STRENGTHS

A magazine from Society of Civil Engineers

September, 2022

It's not merely our responsibility to
SAVE NATURE
it's our first duty!!

Society of
Civil Engineers

Highlights

- Articles
- Interviews
- Disasters and management
- Aatma nirbhar bharat
- Work done by SoCE
- Romanticising the branch

namami gange...

Department of Civil Engineering
Indian Institute of Technology Kanpur

Society of
Civil Engineers

STRENGTHS

A magazine from Society of Civil Engineers

namami gange...

Department of Civil Engineering
Indian Institute of Technology Kanpur

Society of
Civil Engineers

From the desk of faculty coordinator

As the campus attempts to emerge from the gloomy days of an isolated, disjointed existence during the pandemic's nadir, there is a need to appreciate longstanding traditions that provide us with a sense of community and engagement. The Society of Civil Engineers (SoCE) has been in existence for over four decades at IIT Kanpur, and seeks to provide one such forum for students, faculty and staff of the Department of Civil Engineering to share their perspectives and visions of the discipline. SoCE's Strengths magazine is an embodiment of those attributes, featuring articles from students about historical and emerging structures/technologies, the might of natural forces, and some personal essays. The magazine also includes insightful interviews of civil engineering faculty who reflect upon their own personal journeys. Finally, the issue concludes with a recap of SoCE and departmental activities, and a fun crossword!

The present iteration of SoCE is a work in progress which is reflected in the magazine that is being revived after many years. The content reflects the aspirations, apprehensions and explorations of students who have spent a substantive part of the last two years away from the institution and are finding their way within the department. Thus, the latest issue of Strengths is perhaps a little more personal, in search of its own unique voice and identity. As we move forward, I hope that we can leverage SoCE to bring together undergraduate/ postgraduate students, alumni, faculty and staff in a meaningful way to enhance the collective experience of becoming and evolving as civil engineers.

- Aditya Medury

INDEX

S.No	Content	Pg.No
	Articles	
1.	Modern civil engineering techniques	1
2.	Old construction techniques	3
3.	Smog free tower	6
4.	Nature and civil engineering	7
5.	Relation of civil engineering with other fields	9
6.	Geothermal energy	11
7.	Disaster construction	13
8.	Landslides	16
9.	Cyclone	18
10.	Aatma nirbhar bharat	22
11.	Way of ganga	23
	Interviews	
1.	Prof. Balaji Devaraju	27
2.	Prof. Gaurav Tiwari	29
3.	Prof. Hemant Gehlot	31
4.	Prof. Salil Goel	33
5.	Prof. Suparno Mukhopadhya	35
6.	Prof. Tarun Gupta	37
7.	Prof. Tushar Apurv	41
	Romanticising the branch	
1.	Golghar	44
2.	Delhi metro	45
3.	Lotus temple	46
4.	Ratneshwar mahadev temple	47
	Student's corner	
1.	A letter to 10 year old me	49
2.	Beauty	50
3.	Offline vs online	51
	Work done by SoCE	
1.	Departmental get together	53
2.	Career choices for civil engineering	54
3.	Intern chat	57
4.	Placement postulates	58
	Crossword	
1.	Crossword	62
2.	Answers	63

Articles

RELATED
TO

CIVIL ENGINEERING

MODERN CIVIL ENGINEERING TECHNIQUES

Winston Churchill said it correctly "to improve is to change, to be perfect is to change often," and the exact fit in this World where new technologies keep on improving our living conditions. Similarly, with technological advancements, the World has provided us with many new techniques in civil engineering, which have allowed us to build relatively light, flexible, and tall structures. Emerging technologies in civil engineering influence the construction industry more than ever before, and these innovations play an important role in making building constructions faster and more sustainable. In the modern World, the importance of civil engineering has undergone a massive upheaval as people always want unique and advanced gradation of techniques. In the last ten years, there have been several new advancements to satisfy present needs without compromising the environment.

• Photovoltaic Glazing

Like any other branch of engineering, Civil engineering is also susceptible to specific trends that come and go. However, some of these become industry staples in the long run. One of them is sustainable development.

While this is something that people have only recently focused on, it comprises technology capable of shifting focus away from unsustainable energy toward more renewable and sustainable energy sources.

Glazing is an exciting concept. This type of glazing aims to provide independent structures with their energy source, similar to transforming the entire system into its solar panel.

Plus, photovoltaic glass is used to create electricity from daylight. This kind of photovoltaic technology can reduce the need for external sources of electricity and energy consumption for cooling and heating.

• Modular Design

After the invention of the first assembly line by Henry Ford – serialized production has become more effective and applicable to all possible industries. As far as Civil engineering and construction are considered, the serialized show was developed for individual construction materials.

However, modern production is set to solve all such problems. New advancements in technology allow us to perform serialized shows of entire buildings by dividing them into prefabricated sections, just like LEGO cubes.

This kind of construction also allows for a level of efficiency that is unimaginable. Huge buildings that would have taken entire years to build are now constructed in not more than a couple of weeks.

Civil engineering has become far easier with prefab construction: we're talking about more than 70% of buildings getting completed before they get transported to the structure – or rather, assembly site.

New Materials

Besides photovoltaic materials, countless new futuristic materials have become a modern civil engineering project staple. For instance, metamaterials are one of the following big things in this industry.

So, what are these materials? We're talking about synthetic materials designed in a laboratory for some specific use: their primary purposes are to make incredibly innovative engineering projects a reality. A considerable number of these are still being tested, but some have already entered the market. One such well-known material is graphene.

Graphene is a solid material: it is hundreds of times more durable and light, and flexible. You need not be a civil engineer to know the kind of construction versatility that the use of graphene has provided. And we are talking about one of the thinnest synthetic materials ever made, which is even a million times thinner than an average hair strand. Plus, it's a conductive material and has widespread utilization.

Apart from all this, scientists and engineers have also developed self-cooling bricks - that have entirely cut down HVAC expenses for future buildings. These bricks are made up of polymer of hydrogel and clay; the former absorbs moisture and reduces the temperature of the building by releasing it.

Self Healing Concrete

As we all know, concrete is a significant component of construction, and cracking is the biggest problem. Hence a self-healing concrete is developed that is a mixture of bacterias within microcapsules, and these bacteria germinate as water enters the crack and exact the limestone. As a result, the gap is plugged before the oxygen and water have a chance to corrode the steel.

Modular construction

In this type of construction, the parts of a building are constructed offsite using controlled plant conditions and then they are transported and assembled at the final position. The main advantage of this type of construction is that it can incorporate a range of different building types and floor plans. Buildings are produced offsite in modules and then, when put together on site, it reflects the identical design intent and specifications of most sophisticated site-built structures without any compromise. Modular construction gives many benefits, such as greater flexibility and reuse facility. Modular buildings have less raw material demand as they can be relocated for new use. Also the material waste is decreased as there is a lot of extra material used in protecting the material used for building which in this case is nearly negligible. Some other advantages include improved air quality, reduced construction schedule, elimination of weather delays, safe construction, better-engineered structures and limitless design opportunities.

Wrapping Up

Materials like graphene are set to revolutionize the world of civil engineering completely: their potential for all kinds of construction projects is limitless. The number of new technologies that are making a positive impact on civil engineering is truly astounding. Also, all of them will become much more commercially viable in the near future.

OLD CONSTRUCTION TECHNIQUES

• DRY STONE

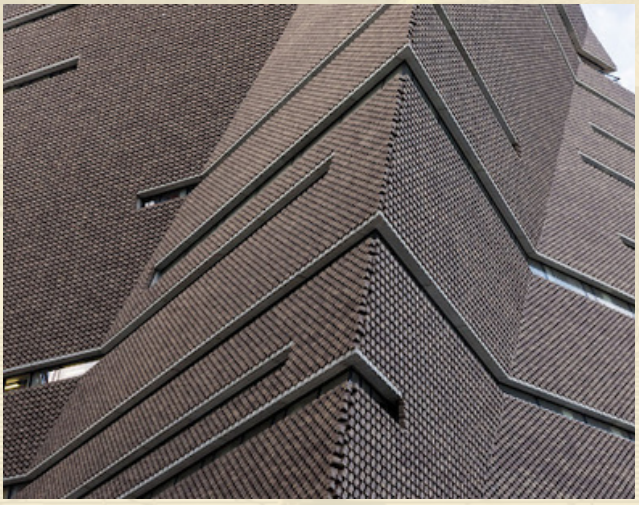
Dry stone is a wondrous construction method found in almost all parts of the world. It is basically a collection of stones piled one above the other, and its stability solely relies on the structure and carefully chosen interlocking stones. This technique goes way back into time, even before the invention of the wheel. This technique was used in the British Isles, Brochs of Scotland, pyramids of Egypt, terraces used for farming in Machu Picchu, and many more. Dry stone construction differs from other brick or masonry construction because it does not use mortar as a glue or binding material: instead, the position and weight of the stones keep the structure in place.

This technique requires a lot of skills, and it is time-consuming to ensure the proper positioning of stones, but they are long-lasting. Its principle is simple, but its efficiency has led to continued use of this technique and updated interpretations in contemporary constructions, like in the Tate Modern Switch House, etc.

Dry stone construction depends on the selection of stone: they must be flat or angled, making them have a larger surface area, thereby ensuring more surface contact between the rocks above and below. They can be built only by hand, but tools like hammers and chisels can also be used to shape the stones in the desired way. Another tool is a string line made of two sharp points and a string. The points are placed on the ground with the string stretched between them. The tool helps builders keep the wall straight.

Builders begin by clearing the area, which must be smooth for putting the foundation. Then footing, the foundation layer, is laid, mainly comprised of large stones placed with the flat side down to support the weight of the wall. Then the courses are laid, the body of the wall, and it is ensured that all stones make a tight fit and are as level as possible.
As courses are laid, small stones called hearting are used to fill the gaps. Builders try that the visible faces are as even as possible, and once the courses are laid, the top layer called coping is placed.





https://media.tate.org.uk/aztate-prd-ew-dg-wgtail-stl-ctr-data/images/tate_modern_hdm_0498_1.width-1200.jpg

MUD CONSTRUCTION

Mud is an eco-friendly construction material. Mud is used for different purposes in different ways. It has been used as a most basic and essential construction material since neolithic times.

Mud is a building material that has already been tested and tried thousand years ago. The low cost and malleability of mud make it an ideal building material. Mud construction is mainly found in places having relatively dry areas. The main advantage of mud is that it reduces energy consumption, unlike other manufacturing materials, due to its easy availability. Mudhouse construction is durable and can be easily rebuilt. It prevents external heat from entering inside and provides cool air from the manure walls.

Mud construction depends on the selection of soil. Soil is collected after digging 60cm of depth. As topsoil contains organic material, it isn't used. Materials like gravel, sand, silt, and clay cannot be used directly. These materials, in combination with binders, are used throughout the building. These binders vary according to the technique used. For foundation, other strong materials should be used rather than mud.

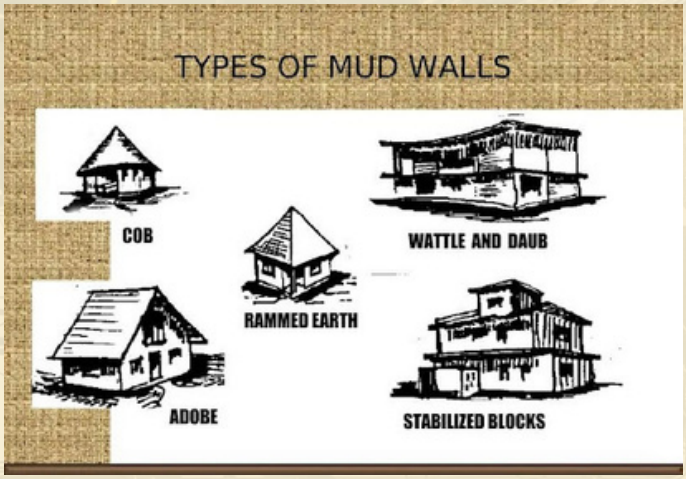
There are different techniques in mud construction. The process varies depending on the climate and availability of soil. Mud construction is classified into five types:

- Cob construction
- Adobe construction,
- Earthbag construction
- Wattle and Daub
- Rammed earth

Mud buildings can become more attractive if the appropriate roofing material is developed. The vast majority of India's population cannot afford even the cheapest modern houses. The lack of any significant effort to develop cheaper alternatives like the construction of mud houses also depends mainly on low-cost housing schemes. So the people are being involved in building at least the walls of their homes with their own hands. This happens by using traditional mud technology.



https://www.archinomy.com/wp-content/uploads/case-studies/2009/mud-architecture.jpg?ezimgfmt=ng%3Awebp%2Fngcb2%2Frs%3Adevice%2Frscb2-1



CONSTRUCTION USING LIME AND MORTAR

Lime mortar is the traditional and oldest building material. However, now it is only used to restore and repair old buildings and recreate new ones using traditional methods. Now cement mortar is used instead of lime mortar, but lime is also used in smaller quantities, making the mortar slower to harden and more flexible. Lime mortar has been used since the time of the ancient Egyptians until the 19th century when cement mortar was introduced. The first mortar used consisted of mud and clay because of availability and lower cost, but the limestone introduced was hardened with age when burnt and combined with water.

There are various characteristics of lime :

- Good water retention
- Slow settings and hardening, low strength
- Poor water resistance
- Large shrinkage

The word lime is derived from the old English word lime, which means a sticky substance. Its particles are finer than cement particles, due to which they are easily able to penetrate smaller holes in the materials.

Lime mortar is easy to handle as compared to components such as bricks, stones, and blocks. It is composed of lime, water, and an aggregate such as sand. Its soft and porous properties have many advantages when working with softer building materials.

Lime mortar is more porous than cement mortar, due to which it is more breathable than cement, more vapour-permeable, so it is less likely to trap moisture.

Lime mortar has played a significant role in masonry construction. Lime has proven its performance, such as the Great Wall of China. The reason for using lime mortar years ago still remains valid.



https://www.designingbuildings.co.uk/wiki/File:Cement_mortar_and_sandstone.JPG



http://www.builderbill-diy-help.com/image-files/lime-mortar-bruges.jpg

CONCLUSION

Old construction techniques consume less energy and are durable. These techniques do not affect nature as the resources we use are eco-friendly.
The buildings constructed using these techniques are stronger and durable. Ancient construction techniques must be brought back to build sustainable homes today.

References : https://thearchinsider.com/mud-an-eco-friendly-construction-materials/

SMOG FREE TOWER

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete." These words of Buckminister Fuller seem to influence many great minds like Daan Roosegaarde, who came up with a great concept of a smog-free tower.

Did you ever think one could get a diamond ring by purifying the air? Doesn't it seem to be attractive?

Yes, it is true: smog-free tower is the machine that has made this impossible task possible, which provides clean air in its surrounding as well as a diamond ring, invented by Dutch designer Daan Roosegaarde. One fine day he was looking out his hotel window in Beijing and realized that the city was not visible due to thick smog. There were cases of eight-year-olds being diagnosed with lung cancer and life expectancy falling every year, which terrified Roosegaarde and he became determined to build the world's largest air purifier.

Structure

The smog-free tower was designed and physically implanted by Roosengaarde and his team. The air purification system of the smog-free tower is based on ENS technology's patented positive ionization technology. It sucks up 30,000 cubic meters of polluted air every hour with very low green energy consumption and cleans the air up to the nano-level, and then releases it. The ENS technology air purification system is capable of removing particulate matter of 60 nanometer and above.



https://cpb-us-e1.wpmucdn.com/blogs.gwu.edu/dist/b/3155/files/2020/03/smog-free-tower-rotterdam-1500x1000-05-lr.jpg

Working Principle

After these air pollutants and sooty particles are filtered and collected, they are separated into different sections.

It was found that 42% of the particles collected are made up of carbon. These particles are then compressed for 30 minutes: what we get on carbon compression is diamond. Each of these diamonds represents 1,000 cubic meters of pollution.

The smog-free tower has low maintenance and uses cheap sources of energy. Hence it is cost-effective as well as has aesthetic value. Beijing is not the only polluted city: instead, many more heavily polluted metropolitan cities where the air is no less than poison.

So, Roosengaarde did not remain confined to Beijing and has partnered with many NGOs, government, and students to reduce air pollution in the cities. He also visited India as he plans to build smog-free towers across the whole country to help Delhi and other cities to turn their polluted air into a diamond.

References : https://www.researchgate.net/publication/281064572_The_Smog_Free_Tower_Solution_of_Daan_Roosegaarde , https://ideas.ted.com/this-tower-sucks-up-smog-and-turns-it-into-diamonds/amp/ , Study paper by Dr. Guido Jenniskens

NATURE AND CIVIL ENGINEERING

The modern era seems to have been evolved with an invention whose base is formed by specific ancient techniques. The ancient techniques that we are referring to here are nothing but techniques involving the application of natural substrates and resources. However, with the advancement in modern techniques, there has also been modernization in implementing and utilizing our natural resources. Civil engineering seems to have taken up or inhibited most of these modern techniques that involve nature as a fundamental resource.

A few of such examples, where nature has attributed towards growth of civil engineering are listed below: -

1.Rainwater Harvesting

Rainwater harvesting is quite a traditional method that involves the utilization of rainwater as a fundamental source of generating a cost-effective way of storage or catchment of water, which can later be used in times of emergency or crisis.

During rainwater harvesting, even after catching the rainwater from its source - the clouds can have impurities. These impurities may or may not be significant enough; however, they have room for quality improvement. The efficiency of the rainwater can be increased furthermore by utilizing the modern civil engineering techniques that have developed in today's world.

To carry out this process with ease, the knowledge of a civil engineer becomes crucial. A civil engineer must analyze and predict weather patterns, understand precipitation, and deeply figure out the requirement for water. Based on these three different factors, a civil engineer can increase the efficiency of rainwater harvesting and, at the same time, make it cost-effective too.

Thus, in this way, civil engineering and rainwater harvesting can go hand in hand. (Civil engineering enhances the utilization of resources and thereby utilizes water as a resource to carry out several project works.)

2. Vertical Farming

Vertical Farming is a modern way to grow food (crops/plants) in vertically stacked layers and vertically inclined surfaces. It is at a nascent stage in India, and some agri-tech companies and startups are working to revolutionize the field.

Vertical Farming is far better than traditional farming as growing food indoors uses up to 98% less water and about 70% less fertilizer than the water and fertilizer that are used in other forms of farming. In Vertical Farming, the area required to grow plants is minimized, which overcomes the problem of feeding the growing urban population by saving space and resources like water and energy, which was not possible in other ways of farming.

In this way of farming, techniques like Hydroponic, Aeroponic, Aquaponic with a combination of natural and artificial (LED) sources of light are used to maintain a perfect environment for the efficient growth of the plants.

Civil engineers play a vital role in reducing the labor charge in maintaining these farms, as the cost of Vertical Farming is still high, but civil engineers, with the advancement of science in this field, will be able to provide the opportunities to grow natural food for the population of unfarmable regions.



https://www.shutterstock.com/image-vector/rainwater-harvesting-system-isometric-diagram-vector-1622700061



https://www.recyclingtoday.com/article/plastic-scrap-road-europe-total-wavin-kwa/



https://www.freepressjournal.in/business/hasf-venture-capital-invests-in-hydroponic-cultivation-startup-urbankisaan



https://www.dreamstime.com/stock-photo-house-alone-peaceful-photo-shooted-bali-can-make-people-feel-smooth-image96823941

3. Plastic Roads

With the increase in plastic pollution, the need to control the pollution also increased. The Indian Government from early 2000 started experimenting with plastic roads with waste plastic as construction material.

An early report by India's central pollution control board (CPCB), a statutory organization, discovered that Jambulingam street in chennai, one of the first plastic roads had not sustained much damage even after four years of use. The board cited that no raveling, potholes, rutting, or edge flaws were discovered during the analysis, which attracted the interest of local governments as well.

Plastic roads are in their early stage as only a few no. of plastic roads exist in the western world. In countries like the United States, the United Kingdom, civil engineering researchers are developing different designs to support plastic roads.

This movement of making roads from concrete roads to Plastic roads will lead to more plastic waste management and safer roads; but it can be hazardous as these roads gradually deteriorate due to heat and light, they may dissolve into micro-plastics that give off harmful pollutants, affecting the functionality and biodiversity of soil and water resources.

Therefore, there is a need for creative civil engineers who can play a significant role in ensuring that the science behind using waste plastic for roads is accurate, and plastic roads can be environmentally friendly.

4. Eco-Floating Homes

Cities are under pressure to reform due to a lack of affordable housing and overcrowding. To address these problems, civil engineers are creating floating homes, which are functional living areas that float on the water. The houses are designed to resist floods by floating the water using a foundation of concrete and styrofoam, which makes them virtually unsinkable. This approach means that houses can be built in previously off-limit spaces, like rivers, lakes, and other bodies of water. Civil engineers predict that modern floating home technology will lower the costs of flood damage in urban cities while also providing compact inner-city populations with more diverse housing options.

Floating structures are not a new concept; they may be found all over the world, particularly in traditional Asian communities. These structures– and the infrastructure required to make them sustainable–are gradually becoming more reliable and easier to maintain, thanks to modern civil engineering understanding.
However, implementing this concept in densely populated urban areas will be difficult, as constructions built within or on top of above-ground water sources could have a severe influence on the ecosystem by disrupting the natural state of the land beneath bodies of water (e.g., lake bottoms or the ocean floor).
The impact of humans on the environment should not be overlooked, and thus, civil engineers must continue to focus on developing mechanisms that prevent floating houses and their tenants from damaging local aquatic ecosystems while also enhancing the technology's viability for usage in low-income areas.

References : https://online.norwich.edu/academic-programs/resources/5-innovations-in-civil-engineering-aimed-at-improving-sustainability , https://plasticsmartcities.org/products/plastic-road , https://krishi.outlookindia.com/story/vertical-farming-with-less-water-over-smaller-areas/374555

RELATION OF CIVIL ENGINEERING WITH OTHER FIELDS

Civil Engineering, apart from being a branch itself, has many versatile applications. Civil Engineering isn't just a branch or field which is restricted to itself or its fundamental applications. It can have a variety of applications and its concepts can be implemented in other fields as well. Other than that, the concepts, theories, and unique benefitting ideas from other fields can also be applied to Civil Engineering to make it more prosperous and rich. A few of these inter-relations with other fields are mentioned below: -

• Civil Engineering & Material Sciences Eng.

This might not be a well-known inter-relation to many of us. However, to everyone's surprise, both of these branches are interrelated, and the exchange of concepts between these two allows to increase the efficiency in packaging and manufacturing of goods. The basic idea of Civil Engineering that we all know, involves architecture and building efficient bridges, dams, houses, buildings and the overall structural unit of a city or township. Now, in order to build all these structural units, several equipment are involved, and the goal is to use materials and elements which are not only cost effective and easily available, also super effective at the same time. This is where the branch of Material Sciences plays a crucial role in providing the necessary machinery. For example, the usage of: Ultrasonic Machining,

, Electric Discharge Machining and Electrochemical Machining in modern times has really taken off the burden that was on the shoulders of Thermal machining, in the olden times. These new techniques like USM involve the usage of high frequencies, electric currents and abrasive materials like Boron carbide and boron silicarbide. AJS equips high speed4 jets of water streams, applied on a narrow section or area of material. Similar combination of unique abrasive materials and modern machinery is used in EDS and ESM too. These new machining techniques have not only enhanced the efficiency of the output, but has also reduced the pollution and wastage of products that used to take place while using traditional methods. These new techniques have ameliorated the standards of manufacturing and production and have really assisted civil engineering in its development in the present times.

• Civil Engineering & Mechanical Engineering

Just like we saw in the above case of Civil Engineering and Material Sciences, in the same way, Civil Engineering and Mechanical Engineering go hand in hand. The only major difference that we observe is that, in the above case, more emphasis is laid on microscopic particles and the substances that go "Inside" the machines. However, when we talk about Mechanical Engineering, a greater emphasis is laid upon the Macroscopic machinery. This macroscopic field includes the development of tools, heavy machines, an entire unit or a sub-unit, a factory where heavy goods are manufactured, etc.

The development of CAD, Artificial Intelligence and Machine Learning are the few well-known and worldwide equipped technologies created by mechanical engineers. In future times, there is a very large possibility that AI, ML and CAD could be combined together to lay out large projects and their development. Several thesis suggest that machines and AI is our future. Thus, it becomes essential to utilise AI in the field of Civil Engineering.

AI could be used to replace manual labour with bots. Equipping a set of robots and assigning them a particular task, which could be as simple as laying a brick or as difficult as structuring an entire unit, could be conducted more efficiently without a great margin of errors and blunders. Thus, we can easily deduce that if Civil Engineers start equipping themselves with these modern techniques such as CAD, AI and ML, we really have a bright future ahead of us.

• Civil Engineering & Computer Science Engineering: -

Since the 1990s, the advent of rapid development in computer technology witnessed many changes in the fields of high-capacity data storage, image voice processing, and network communication technology. This also helped in the civil engineering domain.
With the help of several examples, we'll see how it works,

Application of computer-virtual simulation

We study Computer virtual simulation to establish and develop the main content structure of the system model and simulation analysis methods. The development of a simulation system is an application of computer technology that can be used for drawing technical computer-related fields. For example, using software to build a bridge or building models, various loads applied there or to change its structure (including size, steel configuration, etc.), and then simulate stress analysis, we can get results to perform its mechanical properties in a series of evaluations.

Application of CAD system

Expert systems are also an attractive area of computer application. It is a simulation of expert thinking for problem analysis and solving computer programs mainly by basic parts, knowledge base, inference engine, an interpreter, a user interface, and other components. The graphics module and the internal force analysis module are unique to the engineering expert system, which often lead to the mature finite element and the CAD software package to the system, and realize the complete automation and intelligence of the expert system.

Hence, the application of computer technology in the field of civil engineering has changed the traditional research methods to a certain extent, which effectively improved the working efficiency of civil engineering .

• Civil Engineering and Electrical Engineering: -

It's hard to imagine a world without electricity when almost all of our day-to-day activities depend on it. Hence, in the civil engineering domain as well, we can witness the applications of electrical engineering.
To be more precise, let us discuss the role of an electrical engineer. An electrical engineer creates a framework of network of wires that carries electricity to our homes. They also maintain the proper functioning of electrical systems, making sure that panel boards are not overloaded and that all the pieces maintain their structural integrity. Commercial electrical projects involve addressing a much bigger crowd and creating frameworks of bigger structural units, like in commercial buildings or construction sites, where the Engineers take care of meeting the electrical needs, in terms of providing commercial security systems and electronic key systems in hotels, office spaces, and much more.
Now if we try to relate the commercial Electrical Projects with the work of a civil engineer, who builds the infrastructure, ranging from all-season resistant homes, to creating the roads for transportation, etc., we realise that these developments and structuring, which aim towards helping the citizens lead a better life, are very closely-related. Thus together, by collaborating with a civil engineer, an electrical engineer could scale their projects and applicability of their knowledge. We can get a good idea of this, by understanding the example mentioned below. If there's a highway project undertaken by a civil engineer, we know that the road would need stoplights, lamp posts, and sources of electricity for houses or commercial buildings to connect to when they would be built there. The electrical engineer here decides where to lay down the wires, how much electricity would be needed, how to connect in an efficient manner, and much more. This would take into consideration the building and electrical codes for that particular type of project and area.

Hence, we saw how the two engineering fields are interrelated via several instances. Thus, to conclude our above discussion on the relations of Civil Engineering with other branches, we would like to say that the more we interact with the modern enhancements and upcoming technologies associated with different branches, the more beneficial it will be for us to prosper in the future. With a greater involvement and combination of techniques involved in Computer Science, Electrical Engineering, Material Sciences and Mechanical Engineering, we can reach new heights in the field of development and possibly achieve something which nobody has even thought of.

GEOTHERMAL ENERGY

MAY SATISFY THE UPCOMING ENERGY-POVERTY OF THIS WHOLE PLANET

IT MAY PROVIDE FAR EXCEED WHAT WE NEED TO POWER THE WORLD A THOUSAND TIME OVER FOR ALL OF THE CIVILIZATION....

Natural resources are constantly depleting at a very fast rate which is now a major concern. Discovering new, clean and more accessible sources of energy is a very hot topic of research attracting many climate activists and entrepreneurs.



https://www.dailymail.co.uk/sciencetech/article-1041091l/amp/Geology-Earths-interior-cooling-faster-expected-study-suggests.html

Earth's core is six thousand degrees Celsius, which is the same as that of the surface of the sun, which is not 94 million miles away but right beneath us. We never feel this immense amount of energy even if we walk barefoot as earth crust is such a good insulator of heat, making this massive amount of energy beneath us invisible. Volcanoes, geysers, steam vents and lava, are the surface manifestation of this immense amount of heat.

This article is not about how we tap geothermal energy. We are already doing that very effectively in many places: it is about making Geothermal energy accessible to the whole planet. There are dozens of start-ups now in this field working out on geothermal concepts, New drilling techniques, and better technology. Even if even one of these start-ups is successful at proving a scalable geothermal concept, we are off to the races in developing this massive, reliable, 24*7, and a clean energy source wherever required in the world.



https://www.renewable-technology.com/projects/hellisheidi-geothermal-power-project-hengill/

Geothermal energy is easy to tap in some places on the earth like Iceland and we already are drawing energy from these places. Conditions there favor its harvesting. We have to figure out ways to mimic those conditions that make geothermal energy easy to tap, extract and harvest.

HELLISHEIDI GEOTHERMAL POWER PLANT ICELAND

These conditions are:

1. Hot rocks
2. Pores in the rocks
3. Water filling those pores

Naturally, these conditions are available in very few places on earth which is why we do not have geothermal plants everywhere. There has been a massive technological advancement in the field of drilling like the high pressure, temperature-drilling tools, and directional drilling, which now allows us to drill in any direction, and we are now in a situation to mimic Mother Nature's geothermal sites.

. The various techniques being used by researchers to make geothermal energy accessible as of now are:

1. EGS (Engineered geothermal Systems)
2. Closed-loop systems
3. Using a hybrid of EGS and Closed-loop systems

1. EGS (engineered geothermal systems) :

Wells are drilled. At the bottom of the well, rocks are fractured, creating a reservoir under the surface.
“It is like a pot under the surface to boil our water underground.”
we send some fluids down: it percolates through the fractures and comes back up boiling. We can use it for running turbines. We can even use it to warm an entire building. There are various methods of doing the same.

2. Closed-loop systems :

In this concept, instead of fracturing the rocks, it is drilled throughout, making something like an entire radiator inside the rock. They, too have many forms.
This concept came into existence just because we now have the power of directional drilling.
There is another interesting fact about closed-loop systems.
Which liquid do you think we use in these systems to harvest heat?... Water? But we could optimize the heating process by using a different liquid other than water. It is actually a substance that our center of climate is against right now... It is in huge abundance around us. It's super-cooled CARBON DIOXIDE(CO2).

3. Hybrid systems :

The main aim of hybrid systems is to extract the most heat and minimise the drilling costs. We can bring both worlds together. We get increased surface area and heat from the fracturing rocks.

• CURRENT ADVANCEMENTS :

These ideas and concepts are not just moonshots; there are many research teams and start-ups right now in the field demonstrating these concepts
Sage Geosystems : A team working in Texas are going to demonstrate it this summer. They are drilling and working in an existing abandoned oil and gas well which they had restructured for this geothermal demonstration.

If all goes as per plan, by 2022, there will be a geothermal plant in Texas that is not in Iceland, not on the side of any volcano. It is a Texas pasture where no one ever suspects this enormous geothermal resource to lie below it.
In the words of Jamie C. Beard, team leader for the Sage Geosystems project, “We are in the midst of a geothermal renaissance.”
In the last 18 months, more geothermal start-ups have launched than in the past ten years combined. To scale geothermal, we need world-class drillers which can effectively and safely drill below the surface. If the oil and gas industry works together with this idea and these climate entrepreneurs, we will be able to extract geothermal energy globally.

Start-ups are hiring oil and gas veterans for their efficient drilling. The workforce and the technologies are assets that we can leverage from the Oil and Gas industry to solve climate change. In the past six months, geothermal start-ups have closed more than 100 million dollars in funding deals. Oil and Gas entities were funding partners as well.
Will Geothermal energy be accepted as a clean source of energy in the whole world? Will we be able to draw this immense energy without disturbing the ecological balance?

DISASTER CONSTRUCTION

INTRODUCTION

Since the beginning of mankind, natural disasters have played a vital role in planning people's dwellings and designing their living environment. Every year a significant number of houses are destroyed and damaged by calamities such as earthquakes, floods, landslides and cyclones. The United Nations Human Settlements Programme (UNHSP) notes that in the first half of 2001 alone, natural disasters caused a global damage of over US$24 billion, and natural disasters kill on an average of 60,000 people per year. Inadequate construction regulations and procedures cause devastation during calamities. Therefore, it is becoming extremely important to reduce the disaster vulnerability from buildings.

The location and design of buildings are a governing factor for their ability to withstand various man-made or natural hazards. Countries need the right infrastructure and technologies in place for their residential and commercial buildings.

SOME EXAMPLES OF DISASTERS AND THEIR IMPACT

In Western Congo, the city of Goma was badly affected when a volcano on its outskirts erupted in 2001 and led to the lava flowing through its main streets. This led to the loss of the streets. On 26 January 2001, in Bhuj, Gujarat, an earthquake of 7.7 intensity on the Richter scale came that led to the death of around 20,000 people and a total loss of 7.5 billion dollars in the Kutch area. It was one of the largest disasters that occurred in India.

In 2011, Japan was struck by one of the biggest tsunamis of all time. The event began with a powerful earthquake in the northeastern coast of Honshu, Japan's main island, which caused widespread damage on land. The Japanese government's official count of deaths had exceeded 10,000.



https://cdn.theatlantic.com/thumbor/BNlZeSk7r67zx7YsAmIYgbruULc=/900x600/media/img/photo/2016/03/5-years-since-the-2011-great-east-j/q32_69594150/original.jpg

How does construction can help in reducing the damage

Around the globe, scientists are doing research and finding out new ways so that there is very less damage. They mainly focus on either predicting the disaster or creating some sort of barrier for reducing the impact. Here we would keep our focus on how we can construct the marvels that can help us for the cause. So let's consider various disasters:-

1. Tsunami

Tsunamis are mainly caused by earthquakes on convergent tectonic plate boundaries. However, tsunamis can also be caused by landslides, volcanic activity, certain types of weather, and possibly near-earth objects (e.g., asteroids, comets) colliding with or exploding above the ocean. Japan is one of the major countries struck by Tsunamis very often. That's why the Japanese needed some ways to counter them.

They've built seawalls to protect against tsunamis in some of their coastal cities. There are essential facilities in Japan, often inundated with tsunamis, that feature tsunami-proof designs. The Hamaoka Nuclear Power Plant has a barrier wall designed to protect the facility from tsunami waves caused by an earthquake predicted along the Nankai Sea trough. The barrier itself is made of continuous steel pipes and steel box frames.

They have plans to create tsunami-resistant buildings. The engineers have suggested some ways for this:-

- Building structures with reinforced concrete instead of wood, even though wood construction is more resilient to earthquakes. Reinforced concrete or steel-frame structures are recommended.
- Mitigate resistance. Design structures to let the water flow through. Build multi-story structures, with the first floor being open (or on stilts) or breakaway so the major force of water can move through. Rising water will do less damage if it can flow underneath the structure.
- Orienting the building at an angle to the shoreline. It is found that the walls that directly face the ocean will suffer more damage.
- Designing structural connectors that can absorb stress.
- Construct deep foundations braced at the footings. A tsunami's force can turn an otherwise solid, concrete building completely on its side; deep substantive foundations can overcome that.

2. Tornado

Tornadoes are large flows of air that are like a whirlpool on the ground. Strong winds flow can attain a speed of 150 miles per hour. It is enough to snap off trees, houses or even small buildings. A tornado that ravaged the town of Joplin, Mo. in 2011 took 162 lives and caused an estimated $2.8 billion in damage. And according to scientists, these scary storms may become even more powerful in the future, thanks to the climate change.

During a powerful storm, one of the biggest risks is having the roof ripped off your house. If your roof beams aren't strongly connected, the roof will lift off, leaving your house's walls without any lateral stability or bracing. That, in turn, will cause them to collapse outward. Galvanized-steel "hurricane clips" can be installed which brace portions of the trusses or rafters in a house. These strengthen the roof.

If you want your house to withstand the tornado, you must need strong walls for that. In the late 1960s, an inventor named Werner Gregori developed a new technology: insulating concrete forms, or ICF, that use polystyrene forms that clamp together in tongue-and-groove fashion, with plastic or steel connectors. The result is an airtight, insulated, fire-resistant 2-foot (61-centimetre) thick wall that's sturdy enough to withstand strong winds.



https://cdn.pixabay.com/photo/2017/02/22/22/21/tornado-2090803_1280.jpg

3. Drought

A drought happens when a region receives less than average rainfall. Unlike the simplicity of this definition, the actual scenario is devastating.

Droughts don't just affect the plants or livestock of a region, but they also pose a great threat to human lives. It is regarded as a natural disaster considering the damage it does to the entire ecosystem.
Air as we know it contains many elements, and one among them is moisture. If we could build something efficient to harvest that moisture and condense it, we could harvest water from the air.

And this is what researchers from MIT have done! This solar-powered device uses a large surface area of the pores in Metal-Organic Frameworks (MOFs) to catch water vapour and pass it between two temperature zones to condense it.

The two major advantages of this system are that it can harvest water without the use of electricity and the ability to produce water in desert climates.



https://images.indianexpress.com/2021/11/desert-gc24fe623b_1280.jpg

4. Avalanche

An avalanche is a rapid flow of snow down a hill or mountainside. Although avalanches can occur on any slope given the right conditions, certain times of the year and certain locations are naturally more dangerous than others.
Some ways to counter the Avalanche:-

1. Snow sheds:-
They are a type of deflecting structure that deflects the snow and reduces its impact on the city.

2. Snow fences and wind baffles:-
Relatively low-cost wind fences can alter wind erosion and snow deposition. Experience has shown that wind fences and wind baffles can reduce avalanche size and runout, but supplemental measures are usually needed to achieve a high level of protection.



https://mearsandwilbur.com/images/eastshed.jpg



https://mearsandwilbur.com/images/rogerspass-shed2.jpg

• CONCLUSION

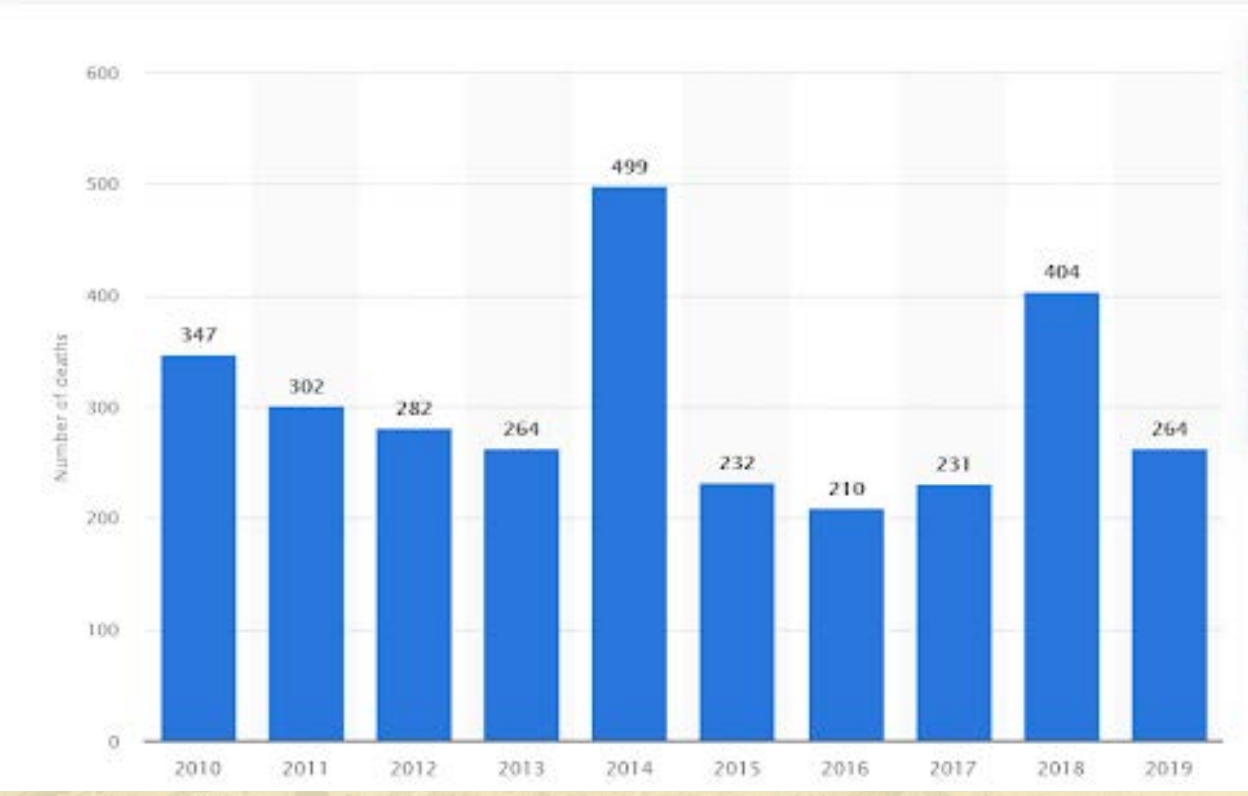
Natural disasters will continue to be a part of everyone's life as the climate's extreme increases. So far, we have seen various ways to mitigate the damage caused by these disasters by designing and building structures based on the latest construction innovation so that we can keep our loved ones and ourselves protected during these tough times.

LANDSLIDES

A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting," which denotes any down-slope movement of soil and rock under the direct influence of gravity. The term "landslide" encompasses five modes of slope movement: falls, topples, slides, spreads, and flows. An average of 25-50 people are killed by landslides each year in the United States. The worldwide death toll per year due to landslides is in thousands. Most landslide fatalities are from rockfalls, debris flows, or volcanic debris flows (called lahars).

Landslides have always been devastating for all of us. Within seconds, the scenic mountain valley starts resembling a war zone. Although the landslides are primarily associated with mountainous terrains, these can also occur while surface excavation for highways, buildings, and open-pit mines. Though landslides occur due to both natural and anthropogenic reasons, landslides due to human activities are rising worldwide. While the trend is global, Asia is the most-affected continent where 75% of landslides occur, and India is among the most affected countries, accounting for at least 28% of such events over the last 12 years. India has the highest mountain chain on earth, the Himalayas, and the northward movement of the Indian plate towards China causes continuous stress on rocks, making the land prone to landslides and earthquakes. Landslides and avalanches are among the significant hydro-geological hazards that affect large parts of India besides the Himalayas, the Northeastern hill ranges, the Western Ghats, the Nilgiris, the Eastern Ghats, and the Vindhyans, in that order, covering about 15 % of the landmass.

NUMBER OF DEATHS DUE TO LANDSLIDES ACROSS INDIA FROM 2010 TO 2019:



https://www.statista.com/statistics/1007663/india-number-of-deaths-due-to-landslides/

This year alone, the states of Himachal Pradesh and Uttarakhand witnessed over 170 landslide incidents, claiming over 46 lives. Lately, the frequency of such disasters has seen an exponential rise. The aggressive developmental model of both states completely disregards the fragile Himalayan topography and ecology. The rapid expansion of dams, unregulated construction activity in the name of expansion of road networks and mindless cutting of trees for such infrastructure projects, according to environmentalists, have made the mountains vulnerable and prone to landslides. In another event in February 2021, a sudden flash flood in the Chamoli district of Uttarakhand resulted in over 200 deaths and missing. Satellite images and sensor data later revealed that the flood was caused due to an avalanche consisting of about 80% bedrock and 20% glacier ice that dropped about 27 million metric cubic meters of debris into the valley below.

WORLD'S MOST DEVASTATIG LANDSLIDE

The world's biggest historic landslide occurred during the 1980 eruption of Mount St. Helens, a volcano in the Cascade Mountain Range in the State of Washington, USA. The volume of material was 2.8 cubic kilometers (km). On March 27, 1980, a series of volcanic explosions and pyroclastic flows began at Mount St. Helens in Skamania County, Washington, United States. An earthquake at 8:32:11 am PDT (UTC−7) on Sunday, May 18, 1980, caused the entire weakened north face to slide away, creating the largest landslide in recorded history.

INDIA'S MOST DEVASTATIG LANDSLIDE

On 18 August 1998 at 3.00 a.m., massive landslides wiped away the entire village of of Malpa in the Pithoraghar of Uttarakhand.
The rockfall started on 16 August bringing down huge rocks which initially killed three mules.
A total of 221 people died, including 60 Hindu pilgrims traveling to Tibet. The rockfall continued till 21 August. The landslide generated around one million cubic meters of rockfall and debris flow.
The famous Indian Dancer Portima Bedi died in this calamity.

CONCLUSION

Landslides are natural disasters that involve the downslope movement of soil and rock under the direct influence of gravity. This article highlights the modes and reasons for this catastrophe. It also mentions the death tolls and damage rates that come as the disaster's repercussions. Lastly, it gives a glimpse of the most devastating landslides which occurred globally and in India. Although we do not have any solution to this, we can mitigate the disaster backlash as much as possible via prior knowledge and developments. We surely are moving towards it.

CYCLONE

The system of high rotating winds counterclockwise in the northern hemisphere and clockwise in the southern hemisphere around a low-pressure center are called cyclones. The swirling air around a low-pressure center rises and cools, creating clouds and precipitation. Cyclones are intense and rotating winds common to the coastal areas and are associated with heavy rains and high tides, and even floods. It can be the most intense storm on earth. Old buildings made of wood or mud get damaged and destroyed by strong winds. Huge storms cause flooding and landslides to occur. Cyclone causes uprooting of electric poles, trees etc. due to which day to day life of people gets disturbed. Diseases like typhoid, jaundice and malaria spread due to contamination of water.

• FORMATION OF CYCLONE

There are two major causes of cyclone formation.

1. WIND MOVEMENT

The major cause of wind movement is pressure gradient. Wind always flows from a high pressure zone to a low pressure zone. In an area, either it is land or water (Ocean or sea), where temperature rises high due to incoming heat from the sun, the air gets heated and rises upward. This causes a fall in air pressure and the area, thus becoming a low pressure area. The space vacated by warm air is replaced by cold, denser air from the surrounding high pressure area. In this way, wind flows from a high pressure area to a low pressure area.

Tropical region is the perfect place where low pressure occurs. It is the region of earth between the tropic of cancer and the tropic of capricorn midway between which the equator lies. This region of the earth receives maximum heat from the sun because sun rays are directly overhead only in this zone. Hence the temperature of this zone becomes high and creates a low pressure belt here.

Similarly the area near the north pole and south

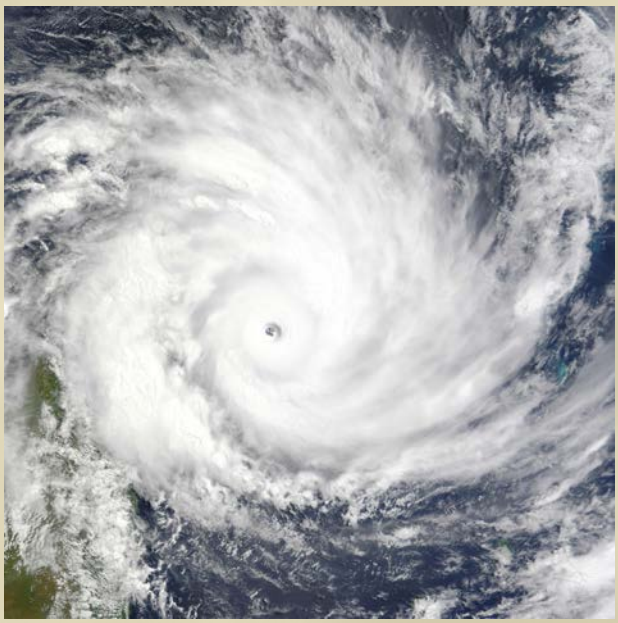
baliyans.com

pole is high pressure zones. The temperature of this zone is very low due to which this zone remains covered with ice and snow for the most part of the year. The north and south frigid zones are the coldest zones of the earth. Hence, there is a low pressure zone near the equator and high pressure zone near the poles due to which air rushes from the north pole towards the equator in the northern hemisphere and from the south poles towards the equator in the southern hemisphere causing wind movement.

2. CORIOLIS FORCE

Due to the rotation of earth, a force is generated that acts perpendicular to the direction of movement of wind and the axis of rotation of the earth. This force is known as the Coriolis force. Air in the northern hemisphere deflects towards the right while moving from the high-pressure zone (north pole) to the low-pressure zone (tropical zone). Similarly, air in the southern hemisphere deflects towards the left while moving from the high-pressure zone (south pole) to the low-pressure zone (equator).

Hence the simultaneous effect of wind movement and Coriolis force causes the spinning of cyclones in the counterclockwise direction in the northern hemisphere and a clockwise direction in the southern hemisphere. Cool air rotates around a low-pressure centre called the eye of the storm.



https://ko.m.wikipedia.org/wiki/%EC%82%AC%EC%9D%B4%ED%81%B4%EB%A1%A0_%EA%B0%80%ED%95%84%EB%A1%9C

TYPES OF CYCLONE

There are two types of cyclones:

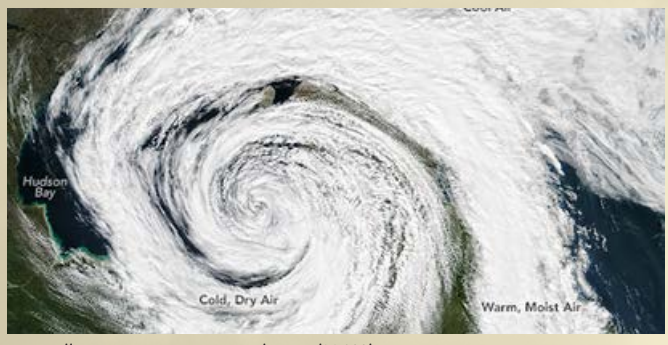
1. Tropical Cyclones:

Tropical cyclones develop in the region between the Tropic of Capricorn and the Tropic of Cancer. It occurs at the time of maximum solar radiation during the summer and autumn seasons around July to October month in the northern hemisphere and December to March month in the southern hemisphere. Tropical cyclones have many names. They are called hurricanes in the North Atlantic and eastern Pacific oceans, Typhoons in the western Pacific Ocean, Cyclones in the Indian Ocean, and Willy-willies in north-western Australia. Tropical cyclones are intense and occur over ocean surfaces and coastal regions because of the continuous supply of moisture by the ocean or sea. When this cyclone reaches the land, the moisture supply is cut off and the storm dissipates. When a cyclone crosses the coast after that landmass starts. The place where the cyclone crosses the beach is called the landfall of the hurricane. Naturally, the power of the cyclone decreases.

The average diameter of circulating tropical cyclones varies between 150-250 km. However, the diameter of storms over the Bay of Bengal, Arabian sea and the Indian Ocean is between 600-1200 km and these cyclones move slowly about 300-500 km per day. The circulation of the tropical cyclones extends up to the troposphere i.e. around 15000-18000 meters. When warm moist air rises in the atmosphere, after a certain height it starts cooling because the temperature drops with increasing altitude. As the air cools at a high altitude, it becomes denser and moves towards the ground. This is called subsiding warm air. Hence, storms get intensified by increasing their diameter.



https://www.shutterstock.com/video/clip-1013149958-cyclone-storm-weather-cloud



https://earthobservatory.nasa.gov/images/88566/extratropical-cyclone-over-hudson-bay

2. Extra Tropical Cyclones

Extratropical cyclones arise in temperate zones and excessive range areas, although they're recognized to originate in the Polar areas. They may be also referred to as Temperate cyclones or centre range cyclones Frontal cyclones or Wave Cyclones. It is the type of cyclone which occurs in areas between 30° to 60° latitudes both north and south of the Equator i.e between the Tropic of cancer and the Arctic circle in the Northern hemisphere and the Tropic of Capricorn and Antarctic circle in the Southern hemisphere. This region is called the mid-latitudes that's why extratropical cyclones are also called mid-latitudes cyclones and some parts of the cyclones even touch the high latitudes. Generally, earthobservatory.nasa.gov between 25° to 35° N and S latitudes, there is a sub-tropical region which is a high pressure belt and it is also a transition zone from tropical to temperate region. Similarly, between 50° to 70° N and S latitudes, there is a sub-polar region which is a low pressure belt and it is also a transition zone from temperate to polar region. So there is a pressure gradient between the sub-tropical and sub-polar regions and hence air circulation takes place in this region. These winds are called westerlies winds which flow from west towards east due to the effect of Coriolis force at surface level. There are winds that occur high in the atmosphere at the height of 12-15 km above the ground. These winds are called sub-tropical jet streams which also flow from west to east. The formation of extra tropical cyclones is explained by Polar Front Theory. According to this theory, the warm air from the tropical region meets the cold air from the poles which creates a polar front. This interaction of cold and warm air creates a low pressure at the center of interaction. Thus a low pressure center is created and the surrounding air rushes in to occupy that center and due to the effect of earth's rotation a cyclone is formed.

RECENT CYCLONE IN INDIA

1. Cyclone Tauktae :

It was the primary cyclonic storm of 2021 that emerged from the Arabian Sea. The word "tauktae" means 'Gecko' (in Burmese Language) which is a highly vocal lizard. It hit southern Gujarat on 17 May 2021 and is assessed as a severe Cyclonic Storm (VSCS). States which were directly impacted are Kerala, Karnataka, Goa, Maharashtra, and Gujarat. More than 20 people were killed across 3 states in India. Twelve people died in Maharashtra, eight in Karnataka, and 4 people in Gujarat.

2. Cyclone Yaas :

The cyclonic storm, Cyclone Yaas, formed within the Bay of Bengal and hit West Bengal and adjoining Odisha coasts on 26th May 2021. The name of the cyclone is given by Oman. The word "Yaas" originated from the Persian language and means 'Jasmin' in English. States which were impacted are West Bengal, Orisha, Assam and Meghalaya

Farmlands all over Odisha, West Bengal, and some in Jharkhand had been damaged through flooding, while small boats inside the Bay of Bengal have been damaged. Electric lines in these states had been knocked down causing lots of strength outages.

3. Cyclone Nisarga :

Cyclone Nisarga was a tropical cyclone and is termed as 'Severe Cyclonic Storm' by the Indian Meteorological Department (IMD) .

Severe Cyclonic Storm Nisarga was the strongest tropical cyclone to strike the Indian state of Maharashtra in the month of June since 1891.

Nisarga Cyclone originated because of the depression in the Arabian Sea. The name 'Nisarga' was given by Bangladesh.

The two states that were affected by the Cyclone Nisarga are Maharashtra and Gujarat.

4. Cyclone Amphan :

The Super Cyclonic Storm Amphan was the strongest and most devastating hurricane that wreaked havoc in East India, especially in West Bengal, Odisha and Bangladesh in May 2020.

It was the strongest hurricane to hit the Ganges Delta since Sidr 2007 and the first super cyclonic storm ever to hit the Bay of Bengal since the 1999 Odisha cyclone.

It fell on May 20 near Bakkhali, West Bengal after weakening after that. It left a trail of severe damage and was later confirmed as the most expensive hurricane ever recorded in a pit. A total of 128 deaths were recorded.

EFFECTS OF CYCLONE

Cyclones are made of swirling winds running at more than 200 km/h and that simply tells how much of a catastrophe it can be. Apart from that, it carries along with it a lot of rain and thunderstorms. These ravaging winds can cause excessive rainfall, which can later result in landslides and the destruction of human property and life.

Floods are a common disaster that is faced after cyclones and waterlogging make the water contaminated and thus many kinds of water-borne diseases are spread. These can result in the affected places being cut off from the rest of the places from which help could have been provided which amplifies the problems being faced by the people. The buildings not having solid foundations just scatter away and a lot of destruction of property and life happens.

Crops are also damaged and a lot of damage to the forests results in an unbalance which becomes hard to recover. They disturb the entire civic life, consisting of water and electricity supply. Apart from the inland that it also affects the coastal lives adversely.



https://www.hindustantimes.com/india-news/tauktae-maintained-intensity-even-after-landfall-affected-hit-nine-states-101621509103481-amp.html



https://news.abplive.com/andhra-pradesh/andhra-pradesh-cyclone-gulab-aftermath-sees-over-1-5-lakh-acres-crop-loss-in-three-districts-1484932/amp

• PREVENTION

There can be a lot of preventive measures that can be taken to evade the adverse effects of the cyclone. Being alert to the cyclone forecast and warnings being provided by the authorities and shifting people to some safer place as soon as possible. Apart from that, storm shelters can be built to tackle such situations, especially in cyclone-prone areas. Public awareness plays an important role in these kinds of situations. Many disaster-proof structures can also be used to prevent the loss of property and human lives. To avoid situations like landslides and floods, afforestation can be used as forests would hold the soil firm and would help to absorb the excess water preventing floods.

• STRUCTURAL ADVANCEMENTS

To tackle problems such as collapsing buildings and bridges, a lot of advancements have taken place in the field of civil engineering. Strengthening the base of a building is one of the most important aspects in any disaster-prone area is it earthquakes, tornadoes or cyclones. Buildings with weak foundations are often prone and most often to fall prey to any kind of mishap and need more strength to bind themselves to the ground and also sustain the whole weight of the building.

Different kinds of techniques have been used to strengthen the foundation of a building. Some prefer pile foundation where the piles are bored deep into the ground so that it has a firm grip down the ground while other options can be going slab foundation, strip foundation or pad foundation.
Even roofs are being designed in these areas to prevent the wind from tearing them off in these kinds of situations. The roofs are made with a more aerodynamic design so that the winds just go over them and do not get stuck under the roof.

The roofs are also being made up with more firm designs to be kept firm in case of disasters.
The wall structures are also being designed nowadays in such a way the wind flowing through the house does not get trapped anywhere and passes through the building without inflicting much harm.

A lot more work is going on in this field to minimize the damage and loss to the properties in these kinds of disasters.

AATMA NIRBHAR BHARAT

With the idea of "Aatma Nirbhar", our plan is to make the country self-sufficient in all senses. Five mainstays of Aatma Nirbhar Bharat were outlined – Economy, System, Vibrant Demography, Demand and Infrastructure. The final tranche concentrates on the sectors of defense, aviation, power and space. The idea of becoming "Aatma Nirbhar" becomes significantly important because it not only allows us to maintain a good "Supply-Demand" cycle and meet our own needs along with producing sufficient goods and products to engage in mutually benefitting trades but also it helps us in validating the authenticity of products and reducing the unnecessary expenditure on trade and services. Currently, there are a lot of fields where India needs to work upon and move ahead on its path of being "Aatma Nirbhar". Some of these fields are talked about below.

India has the 3rd most extensive coal resources globally, producing more than 600 million tonnes for power plants. Despite it, we are shipping 200 million tonnes annually, burdening our economy and questioning our management. The government has changed the coal mining rules and regulations, and this will open the sector and allow more involvement by the private sector to mine and sell coal. Further, India needs to step up its hardware manufacturing base on the renewable energy front, particularly the solar panel or modules. But these aren't the only two problems that our country is facing. India also produces more than 50 million tonnes of plastic waste.

The problem of plastic is neither new to us nor specific to our country. Still, finding an alternative to it or a solution to minimize the usage of plastic has been a puzzle that nobody has yet successfully solved. However, Binesh Desai, a 27-year-old founding father of the Gujarat-based Eco-Eclectic Technologies, was an exception. He came up with an invention of bricks made from plastic waste, including PPE suits and face masks. He started researching the materials from which masks are made by collecting used face masks from his family and neighbours. He dumped the used masks in the bucket of disinfectant for two days before working on them. He then mixed them with some binders created in his lab. To check the material's quality, he conducted many small sample experiments and tried and explored various combinations of binders. For these bricks, the successful ratio was about 52% PPE + 45% paper waste + 3% binder, this is the combination used by him.

Next, Desai created Eco Dustbins to collect PPE waste, he contacted the municipal corporation and local bodies to set up these across Surat and Valsad, and he is also trying to traffic jams with private hospitals, malls, and salons to put the bins. He is in the process of obtaining a NOC from the Gujarat Pollution control panel to conduct mass collection and recycling of the waste.

After following proper sanitation guidelines, the fabric will be shredded, added to industrial paper waste produced from paper mills, and then mixed with a binder. The mix is kept for 4-6 hours before being set in moulds. The bricks are naturally dried for 3-4 days, and therefore, the product is then ready to be used.

Desai compares the bricks with AAC blocks, red bricks, and his P-Block, which has been wont to construct toilets and houses across Gujarat and Maharashtra, and in Hyderabad and Varanasi. Desai said that the new variant, Brick 2.0, is stronger and more durable, making it three times stronger than conventional bricks at twice the size and half the price, and it is fire-resistant, recyclable, and absorbs less than 11% water.

The project is currently at the commercial stage as he has already got the infrastructure for P-Block, and that he will only add a couple of steps for the two 2.0 variants. Desai is planning to start production in mid-September.

Hearing and reading about Binesh and more people like him certainly gives us hope and the motivation we need or seek. Such innovations in the field of waste management and effective use of discarded materials to produce something unexcepted and essential, which can be equipped in daily life, can be economically very benefitting for both the country and individuals. Modern innovations allow us to think out of the box and produce goods that can reorient the working of trades and supply. Our country has high hopes with its individuals, and hopefully, India will successfully become "Aatma Nirbhar" in all means and all the possible fields.

DEVPRAYAG

Devprayag means the confluence of holy rivers, is a small town situated in Tehri Garhwal district in Uttarakhand. It is endowed with divine natural beauty and showers tourists with its calmness. It marks the confluence of river Alaknanda and Bhagirathi to form the holy river Ganga. The Alaknanda rises at the confluence and foot of the Satopanth and Bhagirath Kharak glaciers in Uttarakhand. The five main tributaries joining with Alaknanda include Dhauliganga, Mandakini, Pindar, Mandakini and Bhagirathi, all rising in the northern mountainous regions of Uttarakhand. The Alaknanda contributes a significantly more significant portion to the flow of the Ganges than the Bhagirathi. There are numerous stories related to this place. According to an ancient text, it is believed that Lord Rama and King Dushratha did penance in Devprayag. Interestingly, there is a small water spring called Baitalshila, which locals believe can cure leprosy.

RISHIKESH

Travelling about 75km, Ganga then reaches Rishikesh, a city located in the foothills of the Himalayas. This city is known for studying yoga and meditation. The reason lies in the history of this holy place. According to The Skanda Purana, Lord Vishnu, impressed by the austerity of Rabhya Rishi, blessed him that this place would be named after him. Geographically this place is unstable due to earthquakes and floods, but that does not stop thousands of devotees from going there. Ram and Laxman jhulla is one of the hotspots for tourists apart from several temples and ashrams in the region. Moreover, it is an ideal place for adventure activities like rafting, trekking, and rock climbing due to its perfect physical elements.

HARIDWAR

The city has been mentioned in various ancient texts, Upanishads and even in Mahabharata. According to an old story, king Bhagiratha brought Ganga down to earth in order to purify the souls of his 60,000 ancestors in the Satya Yuga. Its literal meaning is "way to heaven or god" and is one of the seven holiest places for Hindus. Haridwar is the first place down the mountains that welcomes the holy River Ganga. in terms of culture and tradition, it is vibrant, every six years, the Ardh Kumbh Mela is celebrated here with great fervour. Har ki Pauri, which translates into "the footsteps of God," is the entry point of the Ganga into the plains which is at the centre of the city Haridwar.

KANPUR

In 1801, a city was born on the banks of India's oldest and purest river- the Ganga. The city went by the name of Cawnpore back then; now that city's name is Kanpur. All major religions are practiced in Kanpur; nestled on the banks of the eternal Ganga, Kanpur stands as one of North India's major industrial centers with its own historical, religious and commercial importance. Due to a lot of industries in Kanpur, all waste is dunked in the Ganga river. The Ghats are also one of the major sources of pollution in the river. Ganga is one of the essential parts of our Indian culture due to which different kinds of pujas and other religious tasks are performed on the ghats, and the materials used are disposed of in the river. But many projects have been started by the government to clean the Ganga, and their impact is also visible. Ganga Barrage is quite famous in Kanpur, Officially named the Lav Khush Barrage, this bridge across the Ganges river lies at Azad Nagar-Nawabganj in Kanpur. It is a matter of great happiness that many festivals are celebrated here on the banks of the Ganga in Kanpur. Ganga is also a perfect place in Kanpur from the tourism point of view. It is necessary to keep the Ganga clean for all of us.

PRAYAGRAJ

Triveni Sangam is located at Prayag. Triveni Sangam is the confluence of the Ganga, the Yamuna and the mythical Sarasvati River. The Ganga and Yamuna there can be identified by their different colours - the water of the Ganga is clear while that of Yamuna is greenish in colour. The third river, mythical Saraswati, is called invisible. The Ganga joins the 1,444 km long River Yamuna at the Triveni Sangam at Prayagraj, a confluence considered holy in Hinduism. A dip in the Sangam water is supposed to be the holiest of the holy pilgrimages for the devout Hindu. At the mid-river point priests perch on small platforms to perform puja and assist the devout in their ritual ablutions in the shallow waters. Prayag - The area of Allahabad (Prayagraj) neighbouring the confluence; for this reason, the confluence is also sometimes referred to as Prayag. Prayagraj is a religiously important place and the historic Kumbh Mela is organized here every 12 years. The Maha Kumbh Mela is the largest religious congregation in India, attended by millions. It is during the Maha Kumbh that the Sangam truly comes alive, attracting the devout from all across the country. The over month-long fair is marked by the construction of a massive tented township, complete with cottages, huts, platforms, civic facilities, administrative and security measures. The mela is especially renowned for the presence of an extraordinary array of religious ascetics. According to the mythological beliefs of Hinduism, it is said that "Those who bathe at the place where the two rivers, white and dark, flow together, rise up to heaven".

VARANASI

Lying in the south of Uttar Pradesh, on the banks of the holy River Ganges, breathes Varanasi, which is believed to be the oldest living city in the world. Varanasi. also known as Kashi, Benares ,or Banaras, is a city on the banks of the river Ganges in Uttar Pradesh, India, 320 km south-east of the state capital, Lucknow and 121 km east of Allahabad. The culture of Varanasi is closely associated with the River Ganga and the river's religious importance. The city has been a cultural and religious center in North India for several thousand years. People often refer to Varanasi as the city of temples, the holy city of India, the religious capital of India, the city of lights" city of Salvation and "the city of learning. The customs can be seen here by attending the Ganga Aarti in Varanasi. Held every day at dawn and dusk, worshipers flock to the Ghats of the holy river Ganga, a tradition unbroken for thousands of years. Ghats in Varanasi are riverfront steps leading to the banks of the River Ganga. There are 88 ghats on the banks of the Ganga in Varanasi. Most Varanasi ghats were rebuilt in the 18th century under the Maratha patronage. Many ghats are associated with legends or mythologies, while many ghats are privately owned. A morning boat ride on the Ganga across the ghats is a popular visitor attraction In Hindu traditions, cremation is one of the rites of passage, and the Ghats of Varanasi are considered one of the auspicious locations for this ritual. In fact, this city has been attracting pilgrims from India as well as abroad for centuries

PATNA

Patna is an ancient city that sprawls along the south bank of the Ganga River in Bihar, northeast India. It's a perfect setting for history lovers and a guide to spiritual legacy. Culturally vibrant, it is an excellent starting point for visiting various Buddhist and Jain pilgrim Centers. The River Ganga flows through Patna and one cannot leave here without experiencing a boat ride near Gandhi Ghat. A boat ride in the Ganga in the months of October-March could be mesmerizing with its serene and captivating surroundings. Mahatma Gandhi Setu (Gandhi Setu or Ganga Setu) is a bridge over the river Ganga in Bihar, India, connecting Patna in the south to Hajipur in the north. Its length is 5,750 meters and it is the third-longest river bridge in India. It is an attractive and beautiful place

KOLKATA

The Hooghly River or the Bhagirathi-Hooghly called, the Ganga or the Kati-Ganga' in mythological texts is the eastern distributary of the Ganga River in West Bengal, rising close to Giria in Murshidabad. Until the seventeenth century, when the main course of the Ganges shifted decisively eastward, the Hooghly was the major channel through which the Ganga entered the Bay of Bengal. People believe the holy waters of the Ganga still flow through the Bhagirathi-Hoogly and hence it is still worshipped today. From prehistoric times, the Hooghly attracted people for secular as well as sacred reasons. The Ganga ghats of Kolkata dotting the entire city, are the perfect destination to serve your purpose. Their reviving natural beauty and ample recreational options are appealing to visitors. This serene river and its buzzing ghats surrounded by breathtaking nature will touch your heart. The Ghats of Kolkata are a part of the heritage because they can let us peek into the history. Aghat' refers to the steps that are built next to a river to let people walk down from the bank to the water comfortably. They also have a distinct cultural and religious significance, as many rituals of Hinduism take place next to the river, at the Ghat. Ganga makes Kolkata very beautiful.

References : https://yourstory.com/2017/08/ganga-soiling-holy-river/amp , https://prayagraj.nic.in/history/ , https://en.wikipedia.org/wiki/Patna , https://en.wikipedia.org/wiki/Hooghly_River

Professors Interviews

In conversation with Prof.



IN CONVERSATION WITH

PROFESSOR BALAJI DEVARAJU

Let's begin...

STUDENT **Please guide us through your journey to geoinformatics engineering and what fascinates you the most about it?**

PROF. BALAJI I did my BE at Anna university in Chennai. As a child, I was always intrigued by physics. My generation was the Dr. APJ Abdul Kalam generation, and his activities really inspired us. I was interested in space science during my school days, but my rank did not allow me to take up that branch. Instead, I landed in geoinformatics due to the ongoing talks about remote sensing, satellites, etc. And indeed, I reached my destiny. I enjoy what I am doing now.

STUDENT **Can you please tell us about your current research interests?**

PROF. BALAJI Being a geodetic, my current research involvements are about retrieving the gravity field data and its temporal variations. Many people think that the value of gravitational acceleration is 9.81 everywhere. However, this is the mean value at the sea level, and it also changes with time. Geodesy involves determining the earth's gravitational field's shape, size, and temporal variations. If the gravity field is changing with time at one place, this means the mass within the earth is also moving. My research is primarily focused on developing geodetic methods to understand the earth's systems. We deal primarily with satellite data.

Magazines are an excellent way to explore, create interest and expose yourself to the newer innovations in the field. Students can get involved in societies like the American civil engineering society,



PROF. BALAJI DEVARAJU

Prof. Balaji Devaraju is an Assistant Professor in the Department of Civil Engineering at IIT Kanpur. He did his BE from Anna University in Chennai and Masters from the University of Calgary. He earned his PhD from the Institute of Geodesy, University of Stuttgart. His field of expertise is Signal processing on the sphere and Satellite Geodesy. His other research interests include Physical Geodesy, Future Satellite Gravity Missions, and Geodetic tools for monitoring the environment.

PROF BALAJI DEVARAJU INTERVIEW SUMMARY

- Geodesy involves determining the earth's shape, size, gravitational field and its orientation in space including the temporal variations.
- Magazines are an excellent way to explore, create interest and expose yourself to the newer innovations in the field. Students can get involved in academic societies, read their magazines and journals, follow them on social media.
- Managing our water resources should be one of our top priorities. We are already witnessing conflicts over water resources in states like Karnataka, Kerala, TN; We also have a huge economic inequality within our society. We must focus on managing our resources to provide equitable access.
- We should look at AI/ML as a toolbox. We often have problems involving several variables that need to be estimated with varying amounts of data, where AI/ML can be useful. We need people who have good knowledge of both geodesy and AI/ML to analyze and get insights from the huge amount of geodetic data we have acquired.

STUDENT **Why don't we have geodesy based courses for 2nd year students just like we have Mechanics of Solid(MOS) for structural engineering?**

PROF. BALAJI IITK curriculum is a science-based engineering curriculum focusing on teaching sciences. Students have an option to easily access different streams of science. For example, climate science is based on thermodynamics, fluid mechanics, and classical mechanics. So if you understand these topics, you can easily study climate science. I appreciate a science-based curriculum over an engineering-based one in many other colleges. Students of a science-based curriculum are very well equipped to adapt to any technological advancements that may happen in the future, making students more innovative.

STUDENT **You said there is a lack of geodetics in the country. Do you think adding more courses in our curriculum would make a difference?**

PROF. BALAJI IITK has a very strong geoinformatics program. The problem we academicians face is a lack of interest in the newer generation towards traditional sciences. Nowadays, students are more attracted to newer domains like ML/AI. Many students also show interest in traditional sciences.

The problem is that we lack experts in India who can teach this topic. Here at IITK, we offer around 6-7 courses which no other colleges in India offer.

We need to advertise more about the many exciting things happening in the field.

STUDENT **What steps can be taken to control climate change?**

PROF. BALAJI We need to respect the resources we have. In IITK, we get a continuous supply of electricity, water, etc., but we do not have these facilities elsewhere. At other places, we get power cuts, and tap water is not potable. We need to learn to exploit our resources carefully. We sit in a zone where most of the water comes from during the monsoon. If the monsoon fails, we will become drought-prone. Managing our water resources should be one of our top priorities. We are already witnessing conflicts over water resources in states like Karnataka, Kerala and Tamil Nadu. We also have a huge economic inequality within our society. We must focus on managing our resources to bridge this gap sustainably.

STUDENT **How is AI/ ML impacting geodesy ?**

PROF. BALAJI We should look at AI/ML as a tool box. Very often we have problems which involve several variables that we need to estimate with limited amount of information and the underlying theory is mostly statistics and probability. We need people who have good knowledge of both geodesy and AI/ML to analyze the huge amount of data we have In order to become more efficient. First we need to become efficient in our parent domain and then use the knowledge of AI/ML to become more constructive and innovative.

STUDENT **What are your views on climate change of Kanpur as geodetic?**

PROF. BALAJI Since I am new to Kanpur, I have not seen enough seasons to conclude anything concrete. But I can tell you about my hometown Chennai. In Chennai, we get the NW monsoon, not the SE monsoon that north India gets. We generally get rainfalls around October-November. When I was a kid, we used to get rainfall around September-October but over the years the pattern shifted to late October-November-December due to climate change patterns. The rain intensity decreased, and now we have more devastating and more frequent cyclones because of global warming. Any change in the earth system will not be episodic; it will show up gradually over the years.

We should follow our interests rather than run after the trends

STUDENT **Can you list some differences between online and offline teaching?**

PROF. BALAJI Offline classes are way more interactive. Earlier students use to ask doubts and questions in the classroom and they also used to come to my office. The connection between a teacher and student that happens in a classroom is gone. Its like buying things online. It also requires a lot of preparation in terms of resources and editing. In classroom, based on the interaction between students and their input you can always go a bit higher or lower based on their state of mind. But there are many positive aspects of online learning too. It is indeed more efficient as students can watch the lectures multiple times. It puts more pressure on teachers to be more accurate with what they are saying. However it is indeed a disadvantage for students who come from far off places and don't have a stable internet connection. IITK is doing great in sending recorded material to those students.

STUDENT **How can we keep ourselves motivated to go for core subjects?**

PROF. BALAJI The problem lies with the psychology of society. With such substantial economic gaps within the society, students often get distracted by higher pay. If some company offers you high pay, you should ask yourself where is that company getting the money from. Being a part of an elite university, you should think about yourself. Where will it put you in the long term? You cannot keep doing the same thing as programming all your life. Being elite engineers, we should dominate the market rather than let the market dominate us. We should follow our interests rather than run after the trends. If you are starting a startup company, It should be more Engineering/innovation-based than service-based. Most Indian companies lie in the service line, which we need to get past.

STUDENT **How can one develop interests in geoinformatics?**

PROF. BALAJI In our times, we had many magazines on geotech, surveys, CNS, etc. Magazines are an excellent way to explore, create interest and expose yourself to the newer innovations in the field. Students can get involved in societies like the American Society of Civil Engineers (ASCE) and read their magazines and journals, follow them on Twitter. Also, there is a lack of geodetics at various levels in India.

STUDENT **What are some of the projects you are working on or have completed?**

PROF. BALAJI After coming to Kanpur, I got involved in geoid development. A geoid is a surface that closely approximates the ocean surface when the ocean is at rest. The geoid is an equipotential surface, and gravity is everywhere perpendicular to it. By aligning ourselves with the gravity field, we can determine the elevation data, which helps us determine the direction of water flow. This is important for civil engineers in designing water plants, flood plane management, and coastal management. Recently we completed the geoid of India for the first time. My other involvement is with the National Center for Geodesy which Prof. Onkar Dikshit heads. I am a co-investigator in this project. We have a five-year funding from the department of science and technology where we are supposed to educate a lot of geodetics. We promised about 80 of them in a period of 5 years. We also promised a few Ph.D. doctoral candidates with a specialization in geodesy. We also set up an international GNSS station in IIT Kanpur, the fourth one in India after Lucknow, Hyderabad, and Bengaluru.

STUDENT **What are your views on our education system being grade oriented?**

PROF. BALAJI I agree that most of you joined engineering for the sake of jobs and high pay packages. If you look worldwide, not many countries have this many engineering colleges as we have in India. Here engineering seems the only way out of our economic status. However, when you look at learning as a process, it does not start at the engineering level, instead it starts from the kindergarten level. When you teach a child, he is more interested in learning, which did not happen in our culture. We are asked to be more obedient and do certain things. Even our school curriculum does not allow us to do anything more than academics. So, we cannot figure out what our likes and dislikes are. We have failed to create opportunities in other sectors like fine arts, sports, and basic sciences at some stages. These things need to be equalized to make more people interested in learning rather than earning. We should focus more on processes rather than outcomes.

IN CONVERSATION WITH

PROFESSOR GAURAV TIWARI

Let's begin...

STUDENT **Could you please tell us how did you get into civil engineering? Did any particular incident push you to pursue this branch? Also, tell us about your areas of research interest and current project?**

PROF. TIWARI During my school days, I decided to pursue engineering as a career when one of my seniors got into IIT. At that time engineering was limited to branches like electrical, mechanical, and civil. Many of my seniors who were in government PWD jobs advised me the same. I wasn't inclined to civil, I got it based on my rank in competitive exams.

As for research, since my parents were professors, I found it best for me as well. Then after IIT Roorkee, I did my Ph.D. from IISc. Also, when I went for my summer training in the second-third year, it was difficult for me to handle field pressure. Regarding my research interests, I work mainly in engineering rock mechanics, whose applications are rock tunnels and rock slopes found in hilly areas. As for rock mechanics, we are looking forward to establishing a laboratory here.

STUDENT **What is the impact of Covid on the lifestyle and teaching ways of professors? What are the changes you made to make teaching more interesting? What are your views on how it impacts students?**

PROF. TIWARI To ease the situation, I prefer recorded lectures over live so that students can read a lecture in whichever time slot that suits them. In my discussion sessions, I try to do the numerical part together with students, where they solve with my assistance to get the exact feel of the subject. I am not overloading them with a lot of assignments and quizzes.

We'll have to focus on projects and research for better experimental knowledge.



PROF. GAURAV TIWARI

Prof. Gaurav Tiwari is an assistant professor in the Department of Civil Engineering, IIT Kanpur. He obtained his B.E., Civil Engineering from M.B.M. Govt. Engineering College, Jodhpur, M.Tech in Geotechnical Engineering from IIT Roorkee and PhD in Geotechnical Engineering (Rock Mechanics) from IISc Bangalore. Post Doctoral, he also worked as a Research Associate at IISC Bangalore (January,2018-November,2018). His chief research interests are in Rock Mechanics and Engineering, Experimental Rock Mechanics and Probabilistic Rock Mechanics.

PROF GAURAV TIWARI INTERVIEW SUMMARY

- In this interview, Professor Tiwari talked about how he pursued his field. What motivated him during his journey and enlightened students on how to choose the best path for themselves.
- He talked about his experiences in the field of Rock Mechanics and engineering. And, he also highlighted the global advances and future developments in this field.
- He showed his concerns regarding the repercussions of the global pandemic and its impact on the curriculum.
- Along with this, he mentioned his efforts towards normalizing the scenario for his students.
- Lastly, he also mentioned the career opportunities for students in research work, highlighting the ones in rock mechanics.

STUDENT **How does one develop an interest in geotechnical engineering?**

PROF. TIWARI As for Geotechnical engineering, it is an exciting field because you get both experimental and numerical work. It is not just about the foundation but also the problems encountered by people in various areas. Much experimental work is also there that makes it possible to see whatever is happening right before our eyes.

STUDENT **Due to covid we are unable to see experimental implementation, so how are we supposed to develop interest because right now we are just witnessing lectures without practical exposure?**

PROF. TIWARI Actually, the question is quite relevant. I can assure you that once the institute reopens, we will see experiments and cover whatever you missed. Till then, I would suggest you go through the lectures provided and refer to other resources like YouTube videos, etc.

STUDENT **Could you explain how COVID-19 affected your research work?**

PROF. TIWARI The first and foremost problem is the lack of communication with students. Not only the research work, but teaching has also become a lot more difficult. For research students, due to a lack of resources at home, their progress and efficiency are greatly affected.

STUDENT **What are your views about climate change variables of Kanpur from geotechnical observables?**

PROF. TIWARI Climate changes are more related to environmental engineering, which is not a part of my work. However, from my knowledge, the recent temperature rise has led to glaciers melting, which have a significant impact in hilly areas like that in Uttarakhand. As for Kanpur, I do not have information about its direct effects on engineering soil mechanics.

STUDENT **Where do we stand in terms of global advances in Geotechnics? Do you think India is at par with the world in this field?**

PROF. TIWARI As far as numerical aspects are concerned, we are doing reasonably well, but we'll have to focus on projects and research for better experimental knowledge. It's just that we need more advanced laboratories with more modern equipment.

STUDENT **Could you tell us more about other projects you are involved in.**

PROF. TIWARI I have been fortunate to be the part of some important field projects related to rock mechanics during my PhD and after that. I was involved in the slope design aspects of the world's highest railway bridge Chenab Bridge in J&K of India. I was also engaged in the Deccan Gold Mine slope designs in Karnataka. Right now, I am working on the preparation of design charts to design large hydropower rock cavers funded by NHPC. Further, I am involved in one DRDO funded project also which is related to blast loading effects on rock tunnels.

STUDENT **Expected future developments in your field? How are tools like ML/ AI affective in your field?**

PROF. TIWARI When we talk about rock mechanics, both its aspects, experimental and numerical, are developing. For practical developments, they are getting into the micro-mechanics on the particle level, but for the numerical part, people apply these techniques like reliability, probability engineering, machine learning, and AI into rock mechanics

STUDENT **How difficult does it become to teach for recording lectures without the presence of students?**

PROF. TIWARI In the last semester, it was very difficult because there was no interaction. Also, we alter our pace in accordance with the students, but here it is not possible. But it felt really nice when students positively reviewed my course, and I have also improved a lot of things for the convenience of students. Here we are not aware whether you understand things correctly or not. Even in DH, students are hesitant and nervous.

STUDENT **What is the importance of geotechnics for society? How did it become a part of the curriculum?**

PROF. TIWARI There are many integral parts of your life that are directly related to geotechnical engineering. It is more like if your foundation is strong, then the structure will be strong. Landslides and rockslides all hugely impact peoples lives, and it even causes significant economic losses, so geotechnical engineering plays a vital role in our lives.

STUDENT **When IT companies are the major ones providing the highest packages, how do you think a student pursuing civil engineering should take it positively in the initial years because there is a lot of stereotype about huge packages regarding IIT placements?**

PROF. TIWARI If I had been at your place, maybe I would have also preferred higher-paying jobs. You should be looking the position in which you want to be after 10 years. Ask these questions to yourself before opting for a job – Do I have the freedom to opt for any work of my interest? Do I want to be dictated by my bosses at higher positions every time? Do I have flexible office hours? Can I take part in policy decisions of the government? Can I train young minds of our country to do the best? Will I be satisfied on my personal (family) front? Being a professor is not only to teach and deduct marks. I think lot of students look at their professors in this way only. There is a parallel world of research where you could really contribute. I agree that money is a big factor but is that job justifying your potential, talent, and caliber? Further, you could earn huge money, may be more than your company job, by doing consultancies which will also enhance your teaching and research potential. If you honestly think about these things, you will opt for higher studies. Academic career provides you everything which you could possibly wanted to have in life.

STUDENT **Please tell us more about Chenab River Bridge? What are the problems faced by an engineer, and what are the possible solutions to them?**

PROF. TIWARI My supervising professor Madhvi Lata from IISc is a consultant here, and my research area is rock mechanics. I joined this project in 2014. This project started in 2003 and will be completed by 2022. When we see the numerical data from our assignments in actual implementation, it is a great experience. It feels pretty huge. Significant challenges faced are geological and geotechnical issues, like an earthquake of around 8 came in the nearby area. Also, in rocks, there are discontinuities or joints, which makes it challenging to analyze. Therefore, rock mechanics is challenging because one has to deal with natural conditions and materials and then make instant decisions accordingly.

STUDENT **There are a lot of fields in civil engineering itself like structural engineering, hydrology, geotechnical engineering, so how do we find that this particular field is for me to explore ?**

PROF. TIWARI It is all about what excites you . One choice of subjects is all dependent on an individual's interest. Some subjects relate to real problems, while others are more mathematical or more experimental. Many a time, I have seen getting good grades also develops one's interest in a particular subject.

STUDENT **How are the career opportunities for IITK students in this field?**

PROF. TIWARI Here at IITK, I see many are interested in joining civil services. But the research field is a potential field which is being neglected by most students. This could be possibly due to lack of awareness on what this field provides, involvement of degree duration, lack of the role models they are looking for and possibly the immediate money. But, if you like to work independently, if you want to see practical implementation of your designs, if you want to solve new and challenging problems of your liking, if you do not want to be dictated by your bosses every time, if you want to interact with best young brains, if you want to earn money by doing the work which you like, if you are still interested in doing new analytical, mathematical or experimental things - this is the field which you should opt without a second thought.

IN CONVERSATION WITH

PROFESSOR HEMANT GEHLOT

Let's begin...

STUDENT **Can you please tell us about your journey and how you got into civil engineering ?**

PROF. HEMANT I joined as a faculty member in 2021. Before that, I did my PhD at Purdue University (USA). I was a student in IITK and did my BTech and MTech (Dual degree) here. My major interest has always been civil engineering. My choice of civil engineering happened at the time of my undergraduate (UG).

STUDENT **What are the opportunities in the core branch? How to incline yourself towards the core side, and is the academic syllabus enough, or do we need to study extra materials?**

PROF. HEMANT There are many opportunities in the private and public sectors. There are many PSUs like NHAI in the public sector, and there are specific exams to enter in transportation PSUs. Other than that, there are many private companies that focus on transportation problems. There are many opportunities because the infrastructure investment is increasing in the country. If some of you are interested in solving challenging problems, then research is also a good direction to explore. Joining a faculty position in IITs is like a mini entrepreneurship as it requires setting up a research group, developing new courses and solving new research problems.

You should be curious to question everything that is taught to you and have the hunger to learn new.



PROF. HEMANT GEHLOT

Prof. Hemant Gehlot is an Assistant Professor in the Department of Civil Engineering, specializing in Transportation engineering. He completed BTech-MTech (dual degree) from IIT Kanpur in 2015. He then obtained a PhD from Purdue University (USA) in 2021. In 2021, he joined as a faculty member at IIT Kanpur. His research interests include transportation network analysis, combinatorial optimisation, intelligent transportation systems, etc.

PROF HEMANT GEHLOT INTERVIEW SUMMARY

- Transportation Engineering covers many aspects related to moving people and goods from one place to another like planning, design, construction, maintenance of safe and efficient transportation systems.
- Transportation Engineering is a very unique specialization as we employ techniques from various other areas like mathematics, computer science, electrical engineering, physics, and chemistry.
- To develop interest, talk to faculty members, get involved in project and intern opportunities.
- Regarding promising aspects in transportation engineering, the pace at which infrastructure developing in India is a good sign.
- There are many opportunities in the private and public sectors (PSUs like NHAI). Joining as a faculty in IITs and doing research is also a good direction to explore.
- As an engineer, try to question whatever that is being taught to you and have the hunger to learn new.

STUDENT **Can you please tell us something about transportation engineering? What are your current interests?**

PROF. HEMANT Transportation Engineering covers many aspects of moving people and goods from one place to another, like planning, design, construction, and maintenance of safe and efficient transportation systems. It has many branches, e.g., traffic engineering that concerns with the movement of traffic on the roads, transportation network modelling that focuses on network-related problems like finding the shortest path between two locations in the network, pavement engineering that focuses on designing and analysing pavements, traffic safety that analyses safety issues related to traffic, etc. I am interested in transportation network analysis, optimization and control of transportation systems and other transportation problems that involve mathematical analysis.

STUDENT **What are those qualities that, according to you, every student must develop as a civil engineer?**

PROF. HEMANT You should be curious to question everything that is taught to You and have the hunger to learn new. Critical thinking is very important as it will be helpful even after you graduate. Also, as a civil engineer, you need to be an excellent observer. That is because unless you have a good sense to observe the surroundings, it is hard to identify relevant problems and develop corresponding solutions.

STUDENT **How can one develop an interest or explore this field? What are the promising aspects of the future of a transportation engineer?**

PROF. HEMANT Transportation engineering is a unique specialization in civil engineering, as we employ techniques from various other areas like mathematics, computer science, electrical engineering, chemistry, etc. Because of that reason, I took a variety of courses outside my department during my masters and PhD. Taking courses is a good way to develop an interest in this field. Talking to faculty members about transportation engineering and understanding what they do is another way to know more. If you can find any project or intern opportunity in transportation area, then it will provide you exposure to this area. Regarding promising aspects, the pace at which infrastructure is developing in India is a good sign. For instance, various new routes for semi-high speed trains like Vande Bharat are coming up. Also, metro systems are coming rapidly in many cities, including Kanpur, and many expressways, e.g., Delhi-Mumbai Express, are developing. In addition, electric vehicles are the next generation vehicles that may transform transportation systems. Many countries like USA and China have already understood the importance of transportation infrastructure and thus they invested a lot in transportation infrastructure in the last few decades. India has now realized the importance of investment in transportation and thus many new projects are coming these days. For the next 20 years, there is a lot of scope in transportation infrastructure development in the country and thus transportation is one of the most promising areas in civil engineering.

STUDENT **What are the common mistakes students usually make in college, and how can we avoid them?**

PROF. HEMANT One common mistake that some IITians make is that they think that they will automatically succeed without putting in much hardwork but that usually doesn't happen in the long run. Even after graduating from here, you will have to prove yourself at every stage of your life. The moment you stop working hard, your growth will stop in the long run. Also, some students get distracted to other things in college, e.g., getting addicted to something, which affects their overall performance. Thus, students should keep their focus towards studies along with participating in other activities for improvement in their overall personality.

STUDENT **Lastly, Can you please give us some tips so that we can stay motivated through our college journey, or how can we maintain that hunger for exploring and learning?**

PROF. HEMANT All the students have a lot of potential since they come here by clearing very competitive exams. What we need to do is keep nurturing this potential. For that, students should try to find which problems interest them when they learn any course. You could think of pursuing those problems and extensions of them beyond what is taught in classrooms. When I was a student, I sometimes used to go to the library in my masters and check books. Many times I used to get very interested in the new mathematical concepts that I used to encounter. I also did some summer projects and internships that gave me exposure to research and that was a major factor for me to convert to dual degree. Apart from studies, I would also encourage you to participate in other activities to build your personality but never lose focus from studies while engaging in these activities.

IN CONVERSATION WITH

PROFESSOR SALIL GOEL

STUDENT **What fascinates you most about this branch?**

PROF. SALIL The thing that fascinates me the most is that it has various dimensions and is multidisciplinary in nature and depending upon your interest you can pursue one or more dimensions of this multi-faceted geoinformatics group. Geoinformatics is not limited to civil engineering. Instead, it is being used in every phase of life as everywhere you need to have information about location and position.

STUDENT **Please guide us through your journey and how come you end up being a professor in the civil engineering department?**

PROF. SALIL I came here in 2006 as a B.tech student in the Department of Civil Engineering. Sometime around my second and third year, I got involved in several geoinformatics projects, then did research for a full year. I applied for a Ph.D. program in Canada and got selected but at the same time there was an economic crisis in 2011 so my scholarship got canceled. Hence, I couldn't go to Canada so I ended up working in the geoinformatics industry for 2 years. Then I had several options and as I was already working in Australia I also applied for IIT Kanpur and fortunately got selected and joined here in 2018.

STUDENT **Do you think that geoinformatics should be part of the daily curriculum, and should students explore more?**

PROF. SALIL Though India realized it quite late that in order to grow it has to develop the geoinformatics sector but now it has started investing in it and opened the door for industries to be set up in this area.
You all should explore this field more because new jobs will be created in future and industries would ask for specialization in geoinformatics field. So we should offer more courses in this area so that one can develop a good understanding for this.



PROF. SALIL GOEL

Prof. Salil Goel is an Assistant Professor in the Department of Civil Engineering , Indian Institute of Technology, Kanpur. He earned his B.Tech and M.Tech (specialization in Geoinformatics) from the Department of Civil Engineering, IIT Kanpur under the B.Tech-M.Tech Dual Degree Program in 2011. He earned his PhD jointly from The University of Melbourne, Australia and IIT Kanpur, India in the year 2017 as a Melbourne India Postgraduate Academy (MIPA) Scholar under the Joint PhD Agreement between the two institutions.

PROF SALIL GOEL INTERVIEW SUMMARY

- In this interview Professor Salil Goel first gave information about his education and then mentioned his motivation behind his interest in Geoinformatics.
- Then he talked about future implications of Geoinformatics and how students can explore this as per their interest.
- Further he talked about his projects and research works. Then he also mentioned his expectation from the students working under him.
- Then we had a general discussion where he talked about how online teaching affected his way of teaching and also what methods he used to make his classes more interesting.
- At the end we had a discussion on his stay at IIT Kanpur and how he spent his student life in this institute.

STUDENT **According to you, what are the main reasons that students prefer non-core sectors?**

PROF. SALIL There are many reason, one is the way we are teaching students engineering. One cannot learn just by sitting in the classroom. Best way to learn engineering is through hands-on approach. One more reason why students prefer non-core factor is that the initial pay of non-core sectors is high as compared to core, growth can be a little slower in core sectors.

STUDENT **How can a student get interested in the field, and what are the major driving forces?**

PROF. SALIL Talk to faculty members and seniors, get to know about projects, get involved with different projects. You will like certain things and dislike others, you may like geoinformatics or maybe not but you should always explore and strive to go beyond what you already know.

STUDENT **Do you think that India is competent enough in this field? Also, kindly let us know where we stand in terms of global advancements in this field.**

PROF. SALIL A lot is going on in India, a new policy is launched and the focus is to strengthen this geoinformatics area , to train people to set up new industries . ISRO is doing a lot in this field ,they have been launching various types of satellites in space which are being used for natural disaster management, agriculture ,etc. So yes , India is quite competent in this field and is coming up with new industries and technologies .

STUDENT **Could you please describe your projects, especially your favorite mapping project?**

PROF. SALIL One was with Prof. Bharat Lohani in 2012. This project was funded by DRDO they basically wanted us to use laser scanning Technologies to make 3D models of moving objects. The second major project is still going on. In this project, we are basically trying to get the accumulated different types of sensors and technologies to develop new solutions for mapping.

STUDENT **How has this current pandemic situation affected your research field?**

PROF. SALIL Well it has affected in both good and bad ways, the later in the sense that research has slowed down. As when the pandemic started everything was different as students were going back home and they all had their personal problems and we were also going through some rough times. But now as we are familiar with this condition the research has started but not at its full pace. The good part was that it gave me time to re-evaluate what I was doing and take time out from my current engagements and explore something new and come up with new research problems.

STUDENT **What future do you see of the application of geoinformatics and mapping in estate development?**

PROF. SALIL Tremendous application! Geoinformatics is going to be used in all parts of your life ranging from small activities like using your phone for maps to driverless cars. Its applications are basically limitless and now it has evolved a lot, it has its use in the telecom industry, defense industry, etc.

STUDENT **What steps have you taken to engage students and explain your way of teaching ?**

PROF. SALIL In our UG course I try to relate whatever students learn with what they experience daily. I also try to ensure that students get hands-on training. We divide a class of 120 students into 10 groups and ask them to make maps of different areas of campus and put them all together. They apply whatever they learn in the classroom and understand the challenge. So basically students should not get demotivated and they should appreciate the engineering and this can only be done by applying what they learn in real life.

STUDENT **How was your stay at IIT Kanpur? Especially the co-curricular aspects.**

PROF. SALIL It was the best part of my life ! I stayed in H2,H1,H7 and H10. We used to walk to H4 and have maggie at night and all those things. Regarding co-curricular activities I did a couple of things , there used to be Student's Television in which we made videos of campus during events like Antaragni . Also, I explored a lot of clubs during my UG days.

STUDENT **What are the scopes for a student to be involved in research work with you, and what are your expectations from them?**

PROF. SALIL There is a lot of scope, I'm always looking for motivated students who are willing to work and in fact now I have some students working under me doing their internship apart from their daily academics. My expectations from students are quite simple , you should be passionate about your research and have an open mind.

STUDENT **Managing research work with academics is quite difficult for some students. Do you think students should focus more on the research?**

PROF. SALIL I don't have a clear answer to this, it depends on the student and it varies from student to student. From my side I don't really emphasize that whether the research should be given more preference or academics, it totally depends on student but maintaining good CPI is important. For example I have a student who is working with me in a project since second year and now he is in 5th year, he focuses more on research and as a result his CPI is not that good but he is excellent at his research work. But some students are good at keeping a balance. If a student approaches me for a research then I'll assume that he wants to explore more then my role as a faculty is to guide and supervise him so that he is able to learn something .

STUDENT **What steps would you take to handle undermotivated students and give them some light of hope?**

PROF. SALIL I am still facing this problem of how to get students interested in the course because since last one and half year in this online mode it is difficult to judge whether the student is understanding or not ,also in offline mode one can crack a joke in between to get the attention of the students and get them engaged . Also there are many distractions for the students because other platforms are providing far more interesting content as compared to the lecture.

IN CONVERSATION WITH

PROFESSOR SUPARNO MUKHOPADHYAY

Let's begin...

STUDENT **Sir, please guide us through your journey of structural engineering, and how come you end up being a professor in the civil engineering department?**

PROF. SUPARNO My journey was not much different from most of your journeys. When I was an undergraduate, I typically liked the mechanics and structural engineering courses. I didn't like some other courses like irrigation. I didn't have any plans at that time. I sat for placement at the end of 3rd year. I got a job and during the 4th year 1st semester, I took an elective course that was on structural dynamics that I liked a lot and I wanted to study more about that. Then I prepared for GATE and found that IIT Kanpur is one of the best places for structural dynamics. So I took admission in IIT Kanpur. I liked the academic culture and courses at IIT Kanpur, but I didn't have any experience in research so Ph.D. was still not in the picture. But in 2nd year, I started working on my Master's thesis research, and I liked what I was doing, so then decided to go for Ph.D.



PROF. SUPARNO

Prof. Suparno Mukhopadhyay is an Assistant Professor in the Department of Civil Engineering, IIT Kanpur. He completed his bachelor's degree in civil engineering from Jadavpur University, Kolkata in 2007 and his Master's degree from IIT Kanpur in 2010. He earned his Master of Philosophy (MPhil) and Ph.D. from Columbia University, New York in 2013 and 2015, respectively. Structural Identification and Health Monitoring, Structural Dynamics, and Earthquake Engineering are among his areas of research interest.

PROF SUPARNO INTERVIEW SUMMARY

- Structural engineering is the field that deals with structural integrity and strength.
- Structural engineering is an ancient branch, but new analysis techniques and advanced tools are being used, and this can be a good area of research for scholars.
- There is a massive demand for coding and ML in the upcoming days as most of the analysis can be performed quickly and efficiently by using them.
- Initial salary is low in core jobs compared to non-core jobs, but there is a very high rate of increase as one gains experience.
- Industrial demands require substantial industrial exposure; the gap can be minimized by opting for relevant courses as an elective during the 3rd or 4th year.

STUDENT **What is your favourite research project that you think was the most successful one and enjoyed it?**

PROF. SUPARNO Actually, I don't have any particular favorites. In the thesis that I have guided, most of the things are done by students. I typically give them a lot of free hands; do whatever you want to do as long as it is in the area that I can understand and discuss when you need discussions. Amongst these, there is a work on rocking done by one of the dual degree students, which was quite interesting.

STUDENT **How can a student get interested in the field of structural engineering ?**

PROF. SUPARNO If students enjoyed the mechanics of solid course (ESO202A) by relating to the things they have learned in 11th and 12th then they typically tend to enjoy the structural analysis course(CE272A). If the students get to know more about structural engineering, what are the challenges, and do advanced courses, then I think they can get motivated toward this field. Some advanced courses in structural engineering, like Finite Element Analysis, and Dynamics, which can be done by students in their 3rd or 4th year might help students to get motivated.
Another thing that I feel exists is the lack of spirit of entrepreneurship in civil engineering amongst students. Changing that may also increase motivation. For example, can you try to build a company that caters to pollution assessment and control, or assesses deterioration of bridges, helps in advanced analysis etc.

STUDENT **Sir, what fascinates you most about this course so that you opt to go for higher study ?**

PROF. SUPARNO Well, one thing that fascinates me is that there exists some kind of uncertainty in every aspect in structural engineering. The material behavior is uncertain. The loads are uncertain. We are working with these materials and loads, which we don't completely understand - it's not deterministic. How we handle these uncertainties and yet try to build a safe and working structure, fascinates me. Some uncertainties like when an earthquake will happen, what can be the speed of the wind, what can be the load of a moving car or train etc, we don't know exactly, but still, we are working with all those and trying to build a safe structure.

Regarding Ph.D., it was not pre-planned. It was mostly the way different courses were taught, like mechanics, analysis, dynamics, and I could appreciate and relate what I learned to many things around me, and also recognize certain areas where I can work on. That was quite interesting. So that excited me to go for higher study.

STUDENT **What makes structural engineering different from other courses in terms of future job opportunities and what is the scope in this field?**

PROF. SUPARNO If you look for a job in this field just after BTech, you are not going to get a good salary as compared to others because you learn a lot of things in the field while doing the job. You can't design a bridge by only studying. Besides engineering, you also have to know about social factors, economic factors, environmental factors, etc which can only be experienced in the field while being part of a real-life project. Any infrastructure project requires four years of training and beyond, which need to be brought together while working on any project. That's why no college in the world can teach you that completely, and you can only complete your learning while working in the field. This is the reason that the salary starts at a much lower level.

In non-core fields, the average salary is initially higher but may increase at a lower rate. While in structural engineering, the job starts with a lower initial salary, but the salary increases at a much higher rate as your experience in the field grows. In some years, the salary of a structural engineer will pretty much catch up with someone in a non-core job.

STUDENT **What are the scopes for a student to be involved in research work with you, and what are your expectations from them?**

PROF. SUPARNO For the UG students, I typically take the students during 2nd year and start training them from that time. Then in summer, I spend time teaching them something that they haven't learned before and giving them something to read. During 3rd year, I started working with them on something related to what I am currently working on. It is based on the interest of the students. How much is he/she interested in a particular project? Whatever things are necessary, he/she has to learn on the way. As structural engineering is a very old branch, it has a lot of things that need to be first learned and understood. So to make a sudden contribution is difficult. So what the students are mostly doing with me during a summer project is that they are learning something new, that they might not learn in the typical courses, and that they might find interesting and continue later.

STUDENT **Do you think that India is competent enough in this field? Also, kindly let us know where we stand in terms of global advancements in this field.**

PROF. SUPARNO Yes, India is definitely competent. It's a large country, with a large population, that requires a huge and healthy infrastructure system. By and large, that requirement is being met.

However, although structural engineering is a very old branch, new analysis techniques and advanced tools are starting to get used - not all companies are very proficient with such tools. Many companies outside India have their own research divisions which hire PHDs and Masters who are proficient in using such tools. It is good to see that in India also, some companies have recently started research divisions and hiring PhDs. In the future, I think more companies will do so.

STUDENT **What major role can an institute play to minimise the gap between the industrial demands and the knowledge acquired by the students after 4 years ?**

PROF. SUPARNO I think we can have some industrial exposure. When you are joining some structural engineering company, you are not fully prepared yet - you need training for 2 - 3 years. So there will always remain some gap. Some industrial exposure, introducing certain industry-relevant courses that you can take as electives during 3rd or 4th year, can try to minimize this gap.

STUDENT **Sir, according to you, what is the importance of coding in core branch now a days?**

PROF. SUPARNO Nowadays, coding is essential in every field. Like in what I do, we need to find damages in a building, and this can be quickly done by using image recognition techniques, or through the processing of vibration response data, and based on finite element modeling of the building. All these require computer programming. In addition to this, in today's world, one should have some basic knowledge of ML, as nowadays we have a considerable amount of data, processing which we try to get useful information. For example, vibration data from a bridge. So I think that it is good if you have some exposure in these.

IN CONVERSATION WITH

PROFESSOR TARUN GUPTA

Let's begin...

STUDENT **What are some of the differences between a student studying in an IIT and a student from a foreign university?**

PROF. TARUN I would like to share my personal experience here. I attended my master's at the University of Dresden in Mechanical engineering. I had gone there as an exchange student, and my journey was full of shocks but a lot of pleasant surprises too. So as a student, you are pretty much on your own. In the hostel, you can rely on a warden or mess to give you food and security guards for your security. And, if something happens and you can go in and talk to the higher-ups. However, the same isn't true if you live outside; Like I was. (In a rented apartment). We had to make sure that we did our chores daily and maintained the cleanliness in the apartment, as, firstly, it was a shared one and secondly, we used to get severely penalised if we created any nuisance.

Thus, all this resulted in giving me a sense of responsibility and also taught me how to manage different things and handle things individually. The experience also taught me how to manage my expenses.

Overall, these are the few basic things which differentiate an IIT student and a student studying the foreign universities in terms of the "way of living".



PROF. TARUN GUPTA

Prof. Tarun Gupta is currently N C Nigam Chair Professor in the Department of Civil Engineering and an affiliated faculty member with the Design program and Center for Environmental Science and Engineering at IIT Kanpur. He completed his M.Sc. (Chemistry) from IIT Roorkee and M.Tech. (Environmental Science and Engineering) from IIT Bombay. He earned his Doctorate in Environmental Health from Harvard University School of Public Health. A submicron aerosol sampler designed and developed by him has been commercialised by Envirotech Instruments Pvt. Ltd., Delhi, is being marketed as a PM1 sampler (APM 577). Prof. Tarun has also transferred technology to BARC, Mumbai, for retrofitting an existing high volume PM10 sampler into a high volume PM2.5 sampler with only minor operational changes and with a meager additional cost. IITK has also transferred this technology to a startup named Airshed. He has authored over 150 international peer-reviewed journal articles and edited 7 books. He has filed 4 Indian patents and 6 design patents and has supervised 9 PhD students and 36 M.Tech Students. He has won many awards, including INAE Young Engineer, INSA Medal for Young Scientist, NASI-Scopus Young Scientist, INAE Innovator and Entrepreneur award. Recently, he was awarded the VNMM award by IIT Roorkee.

PROF TARUN GUPTA INTERVIEW SUMMARY

- Tarun Sir talks about his experience as the faculty advisor and how he tried to understand the situations from both the faculty and students' perspective and focus on the best interest of all.
- He shares his opinion on the benefits of UGARC being done every ten years.
- He reminiscences his childhood from where he ended up in the civil engineering field, which for him was unexpected. He also mentions the satisfaction he gets being a teacher and researcher.
- He mentions his journey as HOD, the concerns, enthusiasm and dedication that keeps him going.
- He also gives his opinions on the ideal teaching methodology.
- He talks about the perks of the core sector and things that need to be taken care of.
- He talks about his experience as an international student.

STUDENT **Sir, we were wondering why UGARC happens after every 10 years and not 5 years. Would you please enlighten us a little upon this?**

PROF. TARUN I'd say that even after having a span/break of ten years, it is difficult because the UGARC never follows even ten years time period. First, we have UGARC, which typically takes up every ten years, and then there is always a struggle to find an optimum template with the right kind of course basket that caters to the need of all! Teachers feel that we need to offer more courses. Our degree holders should have a minimum of this small amount of Geotech to have a sound base, enough knowledge on the concrete and steel structure, fundamental aspects of hydraulics and fluid mechanic, and science-based learning, which IIT Kanpur is known for and like HSS and economics, which is again like a highlight of IIT Kanpur. IIT Kanpur caters to the student in non-engineering aspects as well. So, we do not want to churn out a one-dimensional engineer who can only solve Navier Stokes' equation and have no idea where to make improvisations to cater to the need of public policies or how you take the science to the general public and how society accepts and adapts to it. Then it would help if you understood the rituals and behaviour prevalent at the local/regional level and have a sense of what technological interventions/solutions will be acceptable and what is not feasible. And that is what all the ex-students who have become an IAS, CEO, executive engineers or have gone into the above fields say, that these knowledge interaction-based HSS courses were the most beneficial for them.

STUDENT **What was your experience as a faculty advisor?**

PROF. TARUN As a faculty advisor, I gained a lot of experience in how students perceive the image of Professors and vice versa. Students often think that the teachers are harsh, and thus, keeping interactions to a minimum. However, this isn't a good thing at all because all the teachers around you are here to help you, and so you should make the most out of this opportunity, during your stay here, at IIT Kanpur. So, to break the ice and initiate a discussion/interaction between students and faculty members, we used to arrange open house sessions during our time (2006-08). The open house sessions used to have about 5 to 7 Faculty members who were there to guide students, interact and clear all the doubts that they had in their minds. From my time, I can remember that Prof. Ashwani Kumar, Durgesh Rai, and Mukesh Sharma were the panelists in one of the open houses we had arranged. We had prepared a few questions about how they structure the courses and the coursework, what their expectations are from the students and other questions related to quizzes, field labs, surveys etc. Also, we talked about time management in the most cumbersome year, i.e., the 3rd year and how a student should create an equal balance between internships/fests and academics and how they should pinpoint which field they want to pursue in the future. Is it IT or Core, or is there something else which they should explore? One key thing I learned over these years was that the atmosphere at IITK enables you to think differently and allows you to ask questions and argue with your professors and peers. Moreover, the best thing about college is that no Faculty member will stop you from asking questions. Along with that, you have your peers, a plethora of books and many knowledgeable seniors around you who are always ready to help.

STUDENT **What are the crucial or major functions of the HOD and how do you prioritize them?**

PROF. TARUN Before being the HOD, I was an ADRD (Associate Dean for Research and Development), and I was given a tenure of three years. After completing two years, I was acknowledged by the Director, for my work and from there on, I was trusted with the task of becoming the HOD and investing myself in the Civil Department. From day 1, my priority was to put in 100% effort and invest myself entirely into the work that I was doing. As a result of this, we decided to re-open the HOD office, which had been closed for the past two years. And I think this gesture of keeping this room and door open for 4-5 hours a day had resulted in the increased interaction with the young faculty members who recently joined. This led to invoking more and more friendly and innovative discussions among the faculty members themselves too. As a result, their priorities were set clear, and everyone knew what was the task at hand and how they were supposed to cater for it and contribute to it on an individual level as well. Other than that, I always tried to bring in positive energy, and I also tried to cater to all the innovative ideas that the team had. Also, the entire team, working together as one, really made my tenure successful.

STUDENT **These days, many students prefer the non-core sector. So what are your views about it?**

PROF. TARUN I think there is no harm in going to the non-core sector. I feel people who come through such intense competition, partly because of their own self-driven motivation to do good for themselves, or they are fulfilling their parent's ambition in some sense. You want to do well because your parents want you to do well, or you want to look good in their eyes. Our job here is to make you a better human being who can do well for society. Becoming a manager, teacher, scientist, or an entrepreneur, totally depends upon you and you alone. Nobody can question you or stop you from following what you think is the best for you.

The market rate dictates the number of students going to the core or non-core sector. If you spend like 10 to 15 years in the core sector, you will be at a managerial level like you will be maybe a general manager or a regional manager. So, you will be getting a monthly salary of close to four lakhs plus perks, which is as good as any corporate sector with less stress.

Yes, it means less job stress because you do not know when someone smarter with a lower compensation package will be hired. And then you will be left only with the stocks of this company that you are looking for. Of course, you are smart, so it does not matter, you will get the next job, but this stress of watching your back all the time does not come mainly in the government sector. But sometimes, government systems are so slow to work for, and you might lose motivation. Well, there will always be pros and cons in whatever you do.

STUDENT **Is there a particular definition for good teaching?**

PROF. TARUN I would say there is no particular and absolute definition or idea of good teaching. However, I can share my opinion and my thoughts about my way of teaching. I believe that before pitching challenging and advanced concepts, the professors should make sure that the basic fundamentals are clear to the students. As these fundamentals are critical for further development and understanding.

But again, that is my idea or my ideal way of teaching. I personally do not care if a student has got eight or nine or 10 CPA, but the student should feel as if they still have got to learn something new and useful after the class or after the semester. So, I think teaching should be more oriented towards showing the light to the students, and then the student should to handed over the work and effort that they put in through the night.

STUDENT **We see that IITs have a much lower ranking than foreign universities. However, entering IITs is very much more difficult compared to foreign universities. Why is it so?**

PROF. TARUN Some ranking agencies charge you money. The consultants say that we will improve your ranking if you give us this much money. So, I do not personally believe in this ranking-based distinction.

We all know that IITs in India are among the best, and people in foreign universities too, recognize us. I remember when I told my advisor that I got a job at IIT Kanpur, one of my mentors said I had looked upon the internet; IIT Kanpur is one of the best, so, Congratulations!

TRIP TO GOA

In 2006, I took third-year students on tour for industrial training. Before that year, Dr Amit Prashant took them to the Konkan Railway tunnel Link project, which was being carried out then, and they all had a lot of fun and learned many things because it was a challenging project, like a lot of tunnels were there. And from Geotech's perspective or other CE disciplines' perspectives, it was a marvelous thing to happen in our country. And some of you who have visited that stretch can also appreciate the fantastic thing from an engineering perspective. So then they approached me for this industrial tour, and the first time I was like, how many students will be there? And they said roughly 70 students. I talked to my wife and asked whether she was willing to come. She said, No way. So then I tried to talk around if any other faculty member was interested; the head said this is part and parcel of your job; you better do it. And he said, like, don't worry about the money we'll give. The department is going to support it. So mainly, it was funded by the department. Then we tried to see where we should go and see in Goa once that Goa destination was decided. So we clubbed Bombay and Goa tour.

We got in touch with HCC, and they were building the Bandra Worli sea link, a first-of-its-kind project in India, a large stretch to reduce the traffic load on the mainline. And till that time, almost 20-25% of the work was done. They were working on that project very fast, putting the piles as blocks in the sea. So the students took the initiative to contact some executives from the engineering side. And then I talked to them and said, like, I'm going to bring around 70 students, Will you be receptive to giving them a site tour and a lecture? They said we'll provide you with lunch also.

So they were very, very accommodating to us from IIT Kanpur. We also had some IITK alumni there, like those who switched their jobs, so this would be wonderful. So I was looking forward to it. Since I was an alumnus of IIT Bombay, I talked to them, and we arranged for a hostel stay for all the students. One hall 7 was allotted to us because it was summertime. In Goa, we found a river called the Mandovi River. So, it had this gear-based bridge system, which is manually operated. So, whenever there's a flood in that river, you need some bridge to cross the river during that time. And it was based on pulley systems like gear and pulley systems. Or manually, they will move it. And so I thought, like from civil engineering perspective, that would be an exciting thing to look at.

So I felt like my homework was done, and I just discussed that with the head. So I was booked in 3rd AC, and students were in the general compartment in this LTT train going to Bombay.

So we landed there at the Lok Manya Tilak Station. And then, from there, we had a bus to take us to IIT Bombay. We reached early morning in IIT Bombay, and then everyone was tired, and nobody had any breakfast. We just went to sleep, and in the afternoon we had lunch or something, and in the evening the people wanted to do some shopping. Mall culture was starting. So in Washi, there was a big new mall called Orbit Mall.

Students said we'd take the local train to that mall. Then I told students not to enter any lady's compartment, and we had to separate ourselves into groups of 10-12, so we could immediately board. Otherwise, everyone cannot board because it's a fast local. And so the nearest station, I think, was Kanjur Marg, to IIT Bombay, so you have to go to this Kanjur Marg, and from there, you have to go to Washi, I think like we didn't have to change train anywhere. But as it goes, when we came down in Washi, I saw two of our students were caught by the TT as they had boarded in the female-only compartment, and I was pleading with them that they were only students from Kanpur and then still we had to pay the penalty. On that trip, there were no female students. So all 65 students who finally went were all male students. So then we went back to IIT Bombay after shopping.

The following day, we had a bus to take us to the station, and from there, we took a train to Goa. And then, in Goa, we booked a state guesthouse. So it was like a big dormitory with a large hall and then a few rooms. So every room had four or five students, and then the big hall could accommodate like 20-25 students.

But we reached in the evening or night, and then at 10:30, one student came and said, like they're a bunch of students who want to talk to you. I thought there was a medical emergency or something; I quickly woke up and came to the hall, and everyone was sitting staring at me. I said what the matter is? They said this is such a wrong choice for this accommodation. This is so far away from all of the beaches. I said, Do you know what kind of things happen there, like XXX? And they say, No, we are grown up. And then I said, like, you don't need me like why you brought me. So I'm not your friend. I'm here as a legal guardian, and I have institute responsibility. If anything happens to any of you, your parents will blame me. Think with a cool head. And I said, on top of it, we are here for primarily for the academic exercise.

And so they kept on arguing, No, no, no. Then I said, like, imagine if you would have brought your younger brothers or sisters, would you still say the same things you are saying that I want a hut next to beach like a shack or something like then they could realize maybe that wasn't a good idea. After that, I said if you push me any further, we are cancelling this trip and going straight back to the IITK campus. So that was very tough for me to say. But. I said, like, if you cooperate, we'll all have fun while having the field trip. I added one more trip, a ferry ride or something like that, so on that ferry, you have one hour ride that they play music, and you get some food and drinks, and you go in the ocean and then come back. So it takes like two hours or something. So I said that to make them happy. Then they were like, ready to take the bargain. And I realized that, yeah, you have to be a little political to handle this. They're simply not getting it.

The next day, we went to the beach, a couple of beaches, and they were delighted. And they did a lot of fun. And then, in the evening, we went on the ferry, so we all danced and enjoyed ourselves, and I could see some of those pictures during their farewell party.

But it was fun. And then the next day we went to see the bridge, which was surprisingly very, very interesting like from the civil engineers' perspective. I think the students enjoyed it a lot. I thought they would say now we have seen the bridge, let us go, but it was not like that; we spent the night in the middle of the park on the side with nothing to do. I was pleasantly surprised that they were helping each other in explaining the engineering concepts involved in making and working of that bridge. In fact, I also learned a few things that day! And then the workers there were also explaining very nicely, so we ended up spending three hours. While we were returning, our bus got stuck somewhere because there was a big stone or something like it was, you know, RedMud. So I was waiting for one minute, and nobody was coming down to take the stone off because the conductor could not take it out on his own. So I stepped down. I was helping them suddenly, 4 to 5 students all jumped down, and we could quickly take the stone out, so I'm saying that it takes just one step by the leader to motivate others to do the same thing. So I could realize the power of a teacher, even though it was not a classroom thing or something.

It was a simple thing that we were giving them. But initially, they were also revealing that we had a white-collar thing, like why we should go down and get our hands dirty. But as a civil engineer, I thought, this is our job. Our job is to make sure that obstacles are cleaned in a smart way. So you could have used something else also quickly. So these were like very, very old memories I could remember about 15-16y in 2006. And when we came back to Bombay, we went to this place, Marine Drive, and some of the students were like these cars are running so fast, even the ambassador. So I realized that they were from smaller cities or some rural areas. They had never been to Bombay. And the sheer thing they may have watched in movies, I'm talking about 2006. So they were so mesmerized just by the speed of the vehicle. And I said, like, Yeah, I like if you are doing good engineering then at marine drive some of the key substance of geotechnical engineering, anchors, road slopes and curvature and another essence of traffic engineering. If you take the students on any worthwhile field trip with the right spirit, they are bound to observe, apply their minds, and learn while having fun.

IN CONVERSATION WITH

PROFESSOR TUSHAR APURV

Let's begin...

STUDENT **Sir, would you please like to tell us something about what led you to pursue civil engineering? Any incidents that kindled you to pursue civil engineering and specialization in Hydrology and Water Resources Engineering?**

PROF. TUSHAR When I was in school, I had an opportunity to visit Japan. On my visit to Japan, I saw a lot of well-developed infrastructure, which fascinated me a lot. After JEE, I decided to pursue Civil Engineering. But it was only after my internship at IISC Bangalore, that sparked my interest in Hydraulics. It involved a lot about modelling of the flood flows in the river. And I really liked those kinds of work. Thus, I shifted to Hydrology, entirely. The second thing is that if you compare it with other branches civil engineering, it has a lot of societal impacts.

STUDENT **Sir, was there a specific reason which made you incline towards hydrology specifically and not the other fields of research that are available under Civil Engineering?**

PROF. TUSHAR I made up my mind to pursue hydrology in the third year of my B.tech. I had done courses like solid and fluid mechanics, but I found these courses a bit tough. Being a nature-lover, I enjoyed learning about natural processes like rainfall, evaporation, runoff and recharge in hydrology. Further, I also found the practical applications of hydrology in agriculture, ecology, water supply and mitigation of extreme events like floods and droughts to be fascinating.

Students should spend some time on exploring the websites of different universities and identify areas in which they would like to work



PROF. TUSHAR APURV

Prof. Tushar Apurv is an Assistant Professor at IIT Kanpur's Department of Civil Engineering, specializing in Hydrology and Water Resources Engineering. He earned his PhD. from the University of Illinois Urbana-Champaign under the supervision of Professor Ximing Cai. He completed his bachelor's degree at IIT Guwahati and his master's degree at IIT Kanpur. Hydro-climatology, hydrologic modelling, and water resources system analysis are among his areas of research interest. His research focuses on the interactions between climate variability, hydrologic processes, and water management practices. His research goal is to provide solutions to water resource management, which are based on a better understanding of interactions between natural and human processes.

PROF TUSHAR APURV INTERVIEW SUMMARY

- In this interview, prof. Tushar explained how he developed his interest in Hydrology and Water Resources Engineering.
- Students should take up such projects with the intention of gaining knowledge and exposure to different fields of Civil Engineering rather than seeing them as something which will help you secure a job.
- Machine learning is a new technology that we are using, which is incredibly helpful in the work of hydrology. We also use it for predicting areas which are likely to be affected by calamities.
- He talked about research preparation strategies and gave some important points to students.

STUDENT **How do you think an undergraduate student should develop his/her perspective to pursue a career in the research and development sector? And how did you do the same during your undergraduate days at IITG?**

PROF. TUSHAR One thing that might help you a lot is working under professors. This will allow you to understand different problems and develop an interest in research. For me, during my undergraduate days, my main exposure towards research was to work as an intern at IISC Bangalore. I would suggest that students should take up such projects with an intention to gain knowledge and exposure to different fields of civil engineering rather than seeing them as something which will help them secure a job.

STUDENT **Can you share some of your experiences of MTech at IIT Kanpur? And what were some of the obstacles that you faced during your Ph.D. from the U.S.?**

PROF. TUSHAR IIT Kanpur played a crucial role in helping me make up my mind about pursuing Ph.D. from the U.S. Here, Prof. Ashu Jain and Shivam Tripathi shared their experiences with me and motivated me to pursue Ph.D. from the U.S. They shared with me how rigorous the environment is, in foreign countries, especially the U.S. However, moving abroad, for a span of over 4-5 years can concern some parents. One obstacle that I faced for convincing my parents and assuring them about my Ph.D. programme. Because in India, the culture of competing in UPSC exam after college is more widespread than the research culture. But later, they understood, and I went ahead with pursuing my Ph.D. from the University of Illinois.

STUDENT **With modern innovations coming up in today's world related to Artificial Intelligence and Computer Science, what advancements do you think will empower the research and development of Hydrology?**

PROF. TUSHAR So, machine learning is one such new technology that we are using, which is incredibly helpful in the work of hydrology. We are using a machine learning model for forecasting and predicting areas which are likely to be affected by extreme events like cloudbursts, flash floods and landslides. Another area where machine learning can be applied is the management side or water management to be precise. There is very little data in India about how people use water, how much water do farmers pump, how much is utilized in the field etc. So here machine learning is playing a crucial role in filling this knowledge gap regarding the how much water is being consumed and by whom

STUDENT **How is India prepared to combat water shortage and droughts? What are the new inventions and discoveries that are emanated in India and worldwide to fight these problems and what all new innovations can be kindled in the coming years?**

PROF. TUSHAR In India, right now, several mini schemes have been initiated which aim at the root level, i.e, the villages. Currently, more emphasis is laid on supplying water rather than its management but, in the future, I think gradually the demand of management will also be taken into account because we cannot keep increasing our supply and allow people to use water in an unregulated manner. The second thing I want to talk about is decentralization. If you look into the current water management programme, common people and local residents have a very little involvement in the overall process of water management. Unlike in the earlier times where people used to build ponds and in general, involved more into the overall water conservation and management process. Thus, this can be another alternative that we can seek and thus, revert back to community based water management with the government playing the role of a facilitator.

STUDENT **How has COVID affected your research field? Has the transition from offline to online mode smoothly worked for you?**

PROF. TUSHAR Actually, my work is hardly affected by COVID. My work is mostly computational in nature. Thus, I didn't face much difficulty in offline to online transition either. However, students are highly impacted by this. Their entire learning process is affected. But it's more important that we try to make the most out of the situation that we are currently in, instead of worrying about what is about to happen next.

STUDENT **What is your research about the impacts of climate change on floods in Brahmaputra Basin using CMIP5 decadal predictions?**

PROF. TUSHAR CMIP5 can be considered to be a collection of climate models, which project the state of earth's climate by the end of the 21st century. My study for the Brahmaputra basin showed an increase in the frequency of flood events in the future under climate change. However, these projections are highly uncertain, particularly for precipitation; and thus prediction of climate change impacts on rivers is quite difficult to predict.

STUDENT **People nowadays think that engineering has become more result-oriented rather than being learning-oriented, what's your take on it?**

PROF. TUSHAR This is not entirely correct. There are people who take up research work and further studies. However, their proportion is quite less. Majority of students focus on securing a job after graduation and settling down. After getting a job. They think that engaging in research and further studies will be time consuming. But this isn't true, people switch multiple jobs before settling down with one. Thus, the overall time taken by the entire process is nearly the same. Well, one thing that I think we lack is the exposure to research and the lack of enthusiasm regarding research. If students try to explore opportunities in research by working in small projects with faculty members, they will be in a better position to make a choice between research and industry.

STUDENT **Can you please put some light on Masters' and research preparation strategies?**

PROF. TUSHAR There isn't anything specific that you should be focusing upon other than maintaining a decent CPI. If you have one or two research projects under your name, that would be a plus. However, it is not a necessity. Other than that, Students should spend some time on exploring the websites of different universities and identify areas in which they would like to work.

STUDENT **Why did you choose Research & Development over other job profiles?**

PROF. TUSHAR I majorly like research and development for the freedom of application of knowledge that it allows you to apply. On the other hand, if you look at some other job profile in civil engineering, it majorly requires you to supervise and monitor over people with a minimal application of the intellectual ability. And I personally didn't like this. So, basically the freedom to apply knowledge and a never-ending learning process were my two major motivations behind pursuing research

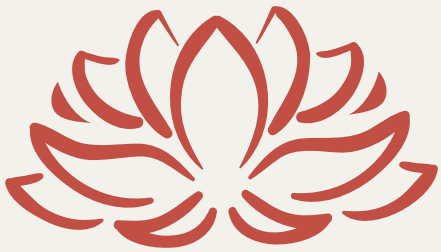
STUDENT **How can an undergraduate student get an opportunity to work on a project under your supervision, and what would you expect as the pre-requisites?**

PROF. TUSHAR First of all, there are no pre-requisites that I look for in a student who wants to work on a project. The basic knowledge of statistics and the enthusiasm to make an effort are enough. I like to start from the very basics and then try to build a project upon that.

Romanticising

THE BRANCH

ARTICLES THAT UPLIFT OUR DEPARTMENT



GOLGHAR

Golghar is situated at the heart of the city of Patna, right to the west of the infamous 'Gandhi Maidan' and is an explicit and excellent representation of the capabilities of structural civil engineering.
It is built in a stupa architecture inspired by ancient India. One astonishing thing about this structure is that it doesn't have any pillars to support its height of 29 meters and has been constructed on a two feet high plinth. The walls of this construction measure 3.6 meters at the base, and the foundation is 125 meters. It also has a spiral staircase along the outer walls, consisting of 145 stairs, which run to its top, which offers a scenic view of the city and the river Ganga flowing by the side.
Its structure was designed by Captain John Garstin, an Engineer of East India Company, and the construction got completed on 20 July 1786. Its purpose was the storage of grains to prevent the provinces of Bihar and Bengal from devastating famines and could store as much as 140,000 tonnes of grains. According to an inscription at its base, it was intended to be the first of a series of colossal grain stores.
However, in the end, none of the others came into existence and hence making it a splendid architecture and one of its kind.



https://en.wikipedia.org/wiki/File:Golghar_%E0%A5%AA.jpg

DELHI METRO

Many of us have traveled through the Delhi metro to enjoy the 'Lost monk' trip to Manali. However, ever you wondered how the most significant and busiest metro rail system in India and the second oldest after the Kolkata Metro was built, constructed, and completed in such a densely populated area of Delhi and Kolkata. Back in the 1990s, after being denominated as one of the most polluted cities globally, the need for an MRTS (Mass Rapid Transit System) was supreme for the city of Delhi. Talks dragged on and on. The arrangement was to develop a separate institution that would construct and manage the metro for Delhi. So DMRC (Delhi Metro Rail Corporation) was formed under the leadership of its first managing director Mr. Elattuvalapil Sreedharan. E. Sreedharan was born on 12 June 1932 in present-day Karukaputhur, Palakkad District, Kerala, India. He completed his primary education at Government Lower Primary School Chathannoor, then completed his education at the Basel Evangelical Mission Higher Secondary School, and then went to Victoria College in Palghat for his further studies. Later on, he completed his Civil Engineering degree from Jawaharlal Nehru Technological University, Andhra Pradesh. E. Sreedharan and T. N. Seshan(who became known for their electoral reforms) were classmates at BEM High School and Victoria College in Palakkad. Sreedharan also worked as a lecturer in Civil Engineering at the Government Polytechnic, Kozhikode. He then joined the Indian Railway Service of Engineers (IRSE) after clearing the Indian Engineering Services Exam (IESE) in 1953. His first appointment was in the Southern Railway as a Probationary Assistant Engineer in December 1954. In December 1964, a cyclone washed away sections of Pamban Bridge that connected Rameswaram to mainland Tamil Nadu. The Ministry set a target of six months for the repair of the bridge. Sreedharan was chosen for this work, under his command the bridge was revived. He renovated the bridge in just 46 days, this shows much about his efficiency and effectiveness, this sounds like the more strange as India is known to be a black hole when it comes to the timely execution of infrastructure projects. The Railway minister's Award was given to him in appreciation of this performance. Another example of these qualities can be seen in the Konkan railway line. Before 1990, there was no straightforward railway line by which Mangalore could connect with the bustling and central commercial center of Mumbai. Both of these cities being important ports(the Jawaharlal Nehru Or Nhava Sheva Port of Mumbai and New Mangalore Port of Mangalore), this was quite the need of the hour, yet travel times were massive, and delays were part of the game. Sreedharan was appointed to manage this project. In 7 years, the outline was completed against unconquerable chances and naysayers–spanning 736 km, 128 railway stations, and 150 bridges. Many of the other extraordinary finished projects include Kochi Metro and Lucknow Metro.

Sreedharan was given the alias of 'Metro Man' by the media for his grand success in executing the completion of the Delhi Metro: the Metro Rail System has proven to be the most efficient in energy consumption, space occupancy, and numbers transported. The Government of India awarded him the Padma Shri in 2001, the Padma Vibhushan in 2008, and the Chevalier de la Légion d'honneur in 2005 by the French government. He was named as one of Asia's Heroes by Time magazine in 2003. Sreedharan was selected by the former UN Secretary-General Ban Ki-moon to serve on the United Nations' High-Level Advisory Group on Sustainable Transport. Book 'Karmayogi' accounts for his extraordinary works (Karmayoga, the manner of attaining phoenix through action and deeds). Ascribing the heading of his book is possibly the most acceptable way, to sum up, the life of Elattuvalapil Sreedharan.

LOTUS TEMPLE

Everyone has heard about Lotus Temple. It has been a prominent attraction among the monuments, the reason being the stunning architecture that makes it look like a true delicate lotus. The architect was an Iranian, Fariborz Sahba who now lives in La Jolla, California. This marvelous structure is built on 26 acres of land, along with its nine surrounding ponds and gardens. He was approached in 1976 to design the Lotus Temple and later oversaw its construction. The structural design was undertaken by the UK firm Flint and Neill over the course of 18 months, and the construction was done by ECC Construction Group of Larsen and Toubro Limited for $10 million.

Many architects consider the Lotus Temple a prime example of contemporary expressionist architecture, alongside buildings like the Sydney Australia Opera House and the TWA Terminal at JFK International Airport. The Lotus Temple is the most visited building in India (passing up even the Taj Mahal) and one of the most visited religious tourist attractions in the world according to the Guinness World Records, boasting over 10,000 visitors per day.

A LOOK AT THE ARCHITECTURAL STYLE OF THE LOTUS TEMPLE

The Lotus Temple's architectural style is characterized by :-

BIOMIMICRY

The Lotus Temple is most famous for its distinct flowerlike shape, deliberately built to reflect the beauty and symmetry of the lotus flower important to many Eastern and Indian faiths, including the Bahai Faith, Hinduism, and Buddhism. The Lotus Temple is one of the most famous examples of biomimicry in modern architecture.

NUMERIC SYMMETRY

The number nine is sacred in the Bahai faith. Thus, the Lotus Temple (like many other Bahai houses of worship) incorporates the number nine in a symmetrical pattern for balance and beauty–for instance, the building is shaped in a nine-sided dome. The 27 concrete-and-marble petals that make up the structure are split into three different types: nine entrance leaves (which mark the doorways), nine outer leaves (which form the roof space), and nine inner leaves (which enclose the central hall in an interior dome).

SIGNIFICANT STRUCTURAL INTEGRITY

The Lotus Temple may look delicate, but the construction team spent considerable effort ensuring that the building was sturdy enough to withstand regular earthquakes in New Delhi. To ensure the security of the building, construction teams formed each petal as a free-standing marble and concrete structure.

ENVIRONMENTAL CONSIDERATION

In design, the Lotus Temple aimed to prioritize environmental sustainability, generating 20% of its electricity needs through a set of solar panels on the roof, using openings at the top and bottom of the building to encourage natural ventilation, and installing a large glass and steel skylight at the top of the structure to let in natural light.

Ratneshwar Mahadev

The Leaning Temple of Kashi

Varanasi, also called Kashi, Banaras, is a town on the banks of the river Ganga in Uttar Pradesh. The metropolis's religious significance persevered to develop inside the eighth century, while Adi Shankara established the worshipers of Shiva as a professional sect of Varanasi. The great temple of Mahadev, Ratneshwar Mahadev Temple is located at the Manikarnika Ghat of Varanasi.

The temple has advanced a nine-diploma slant. It is also known as the Kashi Karvat (Varanasi was earlier known as Kashi and Karvat mean leaning in Hindi). It leans at an awesome 9° which is approximately 5° more than Italy's famous Leaning tower. It is one of the maximum photographed temples within the holy metropolis of Varanasi. Unlike all the different temples in Varanasi on the coast of Ganga, the temple is built at a totally low stage. The water level can attain the Shikhara part of the temple(refers to the rising tower in the Hindu temple architecture of North India). It is constructed at a totally low spot. The builder needs to have regarded that its Garbhagriha(the innermost sanctuary of Hindu and Jain temples where resides the murti (idol or icon) of the primary deity of the temple) might be underwater for a great deal of the 12 months. Notwithstanding a good deal of the temple being underwater throughout most of the year, it is miles properly preserved, except for the tilt that may be highlighted in 20th-century pix. The temple is 13-14 meters in peak. The actual time of construction is unknown. But, a few folks declare that it was built via an unnamed servant of the king of that time, Raja Man Singh, for his mother Ratna Bai approximately 500 years ago.

After having constructed the temple, the king proudly boasted that he had now paid all his debt to his mother. However, one can't repay the debts to one's mother, so the temple began to lean due to a curse given by the mother. This is the cause for the alternative name of the temple: Matru-Runa (mother's debt).

The sector's well-known monument in Italy, the Leaning Tower of Pisa or the Torre Pendente di Pisa, was built lower back in 1173. Soon after it was constructed, the ground underneath one facet began to sink below the burden of the stones and the shape started declining. As consistent with today's update, the tower leans at 3.99 degrees owing to extensive works carried out to straighten the tower. Yet the Ratneshwar Temple is not as well-known as the Leaning of Pisa. Similar to the ancient Indian technological science and arithmetic, the ancient Indian structure is likewise destroyed by the Muslim Invaders, whose revival can lead to numerous different records from which the sector continues to be unaware.



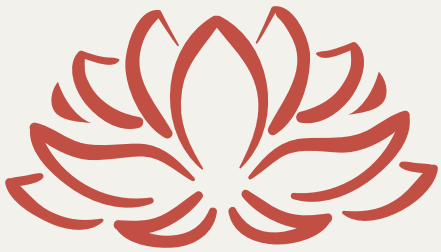
https://upload.wikimedia.org/wikipedia/commons/thumb/5/57/Matri-iin_Temple_in_Varanasi.jpg/330px-Matri-iin_Temple_in_Varanasi.jpg

References : https://en.m.wikipedia.org/wiki/Ratneshwar_Mahadev_temple

Student's Corner

THOUGHTS

PERSONAL ARTICLES TO SHARE THOUGHTS



Letter to 10-year-old me

Hi there

This is 20-year-old you. And I want to tell you what I have learned in this past decade.

Firstly, I want to appreciate you for being the one you are. You may think that you're not enough, but you will shine. The introvert that you are will one day be confident enough to speak up. Keep doing your best. Try not to worry too much. Try to cherish these moments with your loved ones because they all say it is right. These days are the golden ones and won't be back. Make more friends because you'll know more people and how they eventually turn out which is going to help you. Nevertheless, you'll ultimately end up being a group of three whom you love immensely. Cherish your family including your irritating siblings, because they will be your beloved "agony aunts'' for the rest of your life. Enjoy outdoor games as much as you can right now because there is going to be a time when the world will be quarantined. I know that you're currently expected to do a lot more than people your age, but eventually, it will all be worth it. Be a little less competitive and a little more empathetic. Also, forget about your perception of teenagers, it is not what you think. You'll have to make tough choices during this time which would basically define your career and adult life so choose wisely and the future has something good to offer.

Be sporty, have fun and you will get to experience the most wonderful moment in the upcoming decade.

Bye

Beauty

We are surrounded by beauty all around. Everything is unique in some or in another way.

Beauty is not just about the visual experience; it provides a perpetual experience to the senses, the intellect, or the aesthetics faculty. It is a very subjective term in itself. Beauty from a scientific point of view depends on personal preferences formed in the early years of life. A person's first perspective of 'what beauty and love are' comes from their mother. Therefore everyone has a different first-hand experience of it. Some find symmetry beautiful, and others find chaos. Some find familiarity attractive, while others prefer novelty. It depends on an individual's mindset to how they process beauty. Philosophically the idea of beauty can be put together as something that makes you happy. Naturally, you build a liking for it, so beauty is the reason for your happiness.

If we talk about physical beauty, it becomes more and more stereotypical due to the media and fashion industry previously. Everyone wish to fulfill some so-called beauty standards, but they forgot that our fundamental existence came with uniqueness. It's all about embracing yourself. It is easier to fall into such traps but also wondrous to emerge out and accept yourself and the world around exactly the way it is. But we are improving. We are moving towards a culture where everyone is welcomed. The idea of beauty is shifting as everyone's idealized version is considered the best.

'Everything has its beauty, but not everyone sees it'

-Confucius

OFFLINE v/s ONLINE



The experience of the online semester at IIT Kanpur is analogous to chewing a toffee having no sweetness! The entire college life with acres of campus, labs, and lecture halls, all squeezed into fifteen to seventeen-inch laptops. I had heard a lot about IIT and its beautiful campus but I am really unfortunate to not have seen the campus yet while studying at an IIT. I had many expectations before becoming an IIT Kanpurite, but what I had expected is great miles away from what the reality is. I expected a big campus with big grounds, hostels, and labs but with this online system, I was in the same room of my house with just a laptop! Although it was not 'just a laptop' but was accompanied by thousands of pdfs. This system of online learning was hard to adjust to at first, but with time I got used to it. I had imagined myself sitting with friends and having debates but the reality is that we have WhatsApp chatting groups with friends spamming :) there. The most surprising thing about the online semester is the expectations of low averages in quiz , but but the reality is that the averages goes very high. I think this was the most surprising reality I had to face in this online semester! But above all, it was the need of the hour, no one could escape that. But seriously, I learned something, although not as much as I could learn if I was on campus. But still, the knowledge continued to flow. The loss, could not be eliminated but , has been minimized to a great extent. This has been possible through continuous efforts put by our professors and the entire management system of IIT Kanpur.

WORK DONE

by

SoCE

Society of civil engineers

DEPARTMENTAL GET-TOGETHER



It is an annual tradition of the Society of Civil Engineers to host a get-together for the new batch. The purpose of this event is to allow the new batch to interact with their fellow batchmates, professors, and seniors of the civil department.
The get-together starts with a welcome note from the professors to the new batch, following which the fun begins.

The get-together has a lot of games, riddles, and jokes.
Society organised some light-hearted games that even professors and students could participate in, like darts...





After this, some students come on the stage to showcase their talents.
With their beautiful voices, some students and professors create a different aura in the entire hall, while others show their writing talent by delivering a poem they wrote. And then, the students give a dance performance, show their awesome and crazy moves to the audience, and add more fun to the night.

After the get-together, the society hosts a dinner with delicious food for everyone at the get-together. After the dinner, there comes the last and most significant event-" The DJ Night." All the students dance to the beats of the songs, enjoying themselves to the fullest. And with this, the get-together came to an end.



Series of talks on

CAREER CHOICES

for

CIVIL ENGINEERS

The SoCE team has been continuously making efforts to help civil engineering students explore their branches and ensure that they are exposed to various choices in their careers. One sincere effort towards the goal has been through a series of talks on Career Choices For Civil Engineers. The team repeatedly contacts various alums with different professions and hence brings upon the interactive series. We have organised various such sessions to date.



One of the sessions was conducted on 13-09-21 with Mr. Varun Tyagi (Y13 CE alum) as the speaker. It was an interactive session about software postulates.



With Mr. Sai Sreenivas Bitra as the speaker, the team organised another session on 20th September 2020. He is currently working as an Assistant Project Director in the Ministry of Road Transport & Highways.

On 27th march 2021, we had a session with Ami Bhaskar, a Y12 alum. She is currently working as a Business Intelligence Engineer at Amazon. She has done her Master's in Construction Management from North Carolina State University.



SoCE had conducted a series of talks on "Career Choices for Civil Engineers"

Mr. Sai Sreenivas Bitra, Y10 Alum

He is currently working as an Assistant Project Director in the Ministry of Road Transport & Highways. He has also worked as an Assistant Executive Engineer in Andhra Pradesh Water Resources Department. During his undergraduate days, he did summer internships at Larsen & Toubro Limited and Indian Railways.
The session was conducted on 20th September 2020.





Mr. Pranay Jain, Y11 Alum

He is currently working as a Junior Associate at McKinsey & Company. He has also worked as a Business Analyst in Auctus Advisors for two years. During his undergraduate days, he did summer internships at CRISIL Limited and Futures First.
The session was conducted on 27th September 2020.

Mr. Aditya Nigam, Y11 Alum

He is currently working as an Analytics Team Lead in GroundTruth. He has also worked as a Business Analyst in Snapdeal. During his undergraduate days, he has done summer research internships at the University of Illinois at Urbana-Champaign and the University of Melbourne.
The session was conducted on 4th October 2020.





Mr. Ashutosh Kumar, Y14 Alum

He is currently working as a computer vision engineer at the department of innovation, Ando hazama Corporation, Japan, and pursuing a PhD, CE. He has also worked as an ML intern in the NASA jet propulsion lab and also in UrbanX Technologies, INC, Japan.
The session was conducted on 1st November 2020.

Mrs. Ami Bhaskar, Y12 Alum

She is currently working as a Business Intelligence Engineer at Amazon. She has done her Master's in Construction Management from North Carolina State University. During her undergraduate days, she did a summer internship at Fluor Corporation.
The session was conducted on 27th March 2021.



Continued . . .



Mr. Karthick Nivas, Y8 Alum

He is currently working as a Strategy Manager at Project Management Institute (PMI). He completed his MBA from IIM Lucknow in 2016. He has also previously worked in Flipkart, Merck, Alvarez & Marsal.
The session was conducted on 3rd April 2021.

Mr. Manasvi Garg, Y10 Alum

He is currently working as an Equity Research Analyst at JPMorgan Chase & Co. He has done his MBA from Management Development Institute. Furthermore, Manasvi also qualified CFA level-3 exam. Previously, he has worked for Axis Bank, Religare Finvest Limited, and IndEU Capital.
The session was conducted on 30th August 2021.





Mr. Varun Tyagi, Y13 Alum

He is currently working as a Software Engineer at Grab Holdings Inc. He has also worked as a Software Development Engineer at nearbuy.com.
The session was conducted on 13th September 2021.

Mr. Shahryar K Ahmad, Y12 Alum

He is currently a Research Scientist at NASA Goddard Space Flight Center. He has done his PhD. & Master's Degree in Civil Engineering from the University of Washington. Previously, he worked as Research Assistant at the University of Washington and was student intern at NASA Goddard Space Flight Center.
The session was conducted on 9th October 2021.





Mr. Raj Bhattari

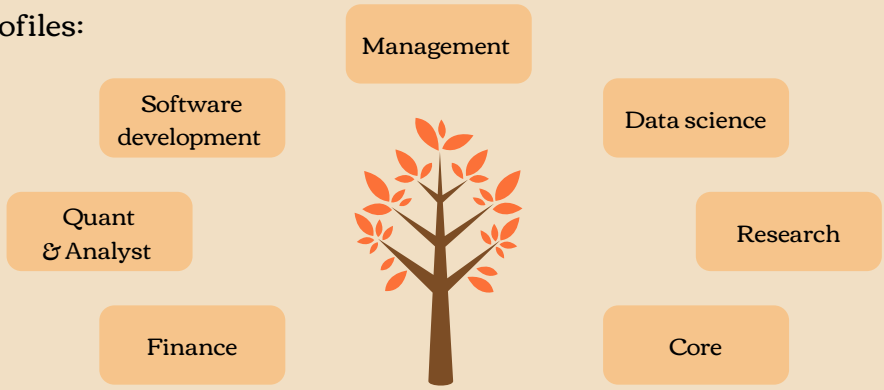
He pursued his B. Tech from IITK in 1971 and MS in Environmental Health Engineering from the University of Texas. He is the president of clean water strategies (Austin, Texas), and he worked as division manager, Environment and regulatory services, Austin, from 1984 to 2018. He is also visiting professor at IIT Kanpur and a guest lecturer at the University of Texas, Austin.
The session was conducted on 28th January 2022.

INTERN CHATS

An internship is a short-term work experience provided by the company. But many of us really don't know the benefits of an internship, what they are, where to apply, how to prepare, and how we find out our interest in a particular profile. Many of these questions generally come up in our minds, and we need help from someone who is experienced and knows all about it. So, SoCE provides an opportunity to sort out all these problems. SoCE conducts intern chats with the students of civil engineering who grabbed internships. These internship chats guide us through the whole process.

In these talks, students who grabbed internships from various profiles would try to cover all the doubts related to that profile.

There are various profiles:



Benefits of Intern chat

1. In the 2nd year, many of us are doubtful regarding internships and how to go with the preparation. So intern chats is one of the events organized specifically for civil students to get direct guidance from their fellow seniors.

2. Because of intern chats, students get good suggestions from experienced seniors who grabbed internships themselves.

3. Help students to understand all profiles and their work so that they can decipher and choose the best for themselves.

4. After attending all sessions of intern chats, students have an idea of how to proceed for preparation, in which profile they should apply, and all about the internships.

SoCE Sessions

1. The first talk of the series focused on software profiles in which speakers were: Kartikeya Sanwal, Manan Bordia, Vyush Agrawal, Yash Vardhan Raizada. All of them were from the Department of Civil Engineering. We got a lot of participation.

2. The second session of the series focused on the "Quant and Analytics" profile. Speakers are: Priya Khulbe and Satyam Prakash.

3. The third session focused on the "Finance" profile. Speakers were Akarsh Mittal and Samyak Jain.

4. The fourth session of the series focused on the "Managerial" profile. Speakers were Aryaman Shandilya, Deepesh Garg, Gaurav Jiwan, Shivam Kumar Shukla.

5. The fifth session of the series focused on the "Research" profile. Speaker was Smriti Chhattani.

PLACEMENT POSTULATES

As a student, we all go through different phases of our life, and we all move from the tag of freshers to 2nd and 3rd-year students to final-year students. As it is said that "Well begun is half done".
So, in order to tackle the problems in placement time, the Society of Civil Engineers (SoCE) brings a blog series called PLACEMENT POSTULATES to give all the insight into placement and guide all of students who are preparing for placements.

Now it is clear why placement postulates are organized by SoCE.
But what are its benefits?
let's see,

These blogs contain the experience and most valuable tips from seniors who have gone through this placement phase, which will help you in relaxing during the placement process.

Blogs contain the steps one should follow to acquire a good job. About the cpi, skills which one should acquire, what points to keep in mind while building your resume, and many more.

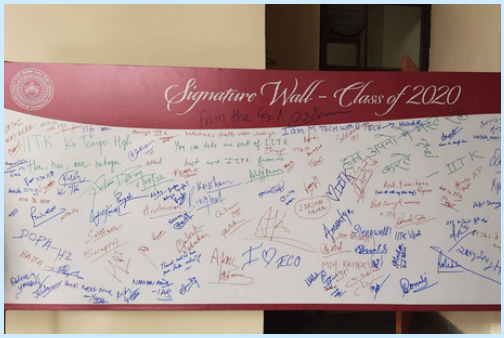
We have blogs from students placed in various fields. So students who want to pursue that field can have excellent guidance after reading such blogs.

These blogs are posted during the 2nd and early 3rd quarter of the year, i.e. near or after the placements, after a brief interview of those who are placed in different fields. We cover all those sectors, with the target of at least one blog on each job profile, which is available as an option to graduates of Civil Engineering during placements. For example:- data scientists, software developers, software engineers, business analysts, product managers, incoming executive trainees, incoming business associates, management trainees, etc. We even post some blogs on the same job profile if it contains some fruitful advice not included or say not much elaborated in previous posts.

Y16 Reunion











Y18 Farewell





Y

1

8













STRENGTHS TEAM 2021-22

HOD : Prof. Tarun Gupta

Faculty Coordinator : Prof. Aditya Medury

Coordinators (Y19) : Govind, Nidhi, Rohan, Janhavi

Overall Design (Y20) : Shubham

Content Editing (Y20) : Prabhat, Om, Sanidhya, Shobhit

Contributors (Y20): Abhishek, Ajeet, Aman, Animesh, Ashish, Devansh, Faiza, Kritika, Mandvi, Narendra, Nikhil, Payal, Rahul, Sahil, Saurabh, Kaushal, Sheshank, Shikha, Shivangi, Shruti, Susmitha, Yuvraj

Society of Civil Engineers

CROSSWORD



ACROSS

1. The Olympic Stadium used in Tokyo Olympics was designed by K___

2. I am London's most striking bridge with liftable central sections. SPIDERMAN fought Mysterio here. T___

6. The Abraj Al-Bait is the most expensive building you will find on the planet and is situated in M___ city of Saudi Arabia.

7. I will be the deepest underwater hotel upon completion. H___

10. John S___ is the first self-proclaimed Civil Engineer who constructed the Eddystone.

11. This dam located at the Brazilian-Paraguay border, is the second largest hydroelectric power plan. I___

13. Oracle billionaire Larry Ellision owns 98% land on this island. It is one of the biggest islands. L___

15. The deepest subway station,110 m under the ground. P___

DOWN

3. P___ is a small artificial island in the Danish part of the Oresund strait, created as a part of the bridge connecting Denmark and Sweden.

4. This UNESCO World Heritage site, a temple is famous for its unique architecture. Its geometrical patterns and carved wheels used to serve as sundials. It is also known as Black Pagoda. K___

5. This 5th longest free-standing structure is one of the 7 wonders of the modern world since 1995. C___

8. S___ canal is an artificial sea-level waterway in Egypt, connecting the Mediterranean Sea to the Red Sea. The Ever Given blocked this canal on 23rd March 2021.

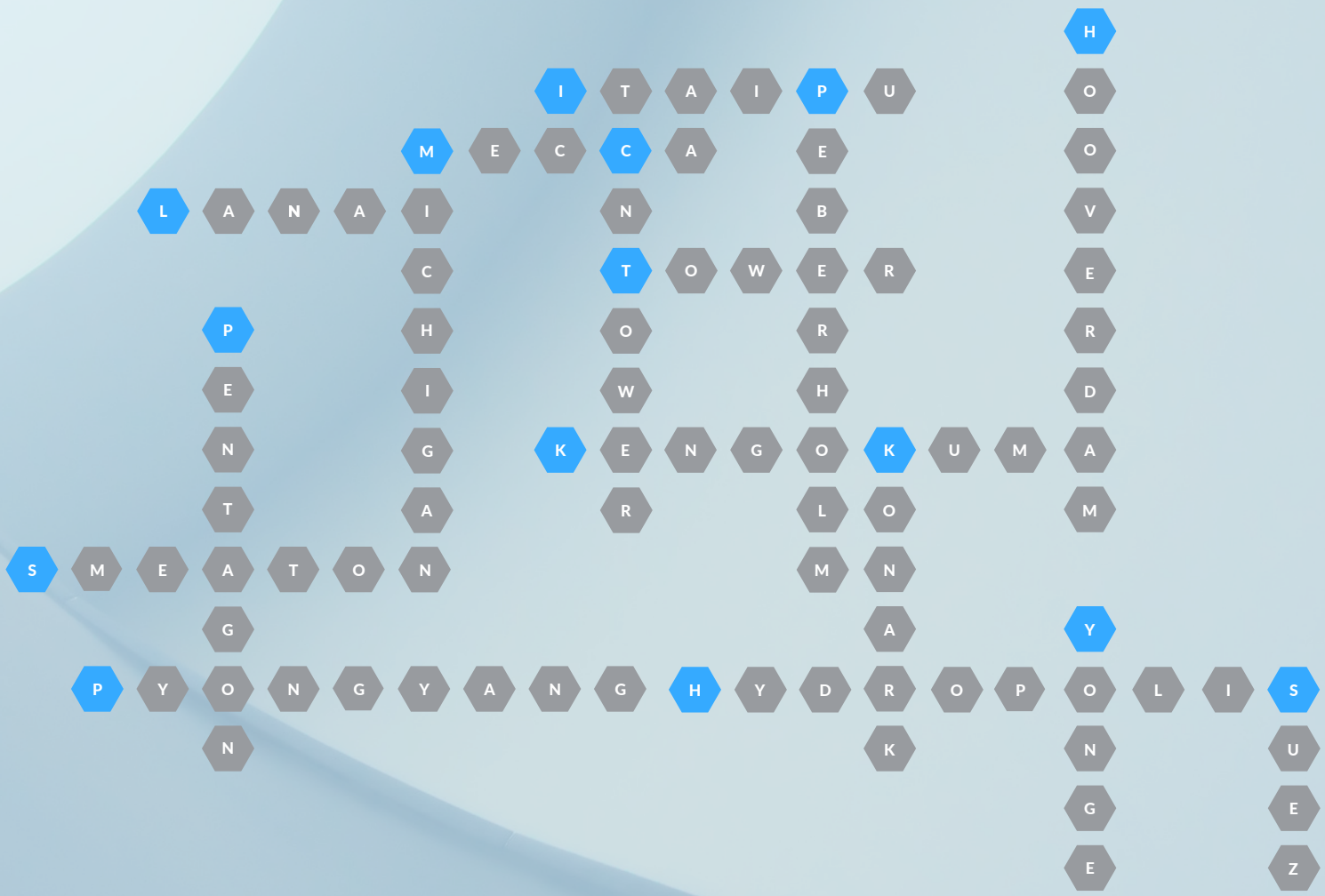
9. The tallest concrete dams ever built and created one of the largest man-made lakes in the U.S. H___

12. Toronto is home to the world's longest street, Y___ street.

14. 'I am the largest American stadium according to the seating capacity.' M___

16. World's largest office building by floor size. P___

CROSSWORD ANSWERS



ACROSS

1. Kengo Kuma

2. Tower

6. Mecca

7. Hydropolis

10. Smeaton

11. Itaipu

13. Lanai

15. Pyongyang

DOWN

3. Peberholm

4. Konark Sun Temple

5. CN Tower

8. Suez

9. Hoover Dam

12. Yonge

14. Michigan

16. Pentagon

The End

SOCIETY OF CIVIL ENGINEERS

soce@iitk.ac.in



Society of
Civil Engineers

STRENGTHS

A magazine from Society of Civil Engineers

"If you have a positive attitude and constantly strive to give your best effort, eventually you will overcome your immediate problems and find you are ready for greater challenges"

Pat Riley

For private circulation only