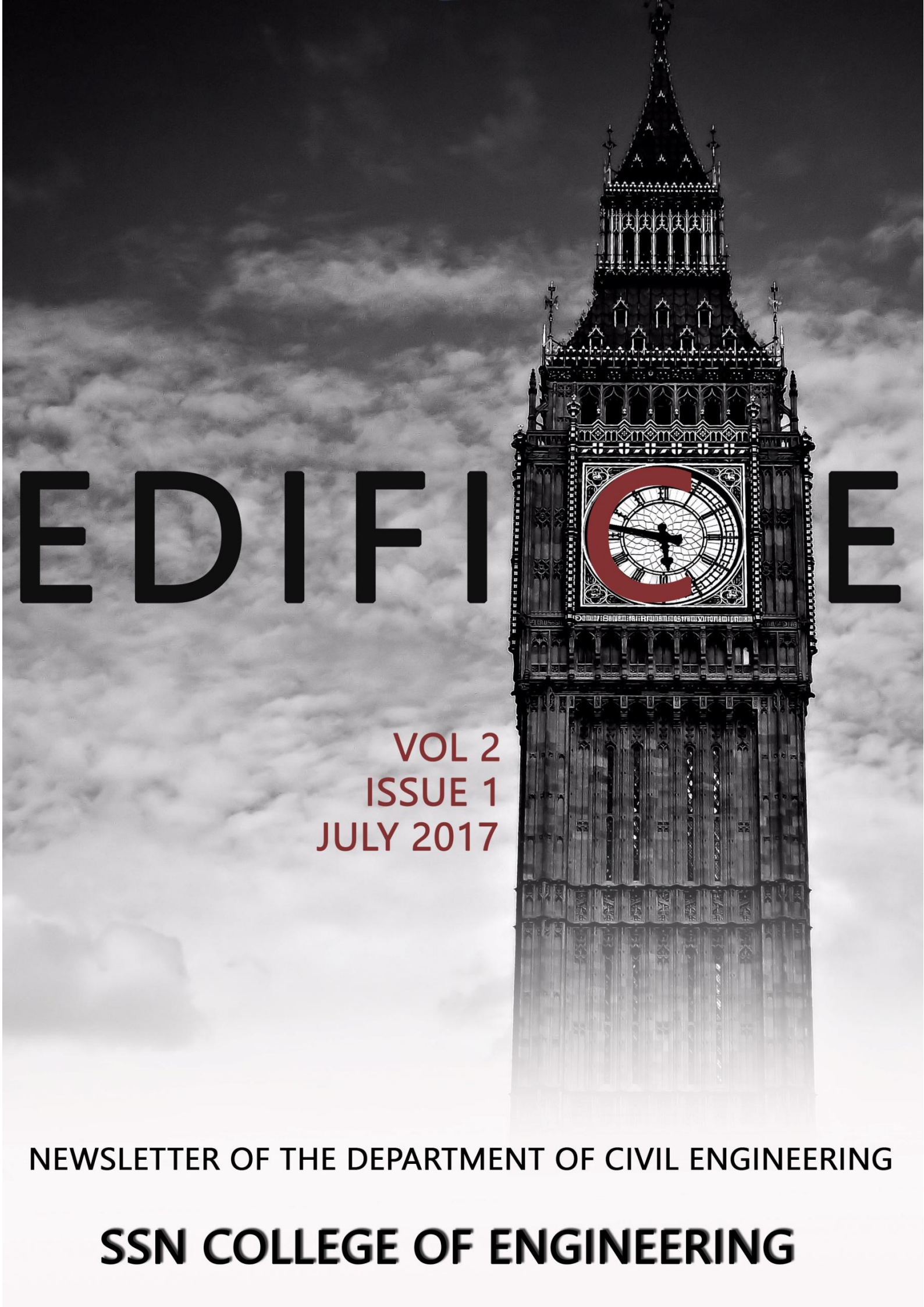

EDIFICE

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NEWSLETTER OF THE DEPARTMENT OF CIVIL ENGINEERING

SSN COLLEGE OF ENGINEERING

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Professor & Head of the Dept.

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Assistant Professor

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Saranya S, III yr.
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Cover Design

FROM THE HoD'S DESK

"The road to SUCCESS is always under construction"

It is very well meant for our department as we grow in the rising path with steady accomplishments through periodical Conferences, Workshops and Seminars being conducted with lectures by eminent persons from various institutions and industries.

The faculty of our department are well qualified and motivated with a strong commitment to teaching and research. My hearty congratulations to Dr. S.Muthulingam, Associate Professor who has obtained funding for Rs. 33.32 lakhs from S.E.R.B., D.S.T., Govt. of India for his project on corrosion studies of concrete structure. One more faculty Mrs. P.Sangeetha has earned a doctorate from Anna University this year.

I am extremely pleased that a total of 33 students have been placed both in campus and off campus placements from the third batch of graduating civil engineers. My best wishes to those who have secured admission to pursue higher studies both in India and abroad.

I wish to congratulate all the faculty members for their continued efforts and commitment towards research and teaching.

Dr.S.Ramana Gopal

NATIONAL CONFERENCE ON DISASTER MITIGATION, RESPONSIVENESS AND MANAGEMENT, 3 & 4 FEB, 2017

The Department of Civil Engineering, Sri Sivasubramaniya Nadar College of Engineering in association with IEEE Madras Section organised a two day national conference on Disaster Mitigation, Responsiveness & Management on the 3rd and 4th of February 2017.

The main objective of the conference was to provide a forum for discussion of issues impacting preparedness, resilience, response, and capability in disaster amongst academics and practitioners, and a venue for presentation of the latest developments.

The conference was inaugurated by Dr. B. Venkatraman, Director, Health, Safety and Environment Group, IGCAR, Kalpakkam and Dr. M.A. Atmanand, Former Director & Scientist-G, National Institute of Ocean Technology, Chennai & Chair, IEEE Madras Section. Dr. S. Salivahanan, Principal, SSN College of Engineering, welcomed the gathering and the conference chair Dr. S. Ramanagopal briefed about the conference. Dr. M.A. Atmanand shed light on how the theme of the conference came into being and stressed the need for academia, industry and the public to come together for effective disaster mitigation and management. Dr. B. Venkatraman provided his views on the theme of the conference and highlighted the potential of a highly advanced Decision Support System developed in Kalpakkam.

The conference benefited from six technical presentations and eleven key note addresses. The speakers included academics, scientists and service personnel from varied backgrounds allowing the conference to serve as a platform for constructive interactions and amalgamation of ideas.

The invited speakers are listed below:

- Mr. M.K. Pathak, Scientist E, Research Development Establishment (Engg.), DRDO, Pune, "DRDO Technologies for Disaster Management".
- Dr. P.Mukhopadhyay, Scientist -E, Indian Institute of Tropical Meteorology, Pune, "Potential of High Resolution (12.5km) Global Forecast System (GFS) Model in Capturing Extreme Events over Indian Region".
- Dr. Kaustav Chakravarty, Scientist -E, Indian Institute of Tropical Meteorology, Pune, "Characteristics of Heavy Precipitation Events as Observed over Western Ghat Mountains".
- Dr. A. Boominathan, Professor, Geotechnical Engg. Division, Dept. of Civil Engg., IITM, Chennai, "Geotechnical Aspects for Seismic Resistant Structures".
- Dr. Goudappa Dodagoudar, Professor, Geotechnical Engg. Division, Dept. of Civil Engg., IITM, Chennai, "Probabilistic Seismic Hazard Assessment for Ground Motion Studies at Kanchipuram, Tamilnadu".
- Dr. Saswati Mukerjee, Prof. & Head, DIST, CEG, Anna University, "Cloud Computing for Disaster Management".
- Dr. R.Venkatesan, Group Head - Ocean Observation Systems, NIOT, Chennai, "Advancements in Ocean Observation in India for Tsunami and Cyclone".
- Mr. G.Padmanaban, Senior Manager, Communication & Telecom Infra., L&T Construction, Chennai, "Early Warning Dissemination Systems - ICT Solutions in Practice".
- Mr. Vinoj P Joseph, Assistant Commandant, NDRF, Arakkonam, "Disaster Response & Management".
- Dr. S. Mohan, Professor, Environmental & Water Resources Engg. Division, IITM, Chennai, "Floods & Droughts: Disaster Mitigation Strategies".
- Dr. G.P.Ganapathy, Director, Center for Disaster Mitigation & Management, VIT University, Vellore, "Earthquake Hazards Mitigation & Quick Response during Emergencies".

The major research agendas moving forward include research and development for relieving service congestion in the mobile network caused by disaster, research and development on the reconfigurable communication resource unit for disaster recovery and developments of next generation VSATs effective for severe disasters.

Glimpses from the conference

WORKSHOP ON CONSTRUCTION MANAGEMENT – BEST PRACTICES, 24 MAR 2017

The Indian Concrete Institute Student Chapter Workshop on Construction Management – Best Practices was held on 24th Mar 2017. The subject experts who delivered the lectures were

- Dr. G. Vijayakumar, Professor, Department of Civil Engineering, Pondicherry Engineering College, Puducherry.
- Dr. M.P. Venkatesh, Assistant Professor, Department of Civil Engineering, Annamalai University, Chidambaram.

Dr. G. Vijayakumar enlightened the participants on the principles of Project Planning, Management and Concepts. He elucidated on the need for estimation, data analysis and steps involved in civil engineering projects and also the role of civil engineers in the site and project monitoring. He explained the entire estimation and cost analysis with the help of the development of buildings in OMR and his talk mainly focused on the economic design of structures without compromising on the safety factor.

Dr. M.P. Venkatesh spoke in detail about Resource Allocation and Resource Levelling. His lecture gave the participants a deep insight into the latest techniques which have been used in construction and scheduling process. He also explained the merits of latest equipments over the conventional methods and equipments. The lecture proved to be very useful because of its relevance to large scale planned construction.

These lectures, apart from being highly informational, gave the participants a peek into the pace at which technology is moving in the world around them.

SEMINAR ON REPAIR & REHABILITATION OF STRUCTURES, 30 JAN 2017

A seminar on Repair & Rehabilitation of Structures was held on 30th Jan 2017 for student enrichment. The subject experts who delivered the lectures were

- Dr. G. Apparao, Professor, Department of Civil Engineering, IITM, Chennai.
- Er. R. Periyasamy, Chartered Engineer & Registered Valuer.

Dr. G. Apparao delivered a lecture on Retrofitting of Beam Column Joint. He spoke extensively about the loads acting, analysis, distress and retrofitting the beam-column joints in framed RC structures.

Er. R. Periyasamy who is a practising valuer and experienced in retrofitting dilapidated structures explained in detail the Retrofitting of Column using FRP Jacketing.

The two talks were illustrated well with case studies and examples throughout India, making them very informative for the students and familiarized them with ground conditions in the retrofitting industry.

Faculty Updates

BOARD OF STUDIES

Dr. S. Ramana Gopal, Professor & HoD attended the 23rd meeting of the **Board of Studies of Faculty of Civil Engineering** for the affiliated Institutions of Anna University on 22-02-2017. The main agenda of the meeting was to consider and approve the new regulations (R-2017) under choice based credit system.

PATENT FILED

Dr. Y.K. Sabapathy, Professor, has applied for a patent on **"Fabrication of Connecting Rods using Fibre Reinforced Plastics by Continual Winding under Tension"**.

BOOKS PUBLISHED

Dr. B.Mahalingam, Associate Professor, has published a book titled **"Construction Techniques, Equipment and Practice"**, ARS Publications, (ISBN: 9789384608613).

Dr. R.Rajkumar, Associate Professor, has published a book titled **"Structural Performance of Buried Flexible Plastic Pipe"**, Scibay Publications, (ISBN: 9788193281949).

Faculty Updates

FUNDED PROJECT

Dr.S.Muthulingam, Associate Professor's project titled **"Impact of Climate Change and Chloride Induced Corrosion Damage Risks of Concrete Infrastructure Deterioration along Coastal Regions of India"** has been approved for funding by SERB, DST, Govt. of India for Rs. 33.32 Lakhs.

DOCTORATE EARNED

Ms.P.Sangeetha, AP, under the guidance of Dr.R.Senthil, Professor & Director, Structural Engineering Division, CEG, Anna University successfully defended her thesis titled **"The Analytical and Experimental Investigations on the Behaviour of Composite Space Truss"** on 21st May 2017.

JOURNAL PUBLICATIONS

- **Vijayalakshmi R., Ramanagopal S.**, Sathia R., and **Arvindh Raj R.*** (*B.E. Civil Engg., 2012-16 batch), "Comparative Study on the Strength and Durability Properties of M-50 Grade Self Compacting Concrete with Micro Concrete", International Journal of Advanced Scientific Research and Management, Volume 2, Issue 5, 2017, pp 46-52.
- **Vijayalakshmi R., Sangeetha P., Ramanagopal S., Arvindh Raj R.*, and Anu Varshini R.D.*** (*B.E. Civil Engg., 2012-16 batch), "Influence of Sphaericus Bacteria on Mechanical Properties of Bagasse Ash Replaced Concrete", International Journal of Science Technology and Engineering, Volume 3, Issue 12, 2017, pp 25-29.

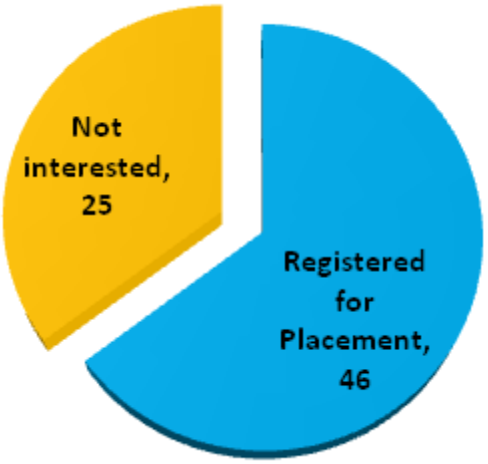
- **Vijayalakshmi R.,** Sathia R., **Ramanagopal S.,** and Paneer Selvam, "Parametric Study on the Hydrodynamic Response of DSI Polygonal Shaped FPSO", Brodogradnja/Ship Building, Volume 68, Issue 2, 2017, pp 93-107.
- **Vijayalakshmi R., Ramanagopal S., Jubin John Thomas H.*, Monika S.*, Priyanka C.*, and Venkatesh S.*** (*B.E. Civil Engg. 2013-17 batch), "Experimental study on CFRP Strengthened Concrete Beams", International Journal of Civil Engineering and Applications, Volume 7, Issue 1, 2017, pp 81-91.
- **Sangeetha P., Vijayalakshmi R., and Ramanagopal S.**, "Study on Effect of Bacteria in Bagasse Ash Concrete", International Journal of Civil Engineering and Technology, Volume 8, Issue 6, 2017, pp 45-52.
- **Sivapriya S.V.,** Vinothkumar S., and Nagarajan V., "Utilization of Copper Slag as a Reinforcing Material", International Journal of Science Technology and Engineering, Volume 2, Issue 12, 2016, pp 149-153.
- **Krishnan A.V.*** (*B.E. Civil Engg. 2011-15 batch), **Sivapriya S.V.,** and Nagarajan V., "Finite Element Analysis of HYPAR Shell Footings with Variation in Edge Beam Dimensions and Embedment Ratio", International Journal of Earth Sciences and Engineering, Volume 10, Issue 2, 2017, pp 150-154.
- Manoharan R., **Rajkumar R., and Akkineni Surya Teja*** (*B.E. Civil Engg. 2013-17 batch), "Study on Compressive Strength Characteristics of Spherical Hollow Core Cement Concrete Blocks using Ferro Sand (Copper Slag)", International Journal of Recent Research Review, Volume 1, Issue 3, 2016, pp 72-79.
- Nirmala R., **Rajkumar R., Akkineni Surya Teja*** (*B.E. Civil Engg. 2013-17 batch), and Vignesh Bharathy K., "Experimental and Theoretical Studies on Un-plasticized Poly Vinyl Chloride (UPVC) Pipe Buried in Cohesionless Backfill", International Journal of Advanced Engineering Technology, Volume 7, Issue 3, 2016, pp 122-125.
- **Rajkumar R.**, Poornima Rajkumar, **Sharon*, and Sureshkumar*** (*B.E. Civil Engg. 2014-18 batch), "Prediction of Failures in Buildings using Sensors", International Journal of Engineering Sciences & Research Technology, Volume 5, Issue 7, 2016, pp 694-699.

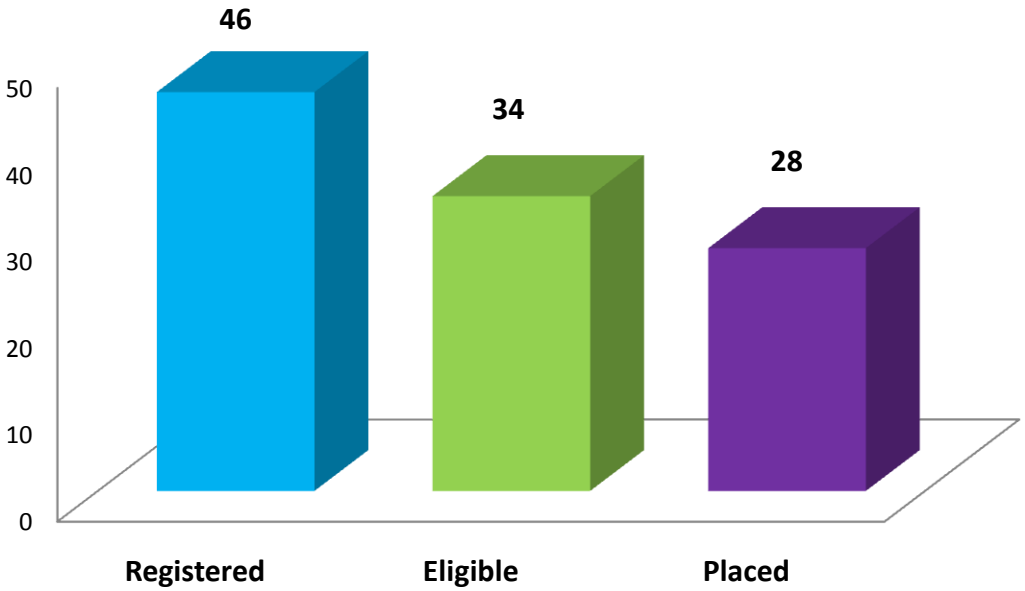
- **Rajkumar R., and Akkineni Surya Teja*** (*B.E. Civil Engg. 2013-17 batch), "Retrofitting of Concrete Circular Columns using CFRP", International Journal of Engineering Sciences & Research Technology, Volume 5, Issue 6, 2016, pp 168-177.
- **Sangeetha P., Prashaanth V.*, Srivatsan D.*, Venkatesh S.*, and Srinivas K.*** (*B.E. Civil Engg. 2013-17 batch), "Fatigue Behaviour of Metals under Various Surface Finishes", IOSR Journal of Mechanical and Civil Engineering, Volume 13, Issue 5, 2016, pp 115-120.

CONFERENCE PUBLICATIONS

- **Rajkumar R., Roshini C.*, Sadhana S.*, and Saranya S.*** (*B.E. Civil Engg. 2015-19 batch), "Robotics in Civil Engineering", in the proceedings of the International Conference on Smart Technologies and Green Environment ICSTaGE-2017, organized by Velammal Engineering College, Chennai.
- **Muthulingam S.** & B.N. Rao, "Prediction of corrosion-free service life of concrete structures along coastal regions: A Numerical framework", in the proceedings of the 5th International Conference on Integrity-Reliability-Failure, 2016 at University of Porto, Portugal.

Total no. of eligible students	-	34
Total placed	-	28
Placement %	-	82.4%





No. of companies	-	26
No. of offers	-	48

No. of students with off campus placement offer	-	5

No. of students who have qualified GATE 2017	-	6

FOREIGN UNIVERSITY ADMITS

Monika S	**University of California, San Diego - Structural Engineering** University of Florida, Gainsville - Structural Engineering Arizona State University, Tempe - Construction Management University of Washington, Seattle - Structural Engineering University at Buffalo , New York - Structural Engineering
Srivatsan V	University of Colorado Denver - Transportation Engineering **Texas A&M University College Station - Transportation Engineering** Arizona State University - Transportation Engineering Iowa State University - Transportation Engineering North Carolina State University - Transportation Engineering State University of New York, Buffalo - Transportation Engineering University of Texas Arlington - Transportation Engineering University of Washington - Transportation Engineering
Prashanth V	**University of California, Irvine - Structural Engineering** Arizona state university , Arizona - Structural Engineering Northeastern university -Structural Engineering University of Massachusetts , Amherst -Structural Engineering
Dinesh Damodharan	**Royal Melbourne Institute of Technology, Australia – Construction Management**

MBA & FELLOWSHIP ADMITS

Roshni A	Xavier's Institute of Management and Entrepreneurship (XIME), Bengaluru Christ University, Bengaluru **Institute for Financial Management and Research (IFMR), Sri City** Amrita School of Business
Swarnalakshmi M V	**Institute for Financial Management and Research (IFMR), Sri City** Xavier's Institute of Management and Entrepreneurship (XIME), Bengaluru National Institute of Bank Management, Pune
Rashmi Nagendran	**Young India Fellowship**

INTERNSHIPS & IN-PLANT TRAINING

III B.E. Civil Engineering

Gokula Krishnan B	Research intern, Division of Geotechnical Engineering, IIT Madras, Chennai
Jawahar V Balamurukan R	IPT at Chennai Port Trust

IV B.E. Civil Engineering

Adhithyan.M.P	Summer Fellowship at IIT Madras, Chennai
Ajay S	Summer Fellowship at IIT Madras, Chennai
Akshay Krishnan B	Intern at Saint Gobain, Mumbai
Aarthy Reddy R, Amudhini K, and Sanjaya Deve P	IPT at URC constructions Pvt. Ltd., Chennai
Gautham S, Arun Kumar R, Vignesh N, Mahesh D, Dharanedharan K S, Karthik J, and Hari Hara Shanmugan G	IPT at Larsen & Toubro Ltd., Chennai
Dharshana Rajasekar, Harika Y, and Abinaya K	IPT at Ceebros Construction, Chennai
Akshay Desai, Nikileesh N U	Intern at SRP Construction Company, Chennai

Nikhileesh N U	IPT at SPK & Co., Vandalur Elevated Road Site, Chennai
Mahesh D	IPT at Uniqcore Construction , Pothys Project, Salem
Srinivasan V	IPT at Mahindra Consulting Engineers, Chennai
Harihara Shanmugan G	IPT at J-Tech. Associates & Co., Chennai
Vignesh Kumar S	Intern at Larsen & Toubro Ltd, FORD GBS Facility Project Site, Chennai
Sharon V	IPT at IGCAR, Kalpakkam
Rajesh M, Gowthaman C, Saravana Kumar M, Lakshmanprasath N, and Suresh Kumar S	IPT at Chennai Metro Rail Limited (CMRL), Chennai
Ashwin Muthuraman R M	Intern at Qatar Design Consortium, Qatar
Rahul Raj R, Sivaram S, and Vighnesh Kumar S	Intern at Panchshil Realty, Pune
Vigneshwaran S T	Intern at IIM, Lucknow
Saravanakumar	IPT at Sobha Pvt. Ltd., Bangalore
Jemshia S. Canis	IPT at Akshaya Builders, Chennai
Sathya Priya S	IPT at PWD Government Hospital bldg. Site, Chennai

WORKSHOPS & SEMINARS ATTENDED

- Saranya S, Shalini V B, Priyadarshini K P, Srilekha V, Vishnu Aravind G, Gokula Krishnan B, Harikrishnan A, Mukul Anand B, Aravindh R, Karthikeyan T, Jai Vigneshwar A, Vaishnavi K, Kannan Meena, Prathibha Devi N, Dharmasekaran K, Parthiban K, Arumugam V, Bala Murugan R and Jawahar V of III year B.E. Civil Engineering attended the two day workshop on **"Superstructure Construction"** organised by Robokart in association with IIT Bombay's Innovation Cell at CEG, Anna University.
- Durga Abhishek K, III year B.E. Civil Engineering and M Saravana Kumar, Gautham S, Ganapathy P, Pown Krishnan B, Akash R, Vignesh B S, Yokesh M V, Vignesh N, Akshay Krishnan, Arun Kumar, Mahesh D and Sathya Priya of IV year B.E. Civil Engineering attended the one day workshop on **"Non-Destructive Testing Methods for Concrete"** at VIT University, Chennai campus.
- Dhayanidhi V and Sai Pradeep M of IV year B.E. Civil Engineering attended the workshop on **"SAP-Structural Analysis Programming"** at NIT Trichy.
- Nikileesh N U and Akshay D Desai of IV year B.E. Civil Engineering attended the workshop on **"Precast Technology and Modern Construction"** at CEG, Anna University.
- Sivaram S and Balasubramaniam of IV year B.E. Civil Engineering attended the seminar on **"Smart Cities"** at CEG, Anna University.
- Kim Nepheg S, Ajith Kumar T and Ashwin Muthuraman R M of IV year B.E. Civil Engineering attended the seminar on **"Myriad Manifestations of Concrete"** at the Concrete Panaroma and Deminar 2017, Nimhans Convention Centre, Bangalore.
- Skanda Vishnu S and Sudarsanan C of IV year B.E. Civil Engineering attended the seminar on **"Future Research Endeavors in Geotechnical, Environmental and Water Resources Engg."** at Sathyabama University.

SYMPOSIUMS & CONFERENCES

- Roshini C, Sadhana S, Saranya S and Chitralekha R of III year B.E. Civil Engineering won the third place in "Sustainable Development Challenge" at CEA FEST, IIT Madras.
- Gokula Krishnan B, Vishnu Aravind G, Aravindh R and Prasanth A of III year B.E. Civil Engineering participated in "Concrete Challenge" and "Aquanomics" at CEA FEST, IIT Madras.
- Gokula Krishnan B, Vishnu Aravind G and Prasanth A of III year B.E. Civil Engineering participated in "Mortar Master" at Moments, NIT Trichy.
- Roshini C, Sadhana S and Saranya S presented a paper on "Robotics in Civil Engineering" in ICSTaGE 2017 organised by Velammal Engineering College.
- Nikhileesh N U, IV year B.E. Civil Engineering participated in "QRiosity" at Daksh, Sastra University.
- Vignesh B S, Pown Krishnan and Akash R of IV year B.E. Civil Engineering won the third place in "Poster Presentation" at Hoover, TJS Engg. College.

ACHIEVEMENTS IN EXTRA CURRICULARS

- Kannan Meena, III year B.E. Civil Engineering
    - Represented Lithuania at European Council in IIT MUN.
    - Represented China at Human Rights in Hindustan Young Leaders Conference MUN.
    - Represented Iran at International Atomic Energy Agency in VIT Chennai MUN.
- Chandramouleeshwar G, III year B.E. Civil Engineering (Badminton)
    - Runner up at Loyala trophy, Chennai.
    - First place in Badminton at Kamaraj trophy, Kamaraj Engineering College, Virudhunagar.
    - Participated in All India Senior Ranking Tournament in Badminton held at Gujarat.
    - Bagged Bronze in State Senior Championship, single and mixed doubles held in Karur.
    - Runner up at Manipal University, Mangalore.
- Dharmasekaran K, III year B.E. Civil Engineering (Badminton)
    - First place in Badminton at Kamaraj trophy, Kamaraj Engineering College, Virudhunagar.
    - Runner up at Manipal University, Mangalore.
    - Participated in the tournament held at Koneru Lakshmaiah University.
- Sai Pradeep M, IV year B.E. Civil Engineering (Basketball)
    - Winner at Sports Fest, Gudlavaleru Engg. College.

ASSOCIATION OF CIVIL ENGINEERS

The office bearers for the Association of Civil Engineers (ACE) were elected for the academic year 2017-18.

- President : K S Dharanedharan (IV year)
- Vice president : R Gohila (IV year)
- Secretary : C Sudharsanan (IV year)
- Treasurer : A Salman Fyas (IV year)
- Joint secretary : C Acash (III Year)
- Assistant treasurer : R Karthik Raja (III Year)
- Executive committee members :

  S Kim Nepheg (IV Year)
  M Vinoth (IV Year)
  V Srinivasan (IV Year)
  P Bala Subramanian (IV Year)
  G Hari hara Shanmugan (IV Year)
  A Ajaykumar (III Year)
  P Ravi kumar (III Year)
  S Sabarish (II Year)
  R S Vishvaa (II Year)

Interaction with Alumni – Tribute '17

SELF HEALING CONCRETE - A MIRACLE

Concrete has the distinction of being the world's most popular building material ever since the Romanian age (nearly 2000 years old). In this developed technological world, **we are looking for ways to make concrete more durable**, having developed concrete with unimaginable strengths.

No matter how carefully it is mixed or reinforced, **concrete eventually cracks** and under some conditions, these cracks can even lead to collapse of the structure.

"The problem with cracks in concrete is leakage", explains Professor Henk Jonkers, Delft University of Technology, Netherlands. Cracks result in the seepage of water through the basements and if this water gets to the steel reinforcements, they would corrode and lead to the downfall of the structure. But Jonkers has come up with an entirely new way of giving concrete a longer life. *"We have invented bioconcrete, a concrete that heals itself using bacteria"*, he says.

Bioconcrete is mixed just like regular concrete but houses an extra ingredient, i.e., the *"healing agent"*. **The bacterial healing agent remains intact during mixing and dissolves and becomes active only if the concrete cracks and water gets in.**

Jonkers, a microbiologist, began working on it in 2006 when a concrete technologist asked him if it would be possible to use bacteria to make self-healing concrete. It took Jonkers three years to crack the problem but there *were some tricky challenges to overcome.* ***"You need bacteria that can survive the harsh environment of concrete"***, says Jonkers. "It's a rock-like, stone-like material and is very dry".

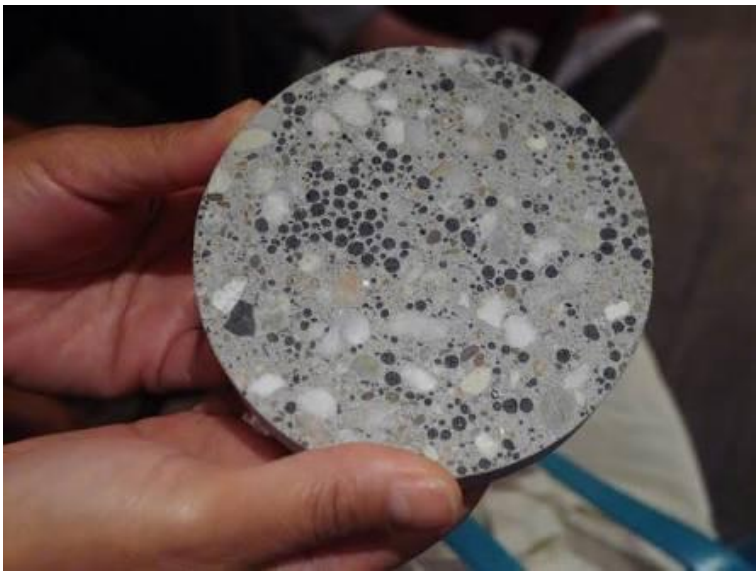
Concrete is extremely alkaline and the *"healing"* bacteria must wait for dormancy for years before being activated by water. Jonkers chose **bacillus bacteria** for the job because they thrive in alkaline conditions and produce spores that can survive for decades without food or oxygen.

"The next challenge was not only to have the bacteria active in concrete but also to make them produce repair material for the concrete", Jonkers explains. **Limestone was chosen as the *"repair material"***. In order to produce limestone, the bacilli needed a food source. Sugar was one option but adding sugar to the mix would make the concrete soft and weak. In the end, Jonkers chose calcium lactate, setting the bacteria and calcium lactate into capsules made from biodegradable plastic and adding the capsules to the wet concrete mix.

BACTERIA that HEAL CONCRETE

When cracks eventually begin to form in the concrete, water enters and opens the capsules. The bacteria then germinate, multiply and feed on the lactate and in doing so, they combine the calcium with the carbonate ions to form calcite (limestone), which closes up the cracks.

Nature has been supplying us a lot of functionality for free and implementing them in materials would prove to be beneficial. Bacterial self-healing concrete would be **great to tie nature and the built environment together** in one new concept.



Section of self healing concrete embedded with bacteria+calcium lactate capsules

- **Rakesh S**
III, B.E. Civil Engg.

THE LEANING TOWER OF PISA

Ever wondered why "The leaning tower of Pisa" is leaning?

If you have guessed that it was built at that inclination, then you are wrong…Come on…let's go on a tour about the tower.

HISTORY OF THE BELL TOWER OF PISA

The construction of the tower started in 1173 AD and it continued in three phases due to intervention of war and social unrest. The construction continued for nearly 200 years and was completed in 1372.

During the initial stages of construction the tower started to incline towards the southern side. Steps were taken to compensate for the inclination by increasing the column heights on the inclining side; however work was disrupted due to political unrest. Then as the construction continued, the inclination worsened over the years. The inclination of the tower was nearly 5.5°.

REASONS FOR THE TILT

Earlier, no information causing the tower to lean was known. But later, John Burland, an English geotechnical engineer analyzed the underlying strata. It consisted of sand and clayey silt for a depth of about 10m. And under that was marine clay for 40m depth. Under which lied dense marine sand for about 60m depth. He concluded that due to the soft clay that was lying under an insufficient foundation of 3m width, the famous leaning tower would have settled.

But if that is the only reason it would have settled evenly. Further studies showed the existence of a fluctuating water table at 3m above the mean sea level. This was located below the northern side of the tower and thus it might have caused uplift pressure on the northern side and would have caused the southern side of the tower to tilt and settle.

A tourist can be seen posing for a perspective view with the tower.

TOURISM

People were not allowed inside the tower owing to the mass stabilization project for a long time. The building was reopened for public in December 2001.

One of the main aspect that was taken into consideration while stabilization was to relieve the tower of strains in the southern side (sinking side) and not correct the tilt completely as it was a major tourist attraction. More than 6 million people are lured to see the leaning tower in a year. Tourists can be seen trying to get a perspective image of themselves lifting or pushing the tower.

GEOTECHNICAL IMPORTANCE

The tower exists as a lesson for all geotechnical and civil engineers urging them to be knowledgeable about underlying strata, variation of groundwater levels between rainy seasons and also their changes between the length of the building.

It also emphasizes the fact that building structures on soft clay soils requires strong foundation and periodical assessment on settlement.

- **Chitralekha R**
III, B.E. Civil Engg.

QUEST FOR SMARTNESS

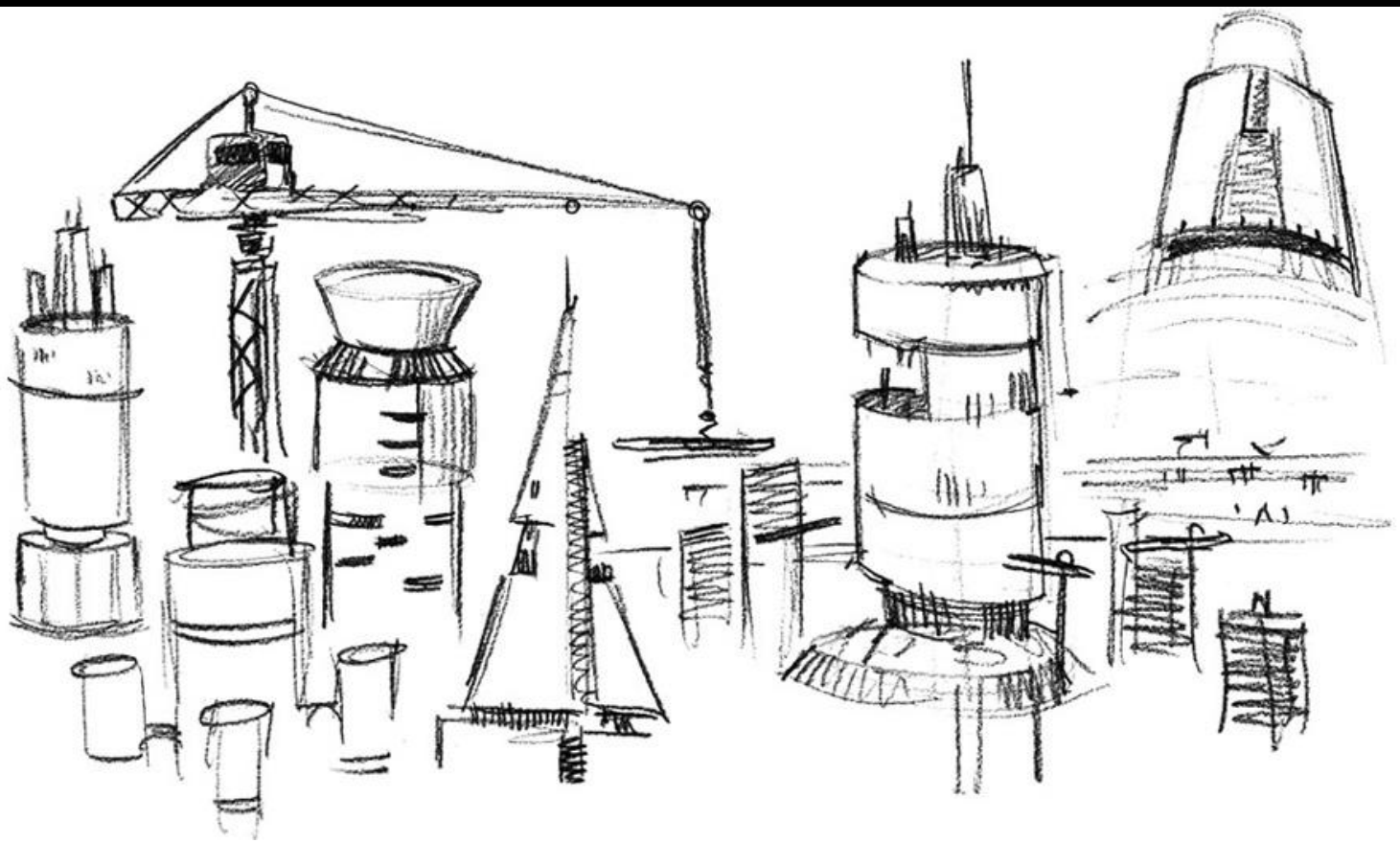
The craze for smartness is never-ending. From phones and watches to entire cities, all things around us are turning smarter by the day. This drive has led to the creation of a new family of construction materials that are smart.

What do these materials do that makes them smart? Well, they turn masses of dumb old bricks and mortar into **sensing, reacting systems of intelligence**. An alternative way of explaining this is that these materials give engineers an excuse to make structures that do cool things.

Smart materials are engineered to respond to environmental stimuli such as temperature, pressure, and the presence of other gases. Self-healing functionality of construction materials is being vigorously studied. Self-healing coatings, sealants and adhesives have been synthesized, that extend the life of structures esp. marine based.

Concrete, is one of the basic building materials used. Though it has high strength it starts to crumble when it comes face-to-face with water, wind and pressure. Till date, the only solution to deal with the structural instability is to replace or repair it. **Smart concrete** heals its own crack in time. It contains dormant bacteria spores and calcium lactate in self-contained pods. When this concrete comes in contact with water, limestone is created which joins the cracks. Smart concrete is still being tested to determine how long the bacteria sustains itself. Researchers hope to be able to introduce smart concrete into the industry soon.

Structures are subjected to great amounts of stress during natural calamities. **Shape shifting metals** can withstand huge stresses and can temporarily change shape, since they are designed to 'remember' their original form and are capable of reverting to it if altered to some extent. Used in the construction of a bridge, for example, would help sustain the bridge against damage from a hurricane or earthquake. This type of metal is chiefly still in the development phase, and its practical use in the construction industry is being specifically studied by scientists.



Imagine a world where all structures tall and short, big and small can process and react to external environmental stimuli. A wide range of smart construction materials are under development. At present these materials are only aimed at improving the lifetime of structures. **In future, buildings may just be able to shape shift, like structures out of the pages of a science fiction novel.**

Except, this wouldn't be fiction anymore.

- **Sadhana S**
III, B.E. Civil Engg.

A GUIDE TO GETTING STARTED WITH RESEARCH – FROM THE PERSPECTIVE OF A FIRST YEAR

I've always had the passion for making new and innovative things, right from my childhood. I had participated and won in national level science projects during my high-school days and I wanted this to continue even during college. Fortunately, our college provides ample opportunity to pursue such interests right from the first year. This is when I decided to start my project under the internally funded students' research project. This write-up is an amalgamation of my thoughts and experiences regarding the same.

Forming the Project Team

Forming a team to start the project is a critical task. If you get it right, you can immeasurably improve both the efficiency of the project and its outcome. You need the right mix of skills and personalities to ensure that the task gets done with minimum friction among the teammates and with the maximum effectiveness.

Be very selective while doing this.

I had formed a team of four, from which 3 were hostellers and 1 was a day scholar. The reason behind going with the one day scholar is that he could be the mediator between the SSN campus and the market for doing work like buying material and tools for the project work.

Selecting an Area of Research

After setting up the team, the next big thing was to choose the topic. Really, being in the 1st year of Civil Engineering, we didn't have any idea of how things actually work in the field. We eventually realized that we needed guidance from our department professors and we consulted the department faculty handling classes for us and our seniors.

Choosing a Faculty Guide

Referring our college website, we got to know about all the faculty, their research work and their area of interest. We decided that we wanted to work with Dr.Y.K.Sabapathy, Professor. He has done extensive research on Fibre Reinforced Plastic (FRP) reinforcements in concrete. We went through the basics about FRPs, and all my teammates were very interested in FRPs. We then got in touch with our guide. He warmly welcomed us to work with him.

More & More of Study

As we only had a mere knowledge about FRPs, our guide gave a number of topics related to FRPs, and let us choose one of our own interest. The first thing we did was searching the topic in Google Scholar, a free search engine for literature, academic journals and research paper by scholars. It had thousands of research works related to the suggested project topic. It was really an arduous job to even have a glance of the research papers with our limited knowledge. But we didn't give up, we often visited our guide with a lot of queries and returned from there with a lot of enthusiasm, for coming up with more such stuff. We also used the online resources like Sciencedirect and Elsevier journals subscribed to by our college for understanding the state of the art and check the feasibility.

Finally, we chose to investigate the influence of bone shaped aluminium fibres on the strength properties of concrete.

The Very Beginning

Once you have done all this, you will have a brighter picture about your project in hand which you can invest your efforts and time in. We had requested for funding for our project and we were asked to submit our proposal. We made our first formal presentation to an expert panel and got our project approved for funding.

And this is where our journey begins. This is where our knowledge, passion and vigor amalgamate to produce great results and get strengthened.

I still remember my dad joking about me getting into research when I first told him that I was going to do a research project. It was indeed good to show him the project approval order.

A note to the juniors - 1st year students should form a team with the seniors. I say this because, a deep subject knowledge is of vital importance for any research. So by working with the seniors, you get to know a lot of the subject concepts of your area of research, which is most likely to be studied in only in the 2nd and 3rd year of academic session.

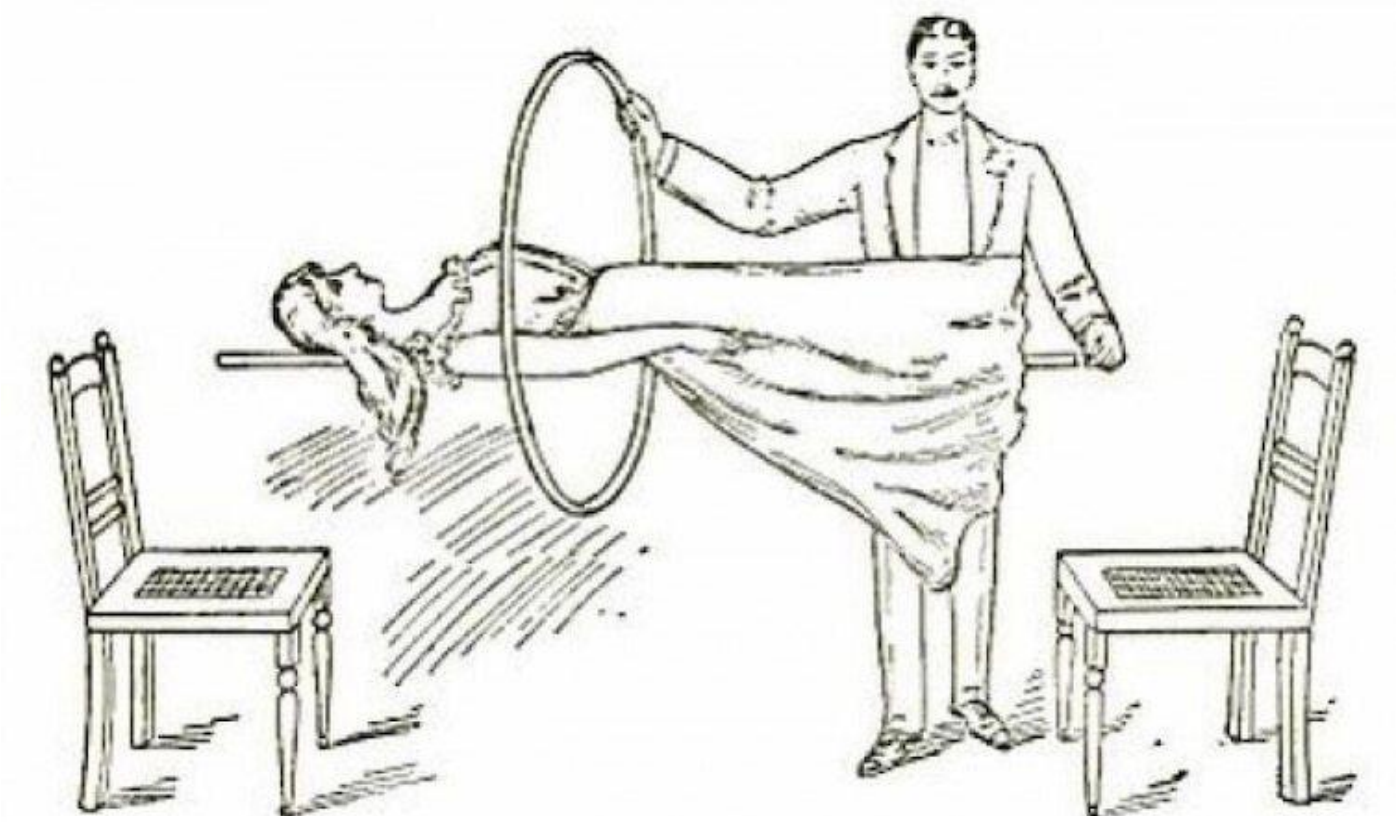
"Every expert was once a beginner" - Rutherford B. Hayes

- **Sabarish Selvam**
  II, B.E. Civil Engg.

INTROSPECTING ARTS

Let's start analysing artists, but wait.....

Ever felt to ponder, if magic tricks played on a public show were results based on authentic supernaturalism? Let us conceive that it is merely the audience failing to interpret the science behind the master's foolproof technique. But we never sit down to blame the idiocy of we spectators, do we? Rather, we give it to the sheer brilliance of the magician to have pulled the wool over our eyes.



So how thin is the line of difference between the performer on the stage and you there? Is it that considerable distance between a 3-D spectacled chap on the seats and the animated dream he's observing on the screen? Or are you the one wondering why the Kenny's stand-up isn't up to his previous shows, and in dire assessment upon the acquired frustration? Do you equate the satisfaction of a show in cash, time or, something else? How could you possibly react, if you got cheated?

Legitimate as it may sound, blaming it all on him seems a direct alternative, for you're entitled to do so. Shedding empathy on his off-day is a second line approach- a good way to go, but one that cannot go on forever too. Remember that there's never a centum heads-up for any artwork. In fact it is the creators themselves who hate it the most sometimes, when they release it.

But it isn't practical for us to just jump on the field to substitute your artist, is it? If a fan has to become his celeb, he has to travel all through his ups and downs, all up to to this juncture, and then correct this day, leave alone bettering him. So we prefer just to be us. Setting aside the notions to outsmart artists, we conclusively adhere to the ground reality. Accepting that, artists have chosen the path to please us, and we have signed only to relish their comic pleasures. An anti-climax for a bad show, and a dejected viewer returning home; once bitten, twice shy.

Artist, for this matter, ought to be doubly vigilant in not only winning hearts by spectacular performances, but also by politeness they must exhibit towards their audience. Just like how an extra tinge of honey can ruin not only the pudding but also the eater's entire day out, exercising caution in one's art is of prime significance. If art is what that makes them live for, the audience's praise and money is what that makes them live with. An artist's gesture of playing to the comfort zone of his crowd is undoubtedly necessary, but may well be undesirable in many aspects.

History has always showed up these poor stories of the ascent of monetary in compromise for art. Whenever "quality of art" comes into picture, this customer-and-artist relationship provides varied conclusions. The remuneration of a street artist who indulges in serious business risking their life and a sudden new-age sensation is like chalk and cheese. When market becomes all about glam and cheesy moderations, it focuses only on wooing the audience at the expense of disrespecting the art. True artists lose their charm, and job satisfaction meanders around this undefined circle chamfered about people's choices, where money takes the centre-stage. They are affluent, even eminent, but they aren't artists- because, artists have an additional responsibility of shaping minds.

The arc of an artist is thus vast, ranging from entertaining from the word go to instilling responsibility in gestures and actions. So much so that he mustn't be the one, who goes by the path audience demand, but is the one who is willing to risk the alternative. He doesn't stop there, but relentlessly keeps his so-called masters guessing till the very end, and ultimately provokes them to think about going by his new-found path. If a comedian is merely going to tickle your funny bones, go enjoy those moments. If a theatre artist is going to send thrills down your spine, get ready for the experience. But if a filmmaker is going to present to you a whole new perspective about what you see daily, do not even miss it. He is offering you a chance to play your minds and indulge in a difference- of perception, of commitment, of art.

That's when you can get the better of your artist. No joy can ever beat finding the real trick of a magician. It's the indicator that a potential rivalry is running between artist and crowd, that art is winning. So, if you want to criticize an artist, you must first prove to everyone why you are better than him. On the contrary, if the artist is only going to subdue his audience all the time, it more than ever proves why he is going to be the most celebrated artist of that generation.

But we can all be sure of one thing. Just like equality of the forward and backward of chemical reactions involves no meaningful change, equality of debt and surplus indicates no prospective trade growth; an equilibrium stage in this consumer-artist relationship is not going to help anyone. Without rising and falling of various experiments in art, society only enjoys being standstill, to say the least. So get out of your shoes to exercise dominance over your potential opponent.

Wait, wait, are you going to be the artist, or the critic?

- **J Gokul Krishna**
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