ ಅಮ್ಮ

ನಂಬಿಕೆ

ಖುಷಿಯೆಂಬುದು ಆಟಿಕೆಯಲ್ಲ

ಕಳೆದು ಹೋಗುವ ಸಮಯವಲ್ಲ

ಹುಡುಕಿ ತರುವ ವಸ್ತುವಲ್ಲ

ಒಮ್ಮೆ ಹೋದರೆ ಬಾರನೆಂಬುದೇನು ಇಲ್ಲ

ಆದರೆ ಮರೆತು ಹೋದರೆ ಬರುವೆ ಎಂಬ ನಂಬಿಕೆಯಿಲ್ಲ

ವಿಧಿ

ಕಾಣುವ ಕನಸಲ್ಲಾ ನನಸಾಗುವಂತಿದ್ದರೆ

ಭಗವಂತನ ಅಸ್ತಿತ್ವಕ್ಕೆ ಬೆಲೆಯೇನಿದೆ

ಮಾಡುವ ಕೆಲಸವಲ್ಲಾ ಕೈಗೊಳ್ಳುವಂತಿದ್ದರೆ

ವಿಧಿಯ ಹಣೆಬರಹಕ್ಕೇನು ಬೆಲೆಯೆದೆ

ಮನುಷ್ಯನ ಸ್ವಾರ್ಥವೆಲ್ಲಾ ಪೂರ್ಣವಾಗಿದ್ದರೆ

ಸಾವಿಗೇನು ಬೆಲೆಯಿದೆ

ನಗು

ನೋವಿನಲ್ಲಿ ನಗುವ ಕಲಿತವಳೇ

ನಗುವಿನಲ್ಲಿ ಮೌನವ ಕಂಡವಳೇ

ತನ್ನ ನೋವನ್ನೇ ಬೇರೆಯವರಿಗಾಗಿ ಮರೆಮಾಡುವವಳೇ

ಮರೆಯಲಾರದೇ ನೋವಲ್ಲೇ ನಗುವವಳೇ...

By,
Deepika C K

ಜೀವನ

ಎಲ್ಲರೂ ಬೆಳೆಯಬೇಕು
ಎಲ್ಲರನ್ನೂ ಬೆಳೆಸಬೇಕು
ಎಲ್ಲರನ್ನೂ ಪ್ರೀತಿಸಬೇಕು
ಯಾರನ್ನೂ ನೋಯಿಸದಂತೆ ಬದುಕಿ ಬಾಳಬೇಕು

ಕನಸುಗಳ ಕಾಣಬೇಕು
ಕನಸುಗಳ ನನಸಾಗಿಸುವ ಪ್ರಯತ್ನ ಮಾಡಬೇಕು
ನಮ್ಮ ಕನಸುಗಳು ನನಸಾಗದಿದ್ದರೇನಂತೆ
ನಮ್ಮವರ ಕನಸುಗಳ ನನಸಾಗಿಸಲು ಸಹಕರಿಸಬೇಕು

ಜೀವನದ ಕಟು ಸತ್ಯ ಅರಿಯಬೇಕು
ನಮ್ಮವರಿಗೆ ಭಾರವೆನಿಸುವ ಮೊದಲೇ
ಮೂರು ದಿನದ ಜೀವನವ
ನಗುನಗುತ ಮುಗಿಸಿ ಹೋಗಬೇಕು.

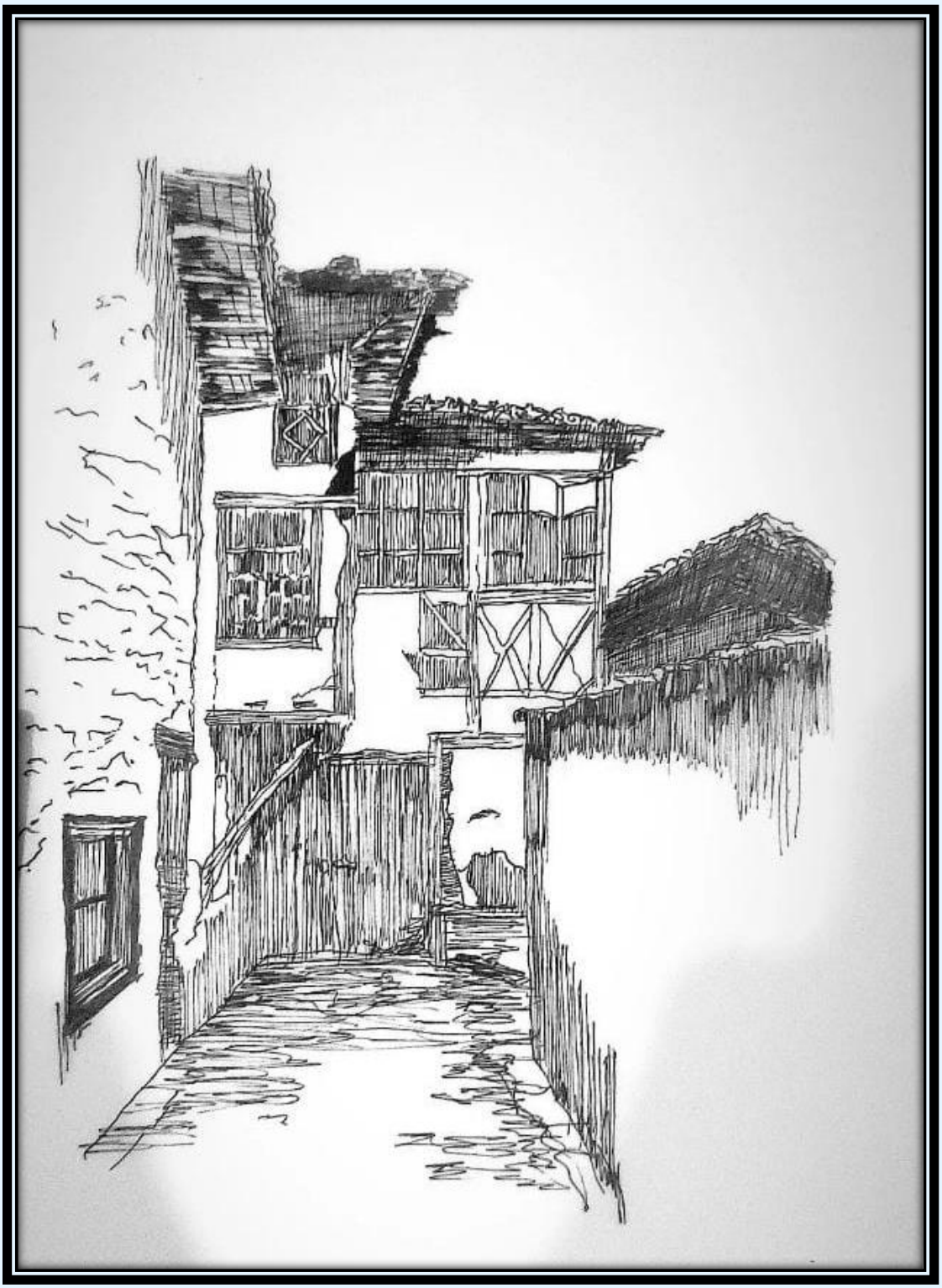
By,
Chandan P

OTHER ARTICLES

ಕನಸು ನನಸಿನ ಹಾದಿಯಲಿ
ನನ್ನಯ ಪಯಣವು ಸಾಗುತಲಿ
ಪ್ರೀತಿ ತುಂಬಿದ ಹೃದಯದಲಿ
ಕಣ್ಣಲ್ಲಿ ಪ್ರೀತಿಯ ತೋರುತಲಿ
ಮಾತು ಮೌನದ ನಡುವಿನಲಿ
ಪ್ರೀತಿಯ ಪಯಣವು ಸಾಗುತಲಿ
ನಿನ್ನಯ ಪ್ರೀತಿಯ ಮನದಲಿ
ಹೊಸ ಚೈತನ್ಯವ ತುಂಬಲಿ
ಮನದಲಿ ಮೂಡಿದ ಭಾವಗಳು
ಅಲೆಗಳ ರೀತಿ ನರ್ತಿಸುತಲಿ
ಪ್ರೀತಿಯ ನೆಲೆಯ ಹುಡುಕುತಲಿ
ತೆರೆತೆರೆಯಾಗಿ ಮನದ ದಡಕೆ ತಾಕುತಲಿ
ಸೋಲು ಗೆಲುವಿನ ಆಟದಲಿ
ಭರವಸೆಯಿಂದಲೆ ಮುಂದೆ ಸಾಗುತಲಿ
ಸೋಲಿನ ಕಹಿಯ ಮರೆಯುತಲಿ
ಗೆಲುವಿನ ಹವಣೆಯಲಿ ಬದುಕುತಲಿ
ಭಾವಯಾಣದಿ ನನ್ನ ಪಯಣ ಸಾಗುತಲಿ
ನೆನಪುಗಳು ಮರೆಯಾಗದೆ ಉಳಿಯುತಲಿ
ಮತ್ತೆ ಮತ್ತೆ ನೆನಪಾಗಿ ನನ್ನ ಕಾಡುತಲಿ
ಮನಸು ಯಾಕೋ ಕಳೆದು ಹೋದ ಕ್ಷಣಗಳ ಬೇಡುತಲಿ
ಸಾಗುತಲಿಹುದು ಪಯಣವು ಬಯಕೆಯ ಬದುಕು ನಗುವುದೆಂಬ ನಂಬಿಕೆಯಲಿ.

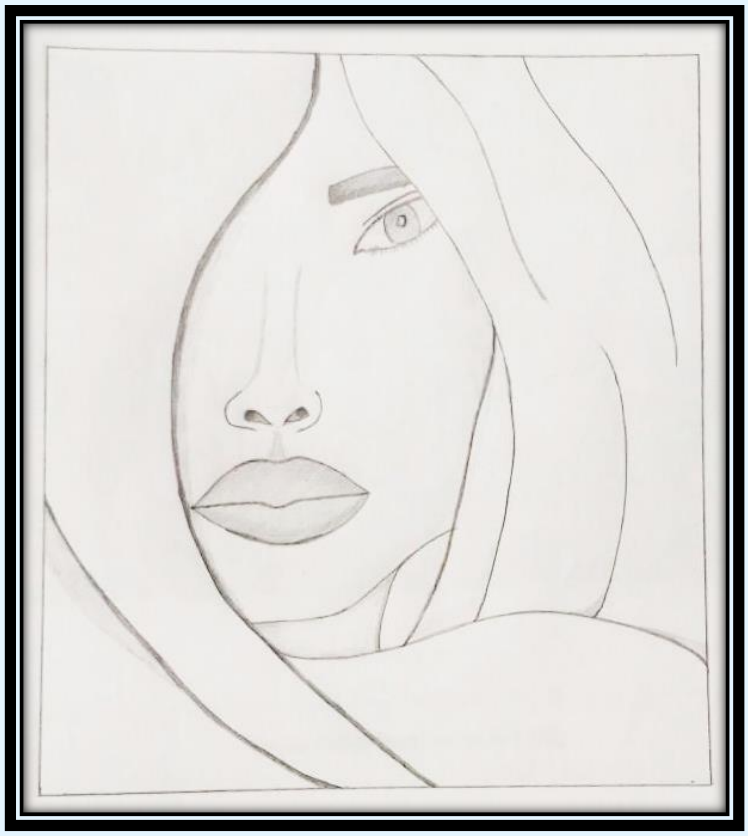
By,
Sanjay M P

OTHER ARTICLES



By,
Sanjay M P

OTHER ARTICLES



By,
Deepika C K,

By,
Deepika C K,

INDIAN ORIGIN CEOs LEADING THE WORLD

ARVIND KRISHNA

Arvind Krishna is an Indian-American business executive serving as the Chairman and CEO of IBM. Krishna was born into a Telugu-speaking Hindu family in West Godavari District in the Coastal Andhra region of Andhra Pradesh, India. His father, Major General Vinod Krishna, was an army officer who served in the Indian Army and his mother, Aarathi Krishna, worked for the welfare of Army widows.

He did his schooling at Stanes Anglo Indian Higher Secondary School, Coonoor, Tamil-Nadu and at St Joseph's Academy, Dehradun. He received is BTech degree in electrical engineering from Indian Institute of Technology, Kanpur in 1985. Krishna earned his Ph.D. in electrical engineering from the University of Illinois at Urbana-Champaign. Krishna joined IBM in 1990, at

IBM's Thomas J. Watson Research Center, and continued in Watson Research for 18 years till 2009. Later, he held General Manager Role in Information management software and systems and technology group of IBM. In 2015, he was promoted has senior vice president of IBM Research. He later became senior vice president of IBM's cloud, and cognitive software division.

He also led the building and expansion of new markets for IBM in artificial intelligence, cloud, quantum computing, and blockchain technology. He was a driving force behind IBM's $34 billion acquisition of Red Hat, which closed in July 2019. He was appointed IBM's CEO in January 2020, effective April 6, 2020, succeeding Ginni Rometty, who had served as CEO since 2012. He joined Satya Nadella, Shantanu Narayen, and Sundar Pichai as an Indian-American CEO of a major United States technology company. In 2021, he was named by CRN as the year's "Most Influential Executive".

MAGAZINE THEME ARTICLE

PARAG AGARWAL

Parag Agarwal is an Indian-American software engineer and businessman who was the CEO of Twitter, Inc. from November 2021. Agrawal was born in Ajmer, Rajasthan.

In 2001, he completed his final year of higher secondary education at Atomic Energy Junior College, Mumbai. In the same year, he secured a gold medal in the International Physics Olympiad held in Antalya, Turkey. In 2005, Agrawal obtained his Bachelor of Technology degree in computer science and engineering

from IIT Bombay. That year, he moved to the United States to pursue a PhD in computer science at Stanford University under the guidance of Jennifer Widom.

Agrawal held research internships at Microsoft Research and Yahoo! Research before joining Twitter as a software engineer in 2011. In October 2017, Twitter announced the appointment of Agrawal as chief technology officer. In December 2019, Twitter CEO Jack Dorsey announced that Agrawal would be in charge of Project Bluesky, an initiative to develop a decentralized social network protocol. On November 29, 2021, Dorsey announced that he was resigning as CEO of Twitter and that Agrawal was replacing him immediately.

MAGAZINE THEME ARTICLE

SATYA NADELLA

Satya Narayana Nadella (born on 19 August 1967) is an Indian-American business executive. Satya Nadella is Chairman and Chief Executive Officer of Microsoft. Before being named CEO in February 2014, Nadella held leadership roles in both enterprise and consumer businesses across the company. On 16th June 2021, Nadella has been further appointed as the Executive Chairman of Microsoft.

Joining Microsoft in 1992, he quickly became known as a leader who could span a breadth of technologies and businesses to transform some of Microsoft′ s biggest product offerings.

Most recently, Nadella was executive vice president of Microsoft′ s Cloud and Enterprise group. In this role he led the transformation to the cloud

infrastructure and services business, which outperformed the market and took share from competition. Previously, Nadella led R&D for the Online Services Division and was vice president of the Microsoft Business Division. Before joining Microsoft, Nadella was a member of the technology staff at Sun Microsystems.

Originally from Hyderabad, India, Nadella earned a bachelor′ s degree in electrical engineering from Mangalore University, a masters degree in computer science from the University of Wisconsin — Milwaukee and a masters degree in business administration from the University of Chicago. Nadella serves on the board of trustees to his alma mater the University of Chicago, as well as the Starbucks board of directors.

AWARDS:

2018 - Time 100 honoree

2019-Named Financial Times Person of the Year and Fortune magazine Businessperson of the Year

2020 - Recognized as Global Indian Business Icon at CNBC-TV18's India Business Leader Awards in Mumbai.

MAGAZINE THEME ARTICLE

SHANTANU NARAYEN

Shantanu Narayen (born May 27, 1963) is an Indian-American business executive. He has been the chairman, president, and chief executive officer (CEO) of Adobe Inc. since December 2007. Before this, he was the company's president and chief operating officer since 2005.

He earned a bachelor's degree in electronics and communication engineering from University College of Engineering, Osmania University in Hyderabad. He moved to the United States to complete his education, and in 1986 received a master's degree in computer science from Bowling Green State University in Ohio. Later he received an MBA from the Haas School of Business, University of California, Berkeley.

In 1986 Narayen joined a Silicon Valley start-up called Measurex Automation Systems, which made computer control systems for automotive and electronics customers. He then moved to Apple, where he was in senior management positions

from 1989 to 1995. After Apple, he served as director of desktop and collaboration products for Silicon Graphics. In 1996 co-founded Pictra Inc., a company that pioneered the concept of digital photo sharing over the Internet.

Narayen joined Adobe in 1998 as senior vice-president of worldwide product development, a position he held through 2001. From 2001 to 2005 he was executive vice-president of worldwide products. In 2005 he was appointed president and chief operating officer.

In November 2007, Adobe announced that Bruce Chizen would step down as CEO effective December 1, 2007, to be replaced by Narayen. As CEO, Narayen led the transformation of the company, moving its creative and digital document software franchises — which include flagship programs such as Photoshop, Premiere Pro, and Acrobat/PDF — from the desktop to the cloud. In addition, during his tenure as CEO, Adobe has entered the digital experiences category, an expansion which began with the company′ s acquisition of Omniture in 2009.

Honors and awards

In May 2011, Narayen received an honorary doctorate from his alma mater, Bowling Green State University.

In 2011, Barack Obama appointed him as a member of his Management Advisory Board.

Narayen is the lead independent director on the board of directors for Pfizer, and vice chairman of the US-India Strategic Partnership Forum.

In 2018, Narayen was ranked 12 on Fortune's "Businessperson of the Year" list and was deemed "Global Indian of the Year" in 2018 by The Economic Times of India.

In 2019, he was a recipient of India's Padma Shri award.

MAGAZINE THEME ARTICLE

SUNDAR PICHAI

Pichai Sundararajan (born June 10, 1972), better known as Sundar Pichai is an Indian-American business executive. He is the chief executive officer (CEO) of Alphabet Inc. and its subsidiary Google.

Pichai was born in Madurai, Tamil Nadu, India. Pichai completed schooling in Jawahar Vidyalaya Senior Secondary School in Ashok Nagar, Chennai and completed the Class XII from Vana Vani school at IIT Madras. He earned his degree from IIT Kharagpur in metallurgical engineering and is a distinguished alumnus from that institution. He holds an M.S. from Stanford University in materials science and engineering, and an MBA from the Wharton School of the University of Pennsylvania, where he was named a Siebel Scholar and a Palmer Scholar, respectively.

MAGAZINE THEME ARTICLE

Pichai began his career as a materials engineer. Following a short stint at the management consulting firm McKinsey & Co., Pichai joined Google in 2004, where he led the product management and innovation efforts for a suite of Google's client software products, including Google Chrome and Chrome OS, as well as being largely responsible for Google Drive. In addition, he went on to oversee the development of other applications such as Gmail and Google Maps. In 2010, Pichai also announced the open-sourcing of the new video codec VP8 by Google and introduced the new video format, WebM. The Chromebook was released in 2012. In 2013, Pichai added Android to the list of Google products that he oversaw.

Pichai was selected to become the next CEO of Google on August 10, 2015, after previously being appointed Product Chief by CEO Larry Page. On October 24, 2015, he stepped into the new position at the completion of the formation of Alphabet Inc., the new holding company for the Google company family. He was appointed to the Alphabet Board of Directors in 2017. Pichai was included in Time's annual list of the 100 most influential people in 2016 and 2020.

MAGAZINE THEME ARTICLE

ROSHNI NADAR

Roshni Nadar Malhotra is an Indian billionaire businesswoman and the chairperson of HCL Technologies. She is the first woman to lead a listed IT company in India. She is the daughter HCL founder and billionaire businessman Shiv Nadar. In 2019, she is ranked 54th on the Forbes World's 100 Most Powerful Women list. According to IIFL Wealth Hurun India Rich List (2019), she is the richest woman in India. In 2020, she is ranked 55th on the Forbes World's 100 Most Powerful Women. She is also the CEO of HCL Corporation, the holding company of all HCL Group entities.

Roshni Nadar grew up in Delhi, studied in Vasant Valley School and graduated from Northwestern University majoring in Communication with a focus on Radio/TV/Film. She earned an MBA from the Kellogg School of Management. She worked in various companies as a producer before joining HCL. Within a year of her joining HCL, she was elevated as executive director and CEO of HCL Corporation. She

subsequently became the chairperson of HCL Technologies, after her father Shiv Nadar stepped down.

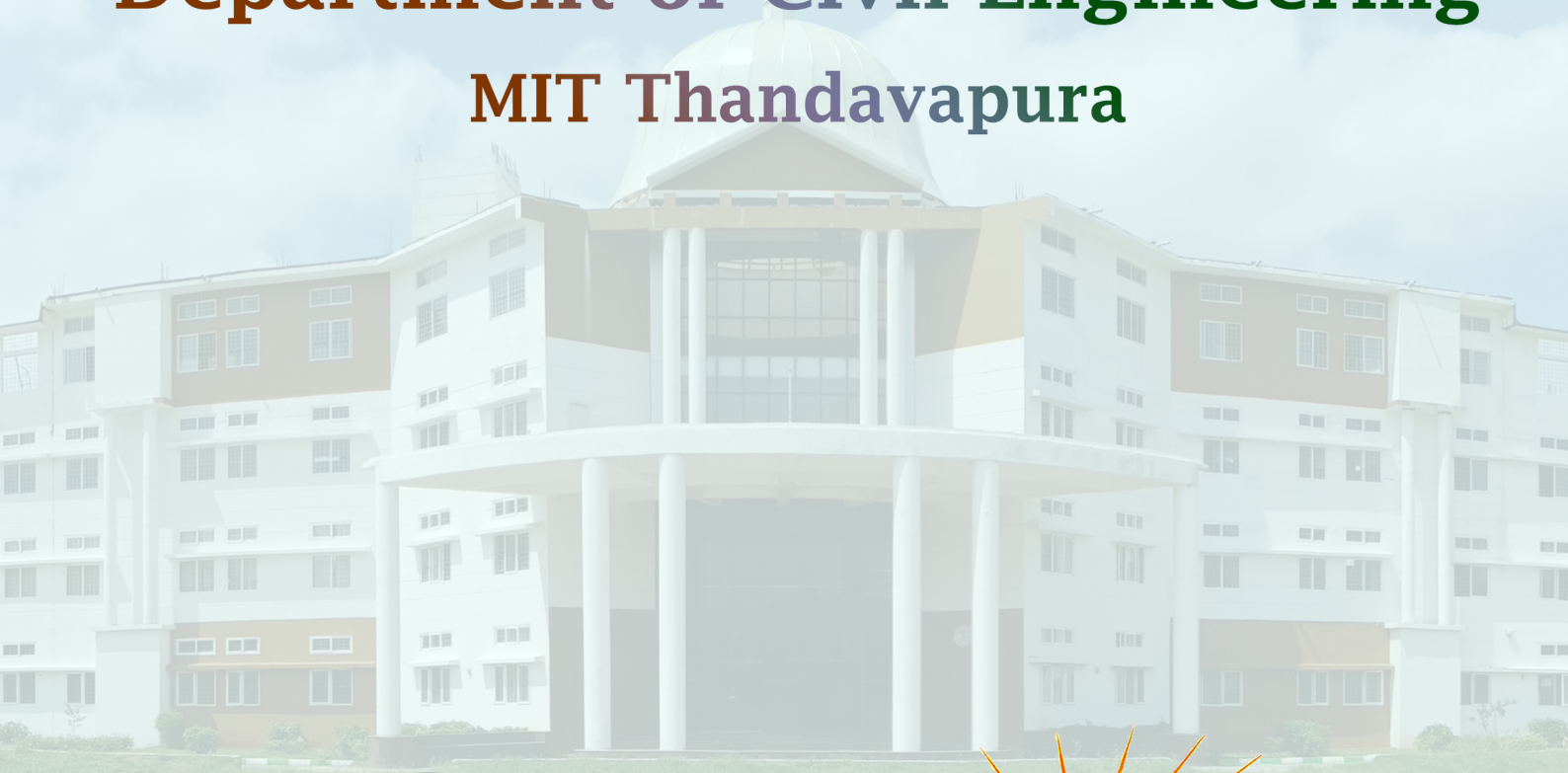
In 2014, she was recognized has NDTV young philanthropist of the year. She was conferred “"The World's Most Innovative People Award" for Philanthropic Innovation by The World Summit on Innovation & Entrepreneurship (WSIE) in 2015. Also, she was recognized as Vogue India Philanthropist of the Year in 2017.

ART WITHOUT ENGINEERING IS DREAMING

ENGINEERING WITHOUT ART IS CALCULATING

Department of Civil Engineering

MIT Thandavapura



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Annual magazine - 2022

Edition 2

Department of Civil Engineering

MIT Thandavapura

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Dr. G Hemanth Kumar
Vice President

Dr. T Vasudev
Secretary

Dr. H K Chethan
Joint Secretary

Dr. D S Guru
Treasurer

Dr. B G Naresh Kumar
Trustee

Dr. Ananth R Koppar
Trustee

Dr. Y T Krishnegowda
Trustee

ABOUT THE COLLEGE

MITT is situated at a beautiful, enchanting and sprawling landscape. The institute is founded by a group of eminent people recognised for their eminence in the field of science and engineering technology. Many of them have served at the highest levels of AICTE and University.

The college is equipped with all modern learning aids to make teaching-learning process a pleasure. The highly qualified staff is its asset.

If you are interested in a quality, Maharaja Institute of Technology Thandavapura is the place for you. MIT Thandavapura is a career-focused college that will provide you with a comprehensive educational experience in a variety of growing areas of employment.

HIGHLIGHTS

- **Built by renowned professors.**
- **IIT qualified Principal.**
- **ISO 9001:2015 & ISO 21001:2018**
- **Experienced & trained faculties.**
- **Day boarding system.**
- **Placement training from first year.**
- **Transport facility in and around Mysuru.**
- **50% waiver of tuition fee for topper of the branch.**
- **Regular interaction with parents.**
- **State of the art laboratories.**

Programs offered

B.E in CIVIL ENGINEERING

B.E in MECHANICAL ENGINEERING

B.E in COMPUTER SCIENCE & ENGINEERING

B.E in ARTIFICIAL INTELLIGENCE & DATA SCIENCE

B.E in ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To be recognized as premiere institute in creating competent graduates driven towards socio-technical needs.

MISSION

- To exhibit quality in processes of teaching and learning evolved through continual feedback.
- To create an ecosystem of greater learning through research and innovation.
- To engage in self-learning through interaction with industry and alumni.
- To maintain professional and ethical approach in dealing with stakeholders.

DEPARTMENT OF CIVIL ENGINEERING

VISION

To be the pioneer in producing competent Civil engineering graduates with knowledge, skills and attitudes that best serves the society.

MISSION

- To impart Civil engineering knowledge relevant to current challenges through learner-centric teaching methodologies and industry interactions.
- To instill essence of entrepreneurial attitude through extension of greater learning drawn from research and consultancy.
- To enact standards, morals and ethics that potentiates positive development of the society.

PEOs

- Acquire startup position in industry and excel in the chosen area of employment.
- Engage in greater learning through research, higher studies or collaboration.
- Instigate entrepreneurial ventures and exhibit apt leadership for greater benefit of the society.

PRESIDENT'S DESK

Dear Readers,

I am happy to note that department of Civil Engineering of Maharaja Institute of Technology Thandavapura is coming out with the second edition of their department magazine called CE-Samaya. If you read straight away this it looks to me ಸಿಹಿ ಸಮಯ means sweet time.

Yes, time is so sweet during student age. We elders always feel best part of our life was college days and that is ಸಿಹಿ ಸಮಯ. Early to the college days, school days were also sweet but it is system driven by parents and school. Post college days are hectic and driven by many like organization you work, family, environment, society etc. The best time for any one could be these years of college.

There is great liberty for students to choose their career, choose right friends, right hobbies, right thinking etc hence this time is so sweet. Congratulations to all those students and staff who have contributed to make this magazine so sweet.

With best wishes,
Dr. S Murali

JOINT SECRETARY'S DESK

"You can boost happiness and positive emotions through the use of your talent, whether it can be singing, dancing or writing skills."

I am pleased to know that the Department of Civil Engineering is coming out with the second edition of their department magazine by name "CE -Samaya". I extend my greetings and blessings on this and congratulate the Editorial team.

The magazine reflects the holistic development of the department. Today the role of the department is not only to pursue academic excellence but also to motivate and empower its students to be lifelong learners, critical thinkers, and productive members of an ever-changing global society.

Each student is an inherent talent that needs to be honed over time to become more refined. The magazine provides a platform to students to share their hidden talents - their creativity, self-expression, and learning experience. The good thing about the magazine is, it is not limited to students but also extended to teaching fraternity who can share their overall achievements.

All contributors and students deserve an applauded and congratulations. I hope in future other students will also feel inspired and motivated to build up their writing and presenting skills.

I congratulate the staff and the students for the commendable achievements.

I wish you all Happy reading….

With best wishes,
Dr. Chethan H K

PRINCIPAL'S DESK

Dear Readers,

It brings me great joy to present the 2nd edition of annual magazine of Department of Civil Engineering, MIT Thandavapura, a window into the dynamic and enriching journey we have undertaken together over the past year. As the Principal of this esteemed institution, I am immensely proud of the collective achievements and unwavering spirit that define our college community.

Education is the cornerstone of progress, and at MIT Thandavapura, we have embraced this principle wholeheartedly. Our college stands as a cradle of knowledge, innovation, and transformative experiences, where students are encouraged to dream big, think critically, and explore their true potential.

Within the pages of this magazine, you will discover a tapestry of success stories, academic triumphs, and co-curricular accomplishments that showcase the outstanding talents of our students. As they strive for excellence, our dedicated faculty members have played an instrumental role in guiding and nurturing their growth. The enduring bonds between our faculty and students exemplify the essence of mentorship and the power of meaningful education.

We firmly believe in nurturing compassionate, responsible, and socially conscious individuals. Through various outreach programs, community engagement, and social initiatives, our students learn the value of empathy and the transformative potential of their actions. They are not only future professionals but also agents of positive change in society.

The success of our college is a collective endeavour, and we are deeply grateful for the unwavering support of our alumni, industry partners, and well-wishers. Their guidance, contributions, and belief in our vision have strengthened our resolve to create a nurturing ecosystem that fosters excellence in every domain.

As you flip through the pages of this magazine, I hope you are inspired by the achievements, camaraderie, and aspirations of our college community. Whether you are a student, a parent, a faculty member, an alumnus, or a friend, this magazine reflects the essence of [College Name] and the profound impact it has on shaping lives.

May this magazine serve as a catalyst for even greater aspirations and accomplishments, as we continue to march forward in our pursuit of knowledge, enlightenment, and societal progress.

With best wishes,
Dr. Y T Krishnegowda

HOD'S DESK

Welcome to the Civil Engineering Department's annual magazine! It gives me great pleasure to present to you the Volume 2 of “CE-Samaya”, a compilation of the remarkable events, achievements and significant contributions made by our faculty, staff, and students over the past year.

The world of Civil Engineering is constantly evolving, driven by advancements in technology, emerging challenges, and the need for sustainable development. In this fast-paced environment, our department takes pride in nurturing young minds and preparing them to be future leaders and problem solvers in the field.

At our department, we have created a vibrant learning ecosystem that fosters creativity, critical thinking, and practical skills. Our dedicated faculty members, with their extensive knowledge and experience, strive to deliver quality education, imparting both theoretical and practical knowledge to our students. We are committed to developing a strong foundation of engineering principles and encouraging a multidisciplinary approach to problem-solving.

One of the key highlights of our department is the state-of-the-art infrastructure and well-equipped laboratories that facilitate hands-on learning experiences. From structural analysis to geotechnical engineering, from transportation planning to environmental sustainability, our students are exposed to a wide array of specialized areas within the Civil engineering discipline. We believe in providing a comprehensive education that prepares our students to tackle the complex challenges of the real world.

In addition to academic pursuits, the Civil Engineering Department encourages active student participation in extracurricular activities, technical events, and professional societies. These activities provide a platform for students to showcase their talents, enhance their leadership skills, and develop a strong network within the industry.

As we reflect on the accomplishments of the past year, we are filled with pride and gratitude for the unwavering support of our students, faculty, staff, and alumni. Their collective efforts have propelled our department to new heights and strengthened our position as a centre of excellence in Civil engineering education.

I extend my heartfelt appreciation to the editorial team for their diligent efforts in bringing together this magazine, showcasing the remarkable achievements of our department. I hope this compilation inspires and motivates all our readers to pursue excellence in their chosen paths.

I invite you to delve into the pages of the first volume of our annual magazine and witness the ingenuity and passion that define the Civil Engineering Department. Together, let us continue to build a better future for our society through the transformative power of civil engineering.

Dr. B C Nagendra Prasad
Head of the department

EDITORIAL BOARD

Dr. Y T Krishnegowda
Principal / Editor-in-chief

Mr. Harshith M
Assistant Professor / Editor

Nitish M
Student

Harshitha M B
Student

Akash A S
Student

Sagar habalkar
Student

Raghavendra
Student

STAFF DETAILS

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Professor & Head

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Assistant Professor

Mr. Akshay N K
Assistant Professor

Mr. Manu S Gowda
Assistant Professor

Mr. Venu Prasad A
Assistant Professor

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Assistant Professor

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Assistant Professor

Ms. Ganavi S
Assistant Professor

Mr. Chethan M B
Assistant Professor

Mr. Harshith M
Assistant Professor

Non teaching staff

1. Chandra S – Instructor
2. Puneeth Kumar – Lab Asst
3. Shivanna – Attender
4. Manu Y P – Attender
5. Naveen Kumar - Attender

TECHNICAL PUBLICATIONS

- Manjunatha M C and Basavarajappa H T, "Land Classification Analysis using Geospatial approach in Nanjangud taluk of Karnataka state, India", International Advanced Research Journal in Science, Engineering and Technology, Vol 8, Issue 6, Pp 629-638, May 2022.
- Manjunatha M C and Basavarajappa H T and Krishne Gowda Y T, "Geospatial Technology in Land classification analysis for H.D Kote taluk of Karnataka State, India", Wesleyan Journal of Research, Vol 14, No 2, Pp 57-71, May 2022.
- Manjunatha M C and Basavarajappa H T, "Flashflood impacts of Kapila river on Temple Town of Nanjangud, Karnataka, India.", International Advanced Research Journal of Science, Engineering and Technology, Vol 9, Issue 7, Pp 359-368, Aug 2022.
- Manjunatha M C, Inchara C S, Prabhavathi M C and Basavarajappa H T, "Slow death of Lakes in the Heritage city of Mysuru, Karnataka State, India through Geospatial approach", International Advanced Research Journal in Science, Engineering and Technology, Vol 9, Issue 11, Pp 19-26, Nov 2022.
- Venuprasad A and D Nagarajun, "Morphometric interpretation for sub basin management planning and practices in Hassan district, Karnataka using GIS and remote sensing", Journal for Geo Science Research, Vol. 7, No 2, Pp. 227-234, July 2022.
- Manu S Gowda and Rajeeth T J, "Use of super absorbent polymer with GGBS in normal concrete", Recent advances in materials, mechanics and structures, Vol. 269, Pp. 699-706, 2022.
- Rohith Jain, Md. Junaid, Kishore N, Yashwanth Gowda R, "Study on behaviour of Masonry Walls using different masonry unit and mortar combinations", International Journal of Engineering Research and Technology, ISSN:2278-0181, Vol. 10, Issue 11, 2022.
- Rohith Jain, Nallaval Chinnaswamy Balaji, Chirdeep N R and G. S. Suresh, "Comparative study of Gabion wall using experimental and analytical methods", International Conference on Civil Engineering Trends and Challenges for Sustainability, ISSN 2366-2557.

CONSULTANCY

The department of Civil Engineering, MIT Thandavapura has a consultancy wing wherein the faculty of the department conduct consultancy works around Karnataka. The department conducts soil testing, building material testing, water and sewage quality testing, surveying, structural stability checks, analysis and design of structures and much more.

The following projects are successfully conducted in the year 2022.

Sl. No.	Project type	Number of projects
1	Tests on aggregates, bricks, tiles etc.	2
2	Tests on cement, concrete etc.	8
3	Test on steel reinforcement	6
4	Soil testing	3
5	NDT	1
6	Structural design	1
7	Surveying	2

CAPTURED MOMENTS

Site visit to KRS dam

Industrial visit to ITC Ltd., Mysuru

Site visit to Canal near Srirangapatna

CAPTURED MOMENTS

Industrial visit to Mangla RMC plant

"Aakruthi" annual department event

Visit to "My build" construction industry exhibition

CAPTURED MOMENTS

Talk by Snake Shyam

Talk by Airport Director, Mysuru Airport

Seminar on "Stress management"

CAPTURED MOMENTS

Seminar on "Entrepreneurship by Mr. Sainath, Alumni

Site visit to Chamarajanagar mine

Talk on "Importance of Professional bodies"

MOUs

BARUNI Civil Consultants	Internships Site visits Placements
SHATHAYU Constructions & Consultants	Internships Site visits Placements Consultancy
Inner Voice CAD Academy	Software training
YASHASWI Consultants	Internships Site visits Placements
AVISHKAR Consultants & Constructions	Internships Site visits Placements
ANIKA Civil Consultants	Internships Site visits Placements
CREATIVE Constructions & Consultants	Internships Site visits Placements

EVENTS

1. Students of 7th semester were exposed to modern tool usage through Introduction to "Applications of Primavera in Civil Engineering" by Prof. Chethan M B on 10/01/2022. The importance of applications of primavera in CPM was taught to students. The speaker highlighted the planning and scheduling of project, resource management, cost management, risk management and collaboration of stakeholders to students.
2. A lecture on Geopolymer concrete by Prof. Raghavendra A was arranged for students of 5th semester on 31/01/2022. The lecture focused on the raw materials used for production of geoploymer concrete, its chemical composition and mix proportioning. Also, the speaker highlighted the advantages of Geoploymer concrete over conventional one and its application in the various civil engineering fields.
3. Students of 4th, 6th & 8th semester visited KRS Dam as an industrial visit to gain knowledge on hydraulic structure on 11/06/2022. Mr. Charan Prakash, Junior Engineer, KRS Dam guided the students. The students were highlighted about the details of gates, spillway, outlet works, intake tower and powerhouse built on downstream side of the dam.
4. Students of 6th semester were made to visit the ongoing Bangalore-Mysuru expressway near Baburayana Koppal on 14/06/2022 along with all the faculty members. Mr. Murugan In-charge Engineer explained the significance of the project of total road length 119km which is being constructed in 2 phases. Students were taught about earthwork excavation and instruments used and about the retaining structures. Plan of bridge and reinforcement detailing drawing were shown to the students.
5. Students of 6th semester visited ITC food production unit on 10/03/2022. An event was organized for girl students, on account of women's day. Students were emphasized on women safety and ethical role of women in life by Ms. Inchara, In-charge H R Department. The students were also

guided about food processing and packing of ready-mix food products prepared in their production unit.

6. Mr. Raja K, Plant Manager, Sarala Industries delivered a seminar on "Advances in construction materials" on 25/05/2022 to 4th semester students. The speaker enlightened about the Columbia vibration technology for block production adopted in their industry. The speaker emphasized curing technique like vaporization method and wrapping method. Also presented about the High-Performance Concrete, Self-healing materials and cross laminated timber used in tall buildings.
7. Students of 4th semester visited a canal near Srirangapatna as a part of site visit with faculty in charge Prof. Rohith Jain on 24/05/2022 to gain practical knowledge of hydraulic structure. Students were explained about canal, criteria adopted for selecting a site for canal, the components of canal and hydraulic structures such as canal regulators, outlets, notches, cross drainage works etc.
8. A seminar on "Project presentation, professional writing and paper publishing" was conducted by Prof. Akshay N K, Assistant Professor on 04/04/2022 to the students of 8th semester. The aim of the seminar is to improve the professional skills of students in writing and presentation and to encourage students to publish their project work.
9. A site visit to Mangala RMC was arranged to students of 8th semester on 06/04/2022. Mr. Mahantesh, Plant Manager, guided the students. During the visit, students learnt about the procurement of raw material, equipments and their functioning and control system unit used for mix proportioning. Students also gained knowledge in preliminary tests carried out on raw materials and quality checking.
10. Seminar on "flooring materials and selection" was conducted to 3rd semester students on 20/12/2022 in association with Builders Association of India to enhance the knowledge of students on flooring materials. The

speaker Mr. Subramanya, Partner, Shathayu Civil Consultants presented students about different flooring materials available in the market and their versatility. He enlightened about ceramic tiles, flooring laminates, vinyl flooring wood laminated floorings and about the selection of different materials for different spaces.

11. Students of 5th and 7th semester visited "My Build 2022" a construction industry expo on 10/12/2022 organized by Builders Association of India. Students benefited from the knowledge of construction materials, interiors, equipment and technologies in the construction industry. Expo showcased many national and international company's ideas and technologies in construction sector. Also, students witnessed other aspects of civil engineering like roofing materials, rainwater harvesting, elevators, kitchen cabinets, building acoustics etc.
12. Mr. Snake Shyam, Former corporator & animal activist presented an expert Talk on "Effect of human intervention in Biodiversity of Karnataka" for students of 3rd, 5th & 7th semester. The speaker emphasized on biodiversity, deforestation, habitat loss, endangered species, awareness campaigns, ecological balance, natural habitats, environmental impact, climate change conservation, wildlife protection and human-wildlife conflict to create social awareness about human intervention on biodiversity.
13. Mr. Manjunath, Airport Director, Mysuru presented an expert talk on "Current development trend in Airport systems" for students of 7th semester. Expert emphasized basic components of airport layout, current Airplane schedules from Mysore city and technology used in monitoring the functioning of the airport system. Also enlightened students about future outgrowth of the airport due to outer ring road provision and other establishments through smart city in and around region. Speaker also depicted the job opportunity for Civil Engineers in the Airport Authority of India.

EVENTS

14. Students of 5th and 7th semester participated in the presentation done by Dr. Bindya J, MBBS, MD Psychiatry, Lady Medical Officer, MIMS, Mandya on 23-11-2022. The session focused on understanding student Psychology, causes of stress in students, coping mechanisms for students, and how to create a supportive environment.
15. A seminar on "Special concrete and its applications" by Mr. Sanjay, Partner, Anika Civil Consultants was conducted on 23/11/2022 for the students of 5th semester. The expert expressed about special concrete, its applications, advancement and challenges and considerations of using special concrete to students.
16. A seminar was conducted to students of 3rd and 5th semester on 08/11/2022 with a motto of enhancing the knowledge of students on formwork and scaffolding. The presenter was Mr. Jai Praveen, Partner, Creative Construction & Consultants. The presenter emphasized students about different formwork and scaffolding materials available and their usage in construction industry.
17. Mr. Sainath Habalkar presented a talk on "Entrepreneurship qualities" for students of 7th semester on 21-11-2022. The motto of the talk was to make students aware of entrepreneurial knowledge and skills. The speaker enlightened students about the visionary, passionate, risk - taker, creativeness, and resilience, adaptation, and leadership, resourceful and persistent qualities of entrepreneur.
18. Communication skill development training by The Hindu Group was arranged to students of 5th semester for spa of 15 days from 17/10/2022 to 10/11/2022. The training helped students to gain knowledge related to skills such as active listening, non-verbal communication, assertiveness, empathy, effective speaking, building rapport, collaboration etc.
19. Students of 3rd, 5th and 7th visited SVG Exports Pvt. Ltd at Chamarajanagar on 07/11/2022. Mr. Raghu, In-charge Engineer of the company guided

students about the site condition, blasting technique and mining equipment used in their quarry. Also, students visited the production unit and were exposed to procedure of cleaning, cutting, finishing and packing of Dolerite dyke granite production.

20. Mr. Ramesh, Marketing In-charge, Institute of Engineers, India (Mysore Chapter) presented an expert talk on "Exposure to importance of Professional body membership" for students of odd semester of Civil Engineering Department. Expert focused on the events organized under the professional bodies and how it helps to develop the relation with industrial experts which benefits individuals to showcase their skill to the society. The procedure for enrolling to Institute of Engineers under student category was emphasized.
21. A site visit to MPro RMC was arranged for students of 3rd and 5th semester on 21/10/2022. Mr. Arun P, Incharge Engineer, MPro RMC plant guided the students. During the visit, students learnt about the various components used in RMC unit, preliminary test conducted on raw materials, different grades of concrete produced and the mechanism of proportioning the materials in control room.
22. Mr. Kumar and Mrs. Rashmi presented a technical talk on "Introduction to steel Detailing using Tekla Structures" as modern tool usage for students of 7th semester. Experts delivered on the basic ideas of steel detailing and enlightened students on Tekla software. The speaker discussed on basic toolbars, knowledge on importing the drawings to Tekla software, advance level BIM environment, 3D models and connections for various structure and idea on types of connections and their properties with respect to steel structure.
23. A lecture on Structural steel material for students of 7th semester was arranged on 20/09/2022. The lecture focused on structural steel material, types commonly used in the construction industry and manufacturing

process. The manufacturing process such as preparation of raw materials by removing impurities, iron making, steel making, casting and finishing of steel products was also highlighted.

24. The annual technical event was conducted on 23rd and 24th June 2022. More than 150 students from Engineering colleges in Karnataka participated in the technical & non-technical events. Technical events included "Do U follow code", "It's a Windy day", "Quirky Surveyor", "Strongest cube", "Super draftsman" and "Treasure Hunt".

Non-technical event comprised of a short over cricket tournament called "Dr. Puneeth Rajkumar Cup" in which 14 teams participated.

ACADEMIC ACHIEVERS

ODD SEMESTER 2021-22

7th semester		
Topper	Punya S L	9.55 SGPA
2nd topper	Yashika C V	9.45 SGPA
3rd topper	Anitha D N	9.40 SGPA
5th semester		
Topper	Ishwarya B	9.68 SGPA
2nd topper	Suhas R	9.60 SGPA
3rd topper	Abhishek S	9.56 SGPA
3rd semester		
Topper	Rekha S	9.44 SGPA
2nd topper	Chandana K	9.20 SGPA
3rd topper	Chitra N	9.08 SGPA

EVEN SEMESTER 2021-22

8th semester		
Topper	Bhoomika K	9.83 SGPA
2nd topper	Charanprakash	9.83 SGPA
3rd topper	Siri R	9.83 SGPA
6th semester		
Topper	Suhas R	9.71 SGPA
2nd topper	Ishwarya B	9.37 SGPA
3rd topper	Yashaswi K P	9.29 SGPA
4th semester		
Topper	Rekha S	9.17 SGPA
2nd topper	Madhura B	8.92 SGPA
3rd topper	Chethana V	8.50 SGPA

KOLKATA FLYOVER COLLAPSE- APRIL 2016

Background

Kolkata is the capital city of West Bengal state within the Indian Union. It covers an area of approximately 185sq. km and current population around 5 million. It is situated on the banks of the river Ganges (GANGA) and is one of the most densely populated cities in the country. To overcome the traffic congestion on the major roads in the business districts, the Govt has undertaken construction of several flyovers which has eased the traffic flow in certain localities. One of the recent ones is a 2.5km stretch in Central Kolkata, having 2 serviceable roads with

provision for expansion to 4 lanes in future as traffic flow grows. The location of the flyover is shown in the above map of the city. Construction of the flyover started in 2007 and target completion was scheduled in 2009 to cater to the needs for uninterrupted construction. But due to various constraints specially in getting regulatory clearances as work site situation changed and also due to fund constraint, the contractor had financial difficulties in progressing as per schedule. There was change of govt in between so that the new target was set at 2014.

About 75% of the work was completed and it was expected that the facilities will be commissioned in 2016. Unfortunately, on March 26, 2016, part of the flyover structure collapsed causing loss of lives and damage to properties. The magnitude of the accident was so severe that Army had to be called in and it took over 6 days to clear the debris and rescue dead bodies trapped under the debris. It was a heart rendering scene.

Construction

The flyover has to be constructed on a very busy stretch of the city road network. Therefore, the construction must not create hurdles to the traffic flow. Moreover, the area is highly congested so the project must be completed within very tight time schedule. Keeping all these factors in mind it was decided to adopt structural steel structures for the superstructure.

Box girders were chosen for columns and beams forming rigid portal frames on RCC foundations supported on bored cast in pipes driven to 45m below the ground level. The soil is predominantly sandy clay with mix of gangetic alluvium having bearing capacity around 8 T/m^2. This required the piles to be on a bed of compact sand stone at average 45m depth. Schematics of the construction shown below.

To expedite the project completion and reduce site work, the super structure was designed using structural steel portal of box sections erected over RCC foundations supported on bored cast in situ piles driven 45m under the GL where a layer of compact sandstone exists. On top of the steel super structure a cast in situ RCC slab 200mm thick was designed topped by a 100mm PC wearing course and finally 50mm thick mastic asphalt surfacing was laid. The live load was as per guideline of various codes and Ministry of Surface Transport, Govt of India. However, as the bridge was not commissioned at the time of accident, the live load was absent.

Application of forensic engineering in root cause failure analysis (RCFA)

In the absence of adequate design data, and restrictions on site visits. Forensic engineering principles have been applied to ascertain the Root Cause Failure Analysis. It is to be noted that failure has occurred when the bridge was not subjected to any live load from moving vehicles.

Thus, it can be inferred that there was some basic design deficiency. The longitudinal beams spanning between the portal hammer head frames had no bracings on the compression flanges to prevent lateral buckling. Such buckling imposed additional horizontal loads on the portal frame box girders. At the portal frame hammer heads, the horizontal box girder beams should have extra depth at the knee joint to withstand additional moments resulting from moment redistribution according to stiffness of each member at the joint. The box girders should have internal ribs to withstand torsion forces resulting from torsion and buckling of the girders. The various stages for failure of the portal frame girders are shown below. Thus, it can be concluded that there were inherent design deficiencies from the beginning. The other contributory factors for failure can be attributed to inadequate QA/QC measures at shop and site during fabrication and site erection of the portal frames. Normal practice for acceptance of structural steel is to depend on mill test certificates. In such girders it is advisable to carry out USG tests and Pulse echo testing of steel plates to ascertain that they are free from internal defects. From the failure pattern of the top flange plates of the portal frame box girders, it is clear that there were internal defects inside the plates causing rupture and eventual failure of the top flange.

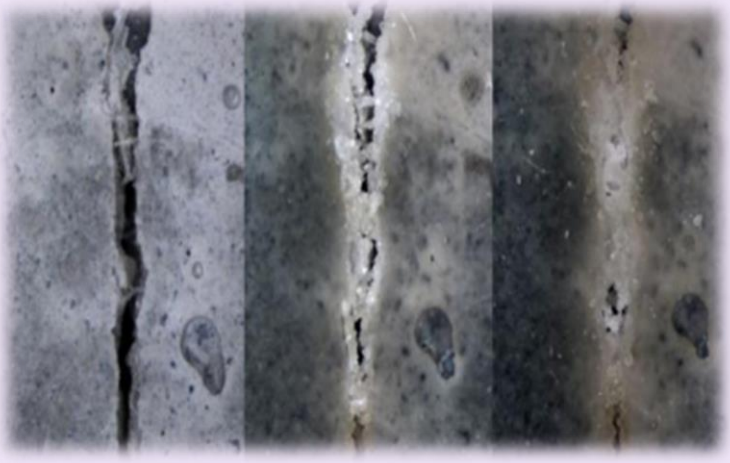
By,
Ishwarya B

LATEST TECHNOLOGIES IN CIVIL ENGINEERING

New materials and energy, design approaches, as well as advances in digital technology and big data, are creating a wave of innovation within the construction industry. Here are the most exciting developments.

- Self-healing concrete
- Thermal bridging
- Kinetic roads

SELF HEALING CONCRETE: - Self-healing concrete is a type of concrete that can heal self autogenously fill up the cracks without any intervention from external sources. Most of the research indicates that the addition of bacteria with or without nutrients affects the mechanical properties of concrete negatively. Various methods of producing self-healing concrete are available in previous research but using bacterial as self -healing agent enables the concrete to be environmentally friendly. Most of the studies by WANG JIANYUN employs Bacillus spherics LMG 22557 as the bacteria of the self-healing agent while JONKER ET AL (2010) used Bacillus pseudoformal DSM 8715 and B. Self-healing concrete is used in the construction of bridges and all road constructions as they often experience small-sized cracks due to heavy loads and constantly need maintenance. However, self-healing concrete is still being perfected. While it may be hard to get your hands on some self-healing concrete at moment, you can expect it to dominate the industry within the next few years.



KINETIC FOOTFALL: - Another technology is KINETIC ENERGY which is under development that is pavement provides a technology that enables the flooring to harness the energy of footsteps. It may be utilized indoors or outdoors in high traffic areas and generates electricity from pedestrian footfall using an electromagnetic induction process and flywheel energy storage. The Kinetic footfall is the most efficient transport hub where a large flow of people will pass over it. The company development has been done so far on a football pitch in Rio de Janeiro to help power the floodlights around the pitch.

KINETIC ROADS: - The utility of Kinetic energy potential in roadways is exploring by Italian start-up underground power. The company has to developed roadways a technology called LYBRA, a tire-like rubber paving that converts the Kinetic energy produced by moving vehicles into electrical energy. The technology is developed in collaboration with the Polytechnic University of Milan, Lybra operates on the principle that a braking car dissipates Kinetic energy. This new cutting-edge technology is able to collect, convert Kinetic energy into electricity and pass it on to the electricity grid also for improving road safety, the device upgrades and promotes sustainability of road innovation in construction.

TECHNICAL ARTICLES

Thermal bridging is used in reference to a building's thermal envelope, which is a layer of the building enclosure system that resists heat flow between the interior conditioned environment and the exterior unconditioned environment. Heat will transfer through a building's thermal envelope at different rates depending on the materials present throughout the envelope. Heat transfer will be greater at thermal bridge locations than where insulation exists because there is less thermal resistance. In the winter, when exterior temperature is typically lower than interior temperature, heat flows outward and will flow at greater rates through thermal bridges. At a thermal bridge location, the surface temperature on the inside of the building envelope will be lower than the surrounding area. In the summer, when the exterior temperature is typically higher than the interior temperature, heat flows inward, and at greater rates through thermal bridges. This causes winter heat losses and summer heat gains for conditioned spaces in buildings.

Thermal bridges can occur at several locations within a building envelope; most commonly, they occur at junctions between two or more building elements. Common locations include:

- Floor-to-wall or balcony-to-wall junctions, including slab-on-grade and concrete balconies or outdoor patios that extend the floor slab through the building envelope.
- Roof/Ceiling-to-wall junctions, especially where full ceiling insulation depths may not be achieved.
- Window-to-wall junctions
- Door-to-wall junctions
- Wall-to-wall junctions
- Wood, steel or concrete members, such as studs and joists, incorporated in exterior wall, ceiling, or roof construction.
- Windows and doors, especially frames components
- Areas with gaps in or poorly installed insulation
- Metal ties in masonry cavity walls

By,
Spoorthi C

LOW-COST HOUSING

Low-Cost Housing is a new concept which deals with effective budgeting and following of techniques which help in reducing the cost construction using locally available materials along with improved skills and technology without sacrificing the strength, performance and life of the structure. There is huge misconception that low-cost housing is suitable for only substandard works, and they are constructed by utilizing cheap building materials of low quality. The fact is that Low-cost housing is done by proper management of resources. Economy is also achieved by postponing finishing works or implementing them in phases.

Building Cost

The building construction cost can be divided into two parts namely:

- Building material cost: 65 to 70 %
- Labour cost: 65 to 70 %

Now in low-cost housing, building material cost is less because we make use of the locally available materials, and the labour cost can be reduced by properly making the time schedule of our work. Cost reduction is achieved through the selection of more efficient material or by an improved design.

Properties of Low-Costing housing

- Plinth: It is suggested to adopt 1 ft. height above ground level for the plinth and may be constructed with a cement mortar of 1:6. The plinth slab of 4 to 6″ which is normally adopted can be avoided and in its place brick on edge can be used for reducing the cost. By adopting this procedure, the cost of plinth foundation can be reduced by about 35 to 50%. It is necessary to take precaution of providing impervious blanket like concrete slabs or stone slabs all-round the building to enable to reduce erosion of soil and thereby avoiding exposure of foundation surface and crack formation.
- Walling: Wall thickness of 6 to 9″ is recommended for adoption in the construction of walls all-round the building and 41/2” for inside walls. It is suggested to use burnt bricks which are immersed in water for 24 hours and then should be used for the walls.
- Rat – trap bond wall: It is a cavity wall construction with the added advantage of thermal comfort and reduction in the quantity of bricks required for masonry work. By adopting this method of bonding of brick masonry compared to traditional English or Flemish bond masonry, it is possible to reduce in the material cost of bricks by 25% and about 10to 15% in the masonry cost. By adopting the rat-trap bond method one can create aesthetically pleasing wall surface and plastering can be avoided.

- Concrete block walling: In view of high energy consumption by burnt brick it is suggested to use concrete block (block hollow and solid) which consumes about only 1/3 of the energy of the burnt bricks in its production. By using concrete block masonry, the wall thickness can be reduced from 20 cms to 15 Cms. Concrete block masonry saves mortar consumption, speedy construction of wall resulting in higher output of labour, plastering can be avoided thereby an overall saving of 10 to 25% can be achieved.

- Soil cement block technology: It is an alternative method of construction of walls using soil cement blocks in place of burnt bricks masonry. It is an energy efficient method of construction where soil is mixed with 5% and above cement and pressed in a hand operated machine and cured well and then used in masonry. This masonry doesn't require plastering on both sides of the wall. The overall economy that could be achieved with the soil cement technology is about 15 to 20% compared to conventional method of construction.

- Doors and windows: It is suggested not to use wood for doors and windows and in its place concrete or steel section frames shall be used for achieving saving in cost up to 30 to 40%.Similiarly for shutters commercially available block boards, fibre or wooden practical boards etc., shall be used for reducing the cost by about 25%.By adopting brick jelly work and precast components effective ventilation could be provided to the building and also the construction cost could be saved up to 50% over the window components.

- Lintals and Chajjas: The traditional R.C.C. lintels which are costly can be replaced by brick arches for small spans and save construction costs up to 30 to 40% over the traditional method of construction. By adopting arches of different shapes, a ...

- Roofing: Normally 5″ (12.5 cms) thick R.C.C. slabs are used for roofing of residential buildings. By adopting rationally designed insitu construction practices like filler slab and precast elements the construction cost of roofing can be reduced by about 20 to 25%.

- Filler slabs: They are normal RCC slabs where bottom half (tension) concrete portions are replaced by filler materials such as bricks, tiles, cellular concrete blocks, etc. These filler materials are so placed as not to compromise structural strength, result in replacing

unwanted and nonfunctional tension concrete, thus resulting in economy. These are safe, sound and provide aesthetically pleasing pattern ceilings and need no plaster.

- Jack arch roof/floor: They are easy to construct, save on cement and steel, and are more appropriate in hot climates. These can be constructed using compressed earth blocks also as alternative to bricks for further economy.

- Ferrocement channel/shell unit: Provide an economic solution to RCC slab by providing 30 to 40% cost reduction on floor/roof unit over RCC slabs without compromising the strength. These being precast, construction is speedy, economical due to avoidance of shuttering and facilitate quality control.

- Finishing Work: The cost of finishing items like sanitary, electricity, painting etc., varies depending upon the type and quality of products used in the building and its cost reduction is left to the individual choice and liking.

By,
Yashika C V

OFFSHORE WIND POWER

Offshore wind power or offshore wind energy is the energy taken from the force of the winds out at sea, transformed into electricity and supplied into the electricity network onshore. It is the generation of electricity through wind farms in bodies of water, usually at sea. Offshore farms are in shallow waters (up to 60 meters deep) and away from the coast, marine traffic routes.

There are higher wind speeds offshore than on land, so offshore farms generate more electricity. Offshore wind farms are also less controversial than those on land, as they have less impact on people and the landscape. This is a type of renewable energy, there are numerous benefits because it does not pollute. The cost of offshore has historically been higher than the onshore. Offshore wind generation grew at over 30 percent per year in the 2010s. As of 2020, offshore wind power had become a significant part of northern Europe power generation. 30GW of offshore wind projects by 2030 is the target of offshore wind in India. The global installed offshore wind capacity is expected to reach 630 gigawatts (GW) by 2050. First offshore wind farm

– Vindeby on July 15, 1991.It is operating for 26 years. India's largest offshore is Muppandal wind.

Globally offshore wind is about two decades old history with the first offshore wind turbine in Denmark in 1991 which has been decommissioned in 2017. As of now, offshore wind energy projects of more than 57 GW are installed in 18 different countries, of which leading countries are UK, China, Germany, Denmark and The Netherlands

Advantage of Offshore Wind Power

- Distance from local populations, therefore cancelling worries about noise from the rotation of the wind turbine blades and reducing the impact on local environments.
- Space to dramatically increase the number of wind farms and therefore clean energy to homes and businesses.
- Job creation – the government estimates that a step rise to 40 gigawatts (GW) of offshore wind in the same period will support up to 60,000 new jobs. Our own analysis in the Job That Can't Wait report shows that the country needs to fill 400,000 jobs in the energy sector in the next three decades to deliver net zero by 2050.
- On top of being clean and green, offshore wind power is cost-efficient so electricity bills will be reduced.

Disadvantages of Offshore Wind Power

- Worries about the effect on birds and marine life. Here, the effect unchecked climate change poses to wildlife needs to be balanced with ongoing research into habitat loss, disturbance and collision. The Royal Society for the Protection of Birds (RSPB) acknowledges the bigger picture, saying: "Switching to renewable energy now, rather than in 10 or 20 years, is essential if we are to stabilize greenhouse gases in the atmosphere at safe levels." Wind farm developers work closely with local environmental groups, through a consultation process on the sitting and scale of wind farms.

- Some potential disruption during infrastructure creation, although the integration of interconnectors means less disruption than multi projects.

Challenges to increasing offshore wind generation.

Minimizing the impact on local communities and creating positive relations, while creating the infrastructure to transport extra electricity from the coast to cities cost-effectively, all while creating local jobs, are some of the challenges.

We welcome ambition and believe that, while challenging, it's achievable. The scale of projects in the pipeline is unprecedented. And it's a stretching target that will need the right regulatory, planning and policy framework to support the requisite investment, both on and offshore, without losing the good will of communities.

The windiest parts of most countries are offshore, out at sea, so putting windfarms out there is the perfect source of renewable energy for us. Find out more about the advances being made in offshore energy and how we'll be using it to generate much more clean energy for a net zero future.

India is blessed with a coastline of about 7600 km surrounded by water on three sides and has good prospects of harnessing offshore wind energy. Offshore wind power is a constantly renewable and infinite energy source, and the conversion of wind into power creates no harmful greenhouse gas emissions. As we work to tackle climate change and reduce greenhouse gases, offshore wind power will play an essential role in our future electricity generation.

By,
Yashaswi K P

PILE CAP CONSTRUCTION

A pile cap is a mass concrete structure contains more piles embeds in it. A group of piles drives into clay, soft, and loose soils to provide a strong, stable and suitable foundation.

The pile is designed by considering the punching shear around the heads of the piles and column base. It also designed for bending moment due to the transmission of loads from columns to the individual piles.

Pile cap Necessity

Pile is necessary when the bearing capacity of soil below the structure is insufficient for a spread footing. It transfers the load to deeper, firmer strata. Piles used where the soil particularly affects by seasonal changes, to transfer the load below the level of such influence.

The load support exceeds the bearing capacity of a single pile, a group of piles is used.

The group capped by a spread footing or a cap to distribute load to all piles in the group. Where there are a large number of closely space piles, provide individual caps. It is more economical to provide just one large cap, forming a piled raft.

SHAPES

The shape and plan dimensions of the pile cap depend on two factors.

1. Number of piles in the group and
2. The spacing between each pile.

The most common shapes are

1. Number of piles in the group

A group of piles accommodates in a pile cap.

In two pile cap, two piles are embedding in one pile cap. The picture shows two and one pile cap PCC arrangements for pile cap.

The shapes of the pile caps minimize the plan area for symmetrical pile arrangement about the load.

It is overhand the outer piles by at least 150mm and not excessive. And not more than the diameter of the pile diameter.

There are different shapes of pile caps according to the number of piles.

DEPTH

The overall depth provides sufficient bond length for the pile reinforcement and the column reinforcement.

The depth decides by the following criteria.

1. Punching shear.
2. Pile anchorage.
3. Shrinkage and swelling of the soil.
4. Frost attack.
5. Groundwater table.

The most important thing is a shear capacity of the pile which affects the selection of the pile depth.

SECONDARY REINFORCEMENT:

The secondary reinforcement provides to prevent the piles from splaying outwards from the pile cap.

1. This reinforcement provided at the bottom of the pile cap running around the longitudinal reinforcement. Projecting from the piles into the pile cap.
2. The direction of the secondary reinforcement is changing at the head of each pile.

The amount of secondary reinforcement changing its direction at the head of each pile. And is not less than 20% of the main tensile reinforcement and well bond.

By,
Rekha S

POLLUTION ABSORBING BRICKS

Pollution absorbing bricks works on the principle of air filtration. They filter the air from the outside and provide filtered air to the inside of the structure. Due to the rise in population, the world is facing critical issues such as climate change, scarcity of food and water, and pollution. To overcome these issues, researchers have come up with various solutions. Sustainability is one of the factors that hold the highest significance in the construction sector. Thanks to the advancement in technology, we have innovated various sustainable materials and one of these inventions is pollution absorbing bricks.

In this article we can see everything regarding pollution absorbing bricks, including their composition and function.

What is Pollution Absorbing Bricks?

Regarding climate change, one of the growing concerns is air pollution. Its severe effects on human health cannot be denied. The excess carbon in the air that emits from artificial resources entraps heat on the surface of the earth, which has caused global temperatures to rise. To cater to these prevalent issues, designers and architects have taken measures to reduce the carbon footprint in the environment, so that its dangerous effects on the atmosphere can be

minimized. Pollution absorbing bricks were invented to tackle the issue of air pollution. They are an amazing alternative to traditional bricks. They are also known as "breath bricks."

Concept Behind Pollution Absorbing Bricks.

Pollution absorbing bricks works on the principle of air filtration. They filter the air from the outside and provide filtered air to the inside of the structure. These bricks separate dust particles and other pollutants from the air, leaving it clean, and safe for breathing. The bricks are a work of genius inspired by the concept of "cyclone filtration" that one sees in vacuum cleaners. Material and components of Pollution Absorbing Bricks. Pollution blocking bricks come in the form of poriferous concrete blocks. Their shape and design are devised particularly in a faceted manner to let the airflow inside them with ease. To reinforce the structure, shafts are supplied. A coupler rod made of reused plastic is located between two bricks, also, a hopper is attached at the bottom part which collects dirt particles.

The function of Pollution Absorbing Bricks.

Breath bricks act as a passive filtration setup fixed in the walls of the structure. It possesses an avity wall which is a two-layered structure built on the exterior with pollution-absorbing bricks which block pollutants and an internal wall that insulates the inner atmosphere of the structure.

Inside the breath brick, a cyclone filtration filter is attached. The filter lets the air from the surroundings pass through the brick, like a cyclone, where it separates the pollutants and dust and lets the clean air enter the internal structure. After that, a brick coupler – an essential part of the system, directs the filtered air. It is made up of recycled plastic and is more of an outlet for filtered air. Furthermore, it directs the filtered particles to the hopper.

As all the dust particles get collected in the hopper, the user needs to empty and clean it regularly. However, they don't need to clean it daily due to its immense size. The brick coupler positions the bricks by putting out structural reinforcement through one of its shafts. Once the filtration is done, the air passes through the chamber and into the opening. Besides, if there is a functioning outlet or window in the structure, then the air directly enters the interiors through it. In case there is no functioning opening, the air passes through the HVAC system.

Advantages of Pollution Absorbing Bricks

A test was carried out to determine the capacity of pollution-absorbing bricks. The results show that the bricks filter up to 30% of dust particles of about 2.5 microns diameter or smaller. This is equal to the effects of smoke or haze. It blocks 100% of rough particles that have a diameter of more than or equal to 10 microns.

- Eco-friendly System: This system is more eco-friendly as it does not utilize any mechanical components. Moreover, pollution-absorbing bricks are an innovative approach to sustainable construction materials.
- Cost-Effectiveness: Besides being more environmentally friendly, it is more economic compared to the air filtration technology used on a large scale. Moreover, no special skilled laborers are required to install the system, making it even more cost-effective.

Disadvantages of Pollution Absorbing Bricks

In addition to advantages, there are some disadvantages of pollution absorbing bricks as well, which are as follows.

- Takes Up More Space: This pollution-absorbing brick wall takes twice the space as regular walls. It certainly can result in a reduction of space inside the structure.

Low Capacity to Bear Loads: These bricks have less capacity to bear the load of the total structure of the building, hence you can only build two-storey structures with these walls.

By,
Akshay Kumar

REPAIRING CONCRETE COLUMN CRACKS AND DAMAGES

Repairing concrete column cracks and damages is essential. The column concrete damages are becoming critical in mass structures like shopping malls, commercial buildings. To carry out the column repair identify the axial dead load, live load, and horizontal load.

Repairing concrete columns are two category.

- Surface or cosmetic – covers local deterioration.
- structural repair – strengthens the affected columns.

Repairing Concrete Methods for cracks and damages

1. Unloading Columns

unloading the column is necessary. Entire cross-section of the repair column is capable of carrying the reintroduce design load. Without unloading, new repair does not carry any load. Drying shrinkage of new material reduces the share of the load.

2. Redistribution of the Load

In corrosion of reinforcement and concrete deterioration, Redistribute a load of column concrete with alternative supports for repair.

3. Supplemental Reinforcing Steel

The supplemental vertical bar to fix outside the original cage with extra ties. Provide adequate cover and Place Apartment's bars outside the tie bars to increase column dimensions. Use Hairpin ties, of stainless steel laterally to support the supplemental bars. Column ties cannot disturb at the repair of the longitudinal bars as it causes buckling.

4. Concrete Removal

Remove concrete within a column cage and unload the column. If not, the longitudinal bars are buckle and compression failure of column take place.

5. Corroded Reinforcing Steel

It's not necessary to remove the corrode reinforcing bar with the reduce cross-sectional area if the loss is supplement with additional reinforcing bars. The partially corrode reinforcing bars are thoroughly clean by sandblasting to obtain the bare metal. The bars with excessive corrosion is replacing with fresh reinforcement having full laps on both sides.

6. Corroded Ties

Replace the corrode ties by adding stainless steel hairpin ties that are anchor into the concrete. It is often necessary to deposit extra material around columns to provide an adequate cover over the supplemental ties.

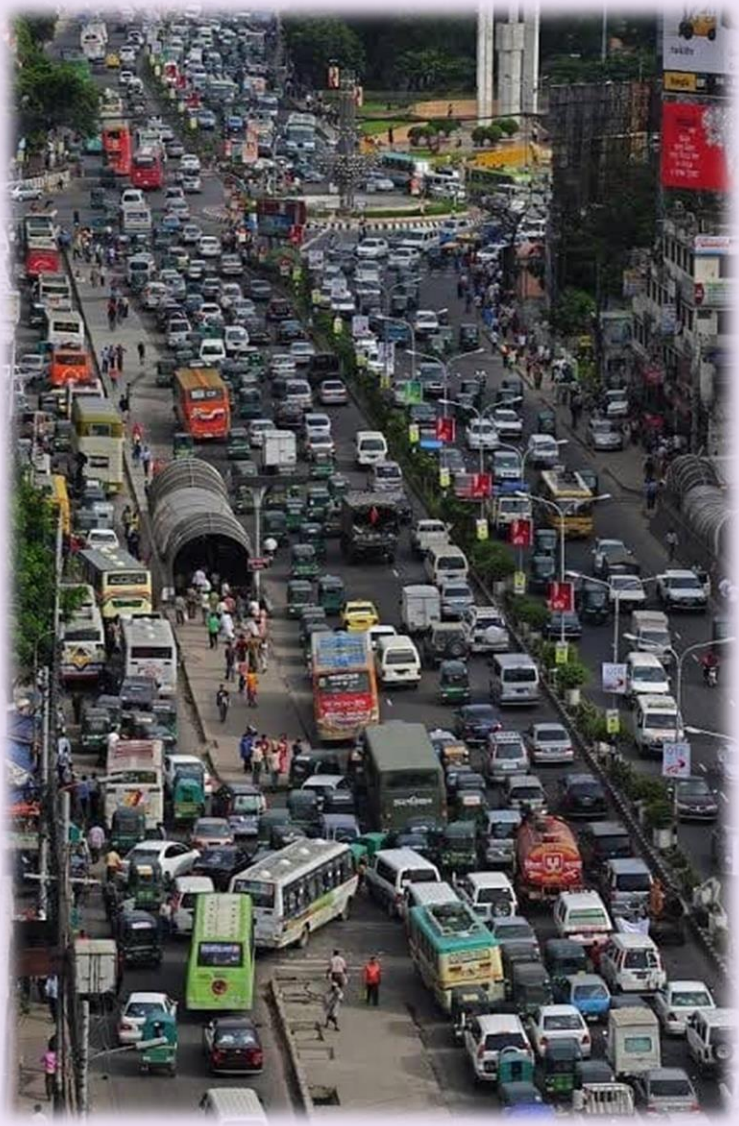
7. Low-strength Concrete

Where the concrete strength is low, resulting in insufficient load-carrying capacity, several alternatives are available:

- Shore the column and remove and replace the in-place concrete.
- Shore column and increase the size of the column to reduce bending stresses and increase confinement on placed weak concrete.
- Wrap the column with carbon- or glass-reinforced plastic.
- Install a supplemental column.

By,
Akash A S

TRAFFIC CONTROL PLAN



Traffic Control Plan means a specific plan that includes but is not limited to signing; application and removal of pavement markings; construction sequencing and scheduling; methods and devices for delineation and channelization; placement and maintenance of devices; traffic regulation; and inspection. The basic objective of each traffic control plan (TCP) is to permit the contractor to work within the public right of way efficiently and effectively, while maintaining a safe, uniform flow of traffic. Both construction work and the public must be given equal consideration when developing a traffic control plan. In addition, when considering the

public, attention must be given to all aspects of travel through the work zone: i.e., vehicular, bicycle, and pedestrian.

Checklist and guidelines for traffic control plans

It is the goal of the Traffic Control Plan (TCP) to achieve balance between providing a safe working environment within the right-of-way, and providing motorists, bicyclists, and pedestrians with a safe and efficient means to travel through the work area.

The following checklist is provided to assist Developers and Contractors in establishing uniformity in the development of TCP's. This checklist should be used as a guide to ensure that all the basic elements are covered and will help speed up the plan review process.

- Show all existing traffic signals and traffic control signs.
- Show existing striping, pavement markings, painted crosswalks and bike lanes. Include total roadway widths, individual lane widths, bike lane widths, median dimensions, etc.
- Show existing curbs, gutters, sidewalks, driveways and intersections in the construction work zone including areas affected by taper transition.
- Indicate posted speed limits. TCP shall be legible, using either ink or computer-generated graphics.
- Indicate contractors name, address and telephone number. Include the name and telephone number of the 24-hour contact person representing the contractor.
- Indicate the north arrow and scale or NOT TO SCALE (N.T.S.).
- Show all streets in the work zone vicinity to ensure proper orientation.
- Show location and dimensions of the construction work zone.
- Show staging area and materials storage area, as appropriate.
- Label all taper lengths and widths, delineator spacing and sign spacing. All taper lengths shall be per Local standards.

- Use a legend to define all symbols and designate them with Local nomenclature.
- Show all parking restriction zones and signs, as appropriate.
- Road closures will require approval from the Deputy Director of Public Works for Transportation or his/her designs. Any road closure also requires notification to be provided to the Local Fire Department, as well as the Local Police Department.
- Signs and barricades will be required to direct pedestrians through or around the construction work zone and shall be shown on the TCP.

Indicate the duration of the construction work and subsequent traffic control on the plan.

- Guidelines for Traffic control Plan
- All traffic control devices shall conform to the latest edition of Traffic Manual of Traffic Control Devices for Construction and Maintenance Work Zones and the Standard Specifications for Public Works Construction.
- The City, through its designated employees, reserves the right to initiate field changes to assure public safety.
- If a road closure is approved for a specific duration, the contractor shall submit a bond for a penalty drawn in favor of the corresponding city of the state. If the road is not reopened on the approved date, the amount prescribed by the state per day shall be deducted from the bond as liquidated damages.
- All traffic control devices shall be removed from view when not in use.
- Work hours shall be restricted to between 8:00 a.m. to 4:00 p.m. unless approved otherwise or according to the customs of the area.
- Trenches must be back filled or plated during non-working hours.
- Pedestrian controls shall be provided as shown on the plans.
- Temporary "NO PARKING" signs shall be posted 24 hours prior to commencing work.
- Access to driveways will always be maintained unless other arrangements are made.
- The contractor shall make immediate temporary repairs to any streetlight/traffic signal conduit damaged during construction. Permanent repairs must be made within five (5 say) working days.
- All striping removed or damaged will be replaced by the contractor with like material within 24 hours (or replaced with temporary tape, though the contractor is still responsible for the full replacement as mentioned above).

By,
Preethu Manjunath

URBAN DESIGN

Urban design in civil engineering refers to the process of planning and shaping the physical layout and organization of cities and urban areas. It involves considering various factors such as functionality, aesthetics, sustainability, and the needs of the community to create well-designed, livable, and efficient urban spaces. Civil engineers play a crucial role in urban design by providing technical expertise and knowledge in the planning and development of urban areas. They collaborate with architects, urban planners, and other professionals to design and construct infrastructure systems that support urban life.

Civil engineering is an essential component of urban design, as it provides the technical expertise needed to implement complex infrastructure projects. Civil engineers design and build structures that support urban life, including roads, bridges, tunnels, water supply systems, and sewage treatment plants. Together, urban design and civil engineering can shape cities that are not only functional and efficient, but also enjoyable and attractive places to live. By integrating sustainable design principles into their work, urban designers and civil engineers can help to create cities that are resilient to the challenges of climate change and other environmental threats. In recent years, there has been growing recognition of the importance of urban design and civil engineering in creating livable and sustainable urban environments. Many cities around the world have launched ambitious initiatives aimed at improving their urban infrastructure and enhancing the quality of life for their residents.

Importance of Urban design

Urban design is versatile and so urban designers can produce ideas and work that is indicative or specific, strategic or detailed, and this is reflected in the types of drawings, reports and ways of working commonly used:

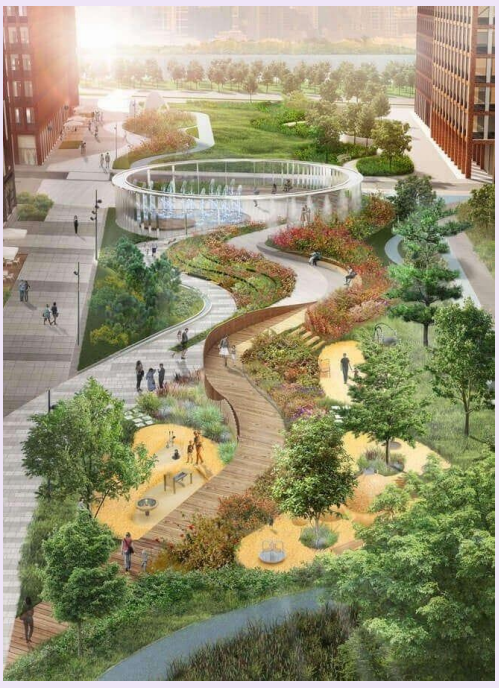
- Urban design is visionary creating a 'vision' to show the economic, social and environmental benefits of investment or changes at a strategic scale over a wide area and over a long period of time. This is usually conveyed through a vision statement, projecting forward 20-25 years' time to explain the future characteristics of an area and how people will use it. This can then be complemented by a development framework, outlining the key physical features that will deliver the vision.

- Urban design is fact-finding urban designers gather data and evidence about places to identify future options and test the feasibility and viability of change or development in context, for example transport and infrastructure capacity, development character and density, environmental capacity issues (such as flooding), plus local community needs and values. Feasibility studies usually include options and a recommendation on the 'best fit' scenario.

- Urban design can be illustrative using masterplans, artists' impressions, photomontages, 3D models and photographs of other successful places, urban designers can bring to life how a development could look. This includes highlighting important local characteristics, landmarks and public spaces. Illustrative masterplans often show just one way in which design guidelines can be built out.

- Urban design setting specifications site-specific masterplans set out precise proposals for which planning consent is being sought, and the use, size, form and location of buildings, roads and open spaces, which are fixed. A local planning authority may prepare a site-specific development brief, which sets out the main characteristics required, and it allows developers to draw up a proposed scheme in response. Masterplans and design codes bring together plot-specific requirements for a site, which development proposals will need to comply with to be approved.

A local planning authority can also identify district-wide character design policies, which set out a combination of broad-brush design ideas - relating to materials and roof styles, for example - and specific requirements, such as minimum back-to-back distances for residential developments.



TECHNICAL ARTICLES

Urban design is about a great variety of places: whether town and city centers, residential neighborhoods and suburbs, grassy fields on the edge of villages, down-at-heel industrial estates, or unloved and overlooked areas around train stations, rivers and canals. Urban design defines the nature of buildings and the spaces between them, and how the design itself should be worked out: design processes and outcomes. Urban design inspires, illustrates and defines how a place could be improved or protected to bring benefits to investors, developers and wider society.

By,
Sagar H S

SIR M VISVESVARAYA

India has seen brilliant engineers and Sir M Visvesvaraya was one of the most prominent builders of India. Engineers are massively important in developing the future of our society and progeny, Sir M Visvesvaraya's contribution to the nation is extremely valuable which will always remain in the history of the mankind. He is the most popular figure in the South Indian State of Karnataka, also called as "the maker of Modern Mysore". In this article we will go through the life and achievements of this great personality.

His life Earlier

Sir Mokshagundam Visvesvaraya, regarded in India as one of the foremost civil engineers. He was born on 15th of September 1861. His birthday is celebrated as Engineer's Day in India, Sri Lanka and Tanzania. Sir M Visvesvaraya worked as a civil engineer for the government of British India and later as Prime Minister of the Kingdom of Mysore. Visvesvaraya received his primary education in Bangalore and earned a Bachelor of Science (BSc) degree from the University of Madras. He later studied at the College of Engineering, Pune (then College of Science at the University of Bombay) and graduated as an engineer, receiving Diploma

in Civil Engineering (DCE). It was here that he became a member of the Deccan Club and was its first secretary; he would therefore have been well-acquainted with the progressives in Pune. He served as civil engineer as well as Dewan of Mysore, building and creating new environment for the upcoming generation and making history. Sir M Visvesvaraya took his last breath on 12th of April 1962, he lived for a century making the engineering community and all the Indians proud of him.

Engineering Career

Sir M Visvesvaraya worked as a civil engineer for the government of British India. Visvesvaraya became an assistant engineer in 1885 at the Public Works Department, Bombay, in Bombay Presidency.

In 1899, Visvesvaraya was invited to join the Indian Irrigation Commission where he implemented an intricate system of irrigation in the Deccan Plateau and designed and patented a system of automatic weir water floodgates that were first installed in 1903 at Khadakvasla Dam near Pune. These gates raised the storage level in the reservoir to the highest level likely to be attained without causing any damage to the dam. Based on the success of these gates, the same system was installed at Tigra Dam in Gwalior and later at the KRS Dam at Mysore, Karnataka. He later became the chief engineer of the Laxmi Talav Dam near Kolhapur.

In around 1906/1907, the Government of British India sent Visvesvaraya to the British Colony of Aden (present-day Yemen), to study water supply and drainage systems. The project prepared by him was successfully implemented in Aden.

After opting for voluntary retirement in 1908, Visvesvaraya took a foreign tour to study industrialised nations. Then, for a short period, he worked for Nizam Osman Ali Khan. He was one of the chief engineers of the flood protection system for the city of Hyderabad who suggested flood relief measures for the city, which was under constant threat by the Musi river. He achieved celebrity status when he designed a flood protection system for the city. He was instrumental in developing a system to protect Visakhapatnam port from sea erosion. This dam created the biggest reservoir in Asia at the time of its construction.

In November 1909, at the invitation of Dewan Sir V.P. Madhava Rao, Visvesvaraya joined as a chief engineer of Mysore State. He was the Chief Engineer of the KRS Dam at Mysore. He was also later the chairman of the board of engineers for the Tungabhadra Dam in Hospet, Karnataka.

Honours

Visvesvaraya was appointed a Companion of the Order of the Indian Empire (CIE) in 1911 by King Edward VII. In 1915, while he was Dewan of Mysore, Visvesvaraya was knighted as a Knight Commander of the Order of the Indian Empire (KCIE) by King George V for his contributions to the public good.

After India attained independence, Visvesvaraya received the Bharat Ratna, India's highest civilian honor, in 1955. He received an honorary membership from the Institution of Civil Engineers, London, a fellowship from the Indian Institute of Science, Bangalore, and several honorary degrees including D.Sc., LL.D., D.Litt. from eight universities in India. He was the president of the 1923 session of the Indian Science Congress.

There have been many inspiring people all over the world and every personality covey the message of overcoming any kind of hardship and achieving whatever they dreamed of and Sir M Visvesvaraya has said through his work that it is better to work out than rust out. His quotes are inspiring as his work does. Remembering his works and contribution to this world we are amazed and inspired by his work. He was the greatest engineer India saw and this will always be an influence to young engineers like us.

By,
Chandan M

OTHER ARTICLES

OTHER ARTICLES

OTHER ARTICLES

Make in India vaccines for the world: 24 crores doses supplied to over 100 countries under 'Vaccine Maitri'

Vaccine Maitri ("Vaccine Friendship") is a humanitarian initiative undertaken by the Indian government to provide COVID-19 vaccines to countries around the world. The government started providing vaccines from 20 January 2021.

The "Make in India" initiative launched by the Government of India has been instrumental in promoting domestic manufacturing and production across various sectors, including pharmaceuticals. As part of this initiative, India has been actively involved in producing COVID-19 vaccines and supplying them to countries around the world under the "Vaccine Maitri" (vaccine friendship) program.

As per information up to September 2021, India had supplied more than 24 crore (240 million) doses of COVID-19 vaccines to over 100 countries through the Vaccine Maitri program. These vaccines were primarily manufactured by two Indian vaccine manufacturers, Serum Institute of India (SII) and Bharat Biotech. The vaccines supplied included Covishield (the Oxford-AstraZeneca vaccine manufactured by SII) and Covaxin (an indigenous vaccine developed by Bharat Biotech).

Supply and Export: India has supplied vaccines to numerous countries under the Vaccine Maitri program. Bhutan and Maldives were the first countries to receive vaccines as a grant by India. This was quickly followed by shipments to Nepal,

Bangladesh, Myanmar and Seychelles. By mid-March 2021, India was also supplying vaccines on a commercial basis to countries including Canada, the UK, and Saudi Arabia.

The countries that received vaccines from India through this initiative include:

a. Neighbouring Countries: India has prioritized the supply of vaccines to its neighbouring countries, including Bangladesh, Nepal, Bhutan, Maldives, Sri Lanka, and Myanmar.

b. African Nations: Several African countries have received vaccines through the Vaccine Maitri initiative, such as South Africa, Nigeria, Ghana, Kenya, and Ethiopia.

c. Middle Eastern Countries: Countries in the Middle East, including the United Arab Emirates, Saudi Arabia, Bahrain, and Kuwait, have also received vaccine supplies from India.

d. Other Countries: India has exported vaccines to countries around the world, including Brazil, Mexico, Argentina, Peru, Morocco, Egypt, and many others.

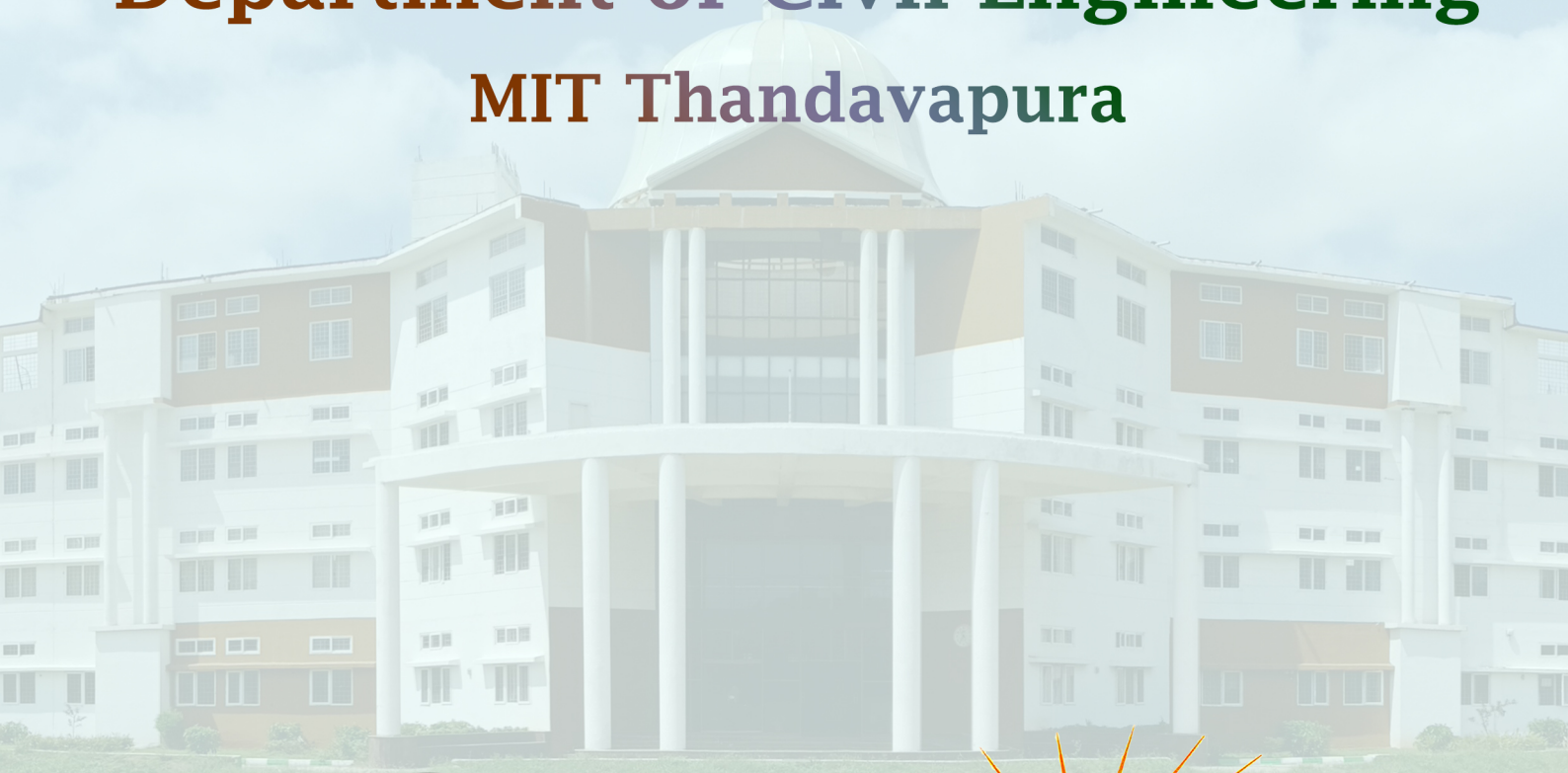
The Indian government's efforts to share vaccines through Vaccine Maitri aimed to support global vaccination efforts and help countries facing vaccine shortages. This initiative highlighted India's commitment to global health and solidarity during the ongoing COVID-19 pandemic.

ART WITHOUT ENGINEERING IS DREAMING

ENGINEERING WITHOUT ART IS CALCULATING

Department of Civil Engineering

MIT Thandavapura



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