WE NEED A SPIRIT OF VICTORY, A SPIRIT THAT WILL CARRY US TO OUR RIGHTFUL PLACE UNDER THE SUN, A SPIRIT WHICH CAN RECOGNIZE THAT WE, AS INHERITORS OF A PROUD CIVILIZATION, ARE ENTITLED TO OUR RIGHTFUL PLACE ON THIS PLANET. IF THAT INDOMITABLE SPIRIT WERE TO ARISE, NOTHING CAN HOLD US FROM ACHIEVING OUR DESTINY.
I am glad to know that Faculty of Engineering and Technology, Manav Rachna International University is bringing out the Technical Magazine, INGENIEUR SPHERE. I take this opportunity to congratulate the management, faculty members, students, the editorial board and all the contributors for helping in bringing out this issue.

By nature, human beings have a strong unending urge for self-expression through creative endeavours. The magazine INGENIEUR SPHERE is a platform to give expression to the thoughts, ideas and the artistic pursuit of students. This is the age of cut throat competition in every field of activity. Apart from being adept in the field of study, one needs to have a holistic development of personality and this is our priority. The magazine INGENIEUR SPHERE is a unique blend of art and technology, and it allows for new medium and avenues of expression to be explored in amazing ways. Our budding engineers definitely have hidden technical writing talents struggling to find a medium of expression. I am glad that FET has created this avenue for the students.

I send my best wishes to the whole team of the magazine INGENIEUR SPHERE. I am very sure that under the dynamic leadership of Dr. Prashant Bhatia, President MREI and Dr. Arpit Bhatia, Vice President MREI, the tireless effort of FET, the editorial team, INGENIEUR SPHERE and enthusiasm of the students, the magazine will be a true mirror, reflecting the creativity as well as the outstanding achievements of the students.

Dr. N.C. Wadhwa
I have always fostered the idea that educational institutes must provide maximum avenues to students to identify themselves their physical, mental, emotional, visible and hidden potential. We at MRLU earnestly try to provide them adequately with such facilities in the form of sports, cultural activities, professional visits, workshop experiences and exposure to industries. The technical magazine INGENIEUR SPHERE published by Faculty of Engineering and Technology is yet another cornerstone in this direction. This magazine opens a new canvas for the students for expressing their creative talents, sharing their views and feelings on different aspects and shades of technology. This journey goes a long way in stimulating and training their minds to learn, assimilate and express.

Shaping the magazine into something aesthetic, innovative, distinct, consistent and meaningful is certainly a gratifying experience. It is rather a daunting challenge, but the final triumph in giving shape to the students' vision endows them with a sense of accomplishment.

I congratulate all the students, faculty members and editorial team who have contributed in making this venture a success.

Prof. (Dr.) M.K. Soni

True education is the education that encompasses intellectual, moral, emotional, social and physical dimensions. With primary purpose to assist students in grooming them to become active and contributing members of the society. We encourage students to work towards developing social, artistic, athletic, cultural, emotional, moral, societal and humanistic elements of their lives. Every student is special, and we believe that given the right environment and ample opportunities, every student has the potential of shining in one field or the other.

Technical Magazine INGENIEUR SPHERE being published by Faculty of Engineering and Technology is one such prospect, where each and every student is welcomed to express and explore his/her creative urge. It is heartening to note that our students, who are primarily technically inclined, do not lack in expressing their ideas. I am pleased that the students and faculty editorial team members have been extremely enthusiastic in bringing out INGENIEUR SPHERE and have whole heartedly contribute in making the magazine a window through which we can gaze at the young and energetic lives of our students, their thoughts and dreams, their aspirations and hopes.

I congratulate each and every person who has contributed in bringing out INGENIEUR SPHERE.

Prof. (Dr.) Naresh Grover
Dr. Krishna Kant
Executive Director & Dean, FET

In a young person’s life choosing a career and that too in a right way, is highly significant. The students of FET, MRIU have decided to be engineers. Engineers are the backbone of the developments in any country. Technological development alone will take India to the forefront of developed nations and the speed of this technological revolution will be due to the contribution of students. I hope our students will actively participate in the process of building a prosperous and technologically advanced India.

In the journey of life, the path one takes is as important as the destination itself. While pursuing one’s education, one should pause and introspect! The question one may ask oneself is – Are we really fully utilising the opportunities offered to us? In the ever changing and highly competitive environment of today, it is imperative to make each day a new learning experience. MRIU presents ample opportunities to the students to make their personality multi-faceted by giving them a chance to be a part of various co-curricular activities. I am pleased that the Faculty of Engineering and Technology magazine INGENIEUR SPHERE has given our students an opportunity to explore their talents in technical writing and a medium of expression. My best wishes to all the students, faculty members and editorial team members who have contributed in making the magazine a reality.

Prof. (Dr.) Krishna Kant
The Great Indian physicist Chandrasekhar Venkata Raman, popularly known as C.V. Raman, was born on 7th November, 1888 at Trichirapalli in Tamil Nadu. His father was a physics teacher and so it was natural that Raman developed love for this subject. He was a brilliant student from the very beginning. As a brilliant and promising lad, he passed his matriculation examination at the young age of 12 from Madras University. His parents wanted to send him to England for higher studies but his poor health did not allow it. So, he studied at Hindu College, Visakhapatnam and Presidency College, Madras. He obtained his post graduation degree in physics in 1907 with the top position.

During his student period he conducted many researches and published his papers in many reputed magazines. Chandrasekhar Venkata Raman in the same year, that is, 1907, bagged the first position in the Financial Service Examination and was appointed as the Assistant Accountant General in Calcutta. There he came in contact with an eminent scientist named Dr. Amritlal Sarkar who was Secretary of the Indian Association for the Cultivation of Science. This contact with Dr. Sarkar proved a turning point in the life of this young scientist.

His interest in physics was deep and lasting, so he continued his research work in his spare time in the laboratory of the Association. He published his research results in the leading journals of Calcutta, now Kolkata which were in regard to the subject of propagation of light. These original research papers were of great scientific significance. When these came to the notice of the then Vice - Chancellor of Calcutta University, Sir Ashutosh Mukharjee, he appointed him Professor of physics in the University. During his stay at the University he continued his research with much more devotion and won immense honour and recognition as a physicist.

He was elected the Fellow of the Royal Society of London in 1924. He discovered the “Raman Effect” in 1928. For it he was awarded the Nobel Prize for Physics in 1930. He became the first Indian to win this prestigious honour. With this award, his reputation increased by leaps and bounds and many Universities and institutions of repute honoured him with Ph.D and D.Sc. degrees.

In December, 1927 he was busy in laboratory when the news came that the well-known physicist A.M. Compton was awarded the Nobel Prize for demonstrating that the nature of X-rays undergoes a change when passed through a matter. This effect came to be known as the “Compton Effect.” Encouraged by this discovery, Raman continued his experiments and ultimately proved that light rays can also be scattered. His discovery enabled for the first time, the mapping of possible levels of energy gains of molecules and atoms of a substance and thus discovered their molecules and atomic structure. This discovery of the scattering of light led to the development of a simple alternative to infra-red spectroscopy, namely, Raman Spectroscopy.

Raman Effect happens when molecules of a medium scatter light energy particles known as photons. The spectrum varies with the nature of the transparent medium used to scatter the light. Raman Effect has proved to be of great scientific value and with its help the structure of more than 200 compounds has been known. He also gave us the scientific explanation for the blue colour of the sky and the ocean.

He explained that the blue color of the ocean was as a result of the scattering of sunlight by the molecules of the water. He travelled widely abroad delivering lectures about his discoveries and researches. In 1933 he became the Director of the Indian Institute of Sciences, Bangalore. In 1943 he founded the Raman Research Institute at Bangalore. He was knighted in 1927. He was awarded the Bharat Ratna in 1954 and the International Lenin Prize in 1957. Raman was a born genius and a self-made man and scientist with deep religious convictions. His interests were wide and deep and so were his contributions to the human knowledge and development. Besides optics, he was deeply interested in acoustics—the science and study of sound.

His contributions to the mechanical theory of bowed, stringed and other musical instruments like violin, sitar, cello, piano, veena, Tanpura and mridangam have been very significant. He explained in detail how these musical instruments produce harmonious tones and notes. He died on November 21, 1970 at the ripe age of 82 at Bangalore and his mortal remains were consigned to flames in the campus of the Raman Research Institute.
The human body is a complete ecosystem. This may sound bizarre but it is true. Our body is teeming with microorganisms and this incredible collection of microorganisms is known as ‘Human Microbiome’. Human microbes outnumber our own cells by a factor of 10 to 1. What’s more is that scientists have proved that humans harbour more than 100 genes from associated microbial community! National Institute of Health (NIH) embarked on an ambitious project to catalogue the ‘Human Microbiome’. The project has unveiled many surprises and has led to the discovery of many new species of microbes. The diversity of species thriving on human body includes bacteria, viruses, mites and fungi who are our partners for life (literally staying longer than our spouses) in health and disease and in happiness and sorrow.

Human microbiome is known to be unique so much so that microbiome fingerprint can be used to identify humans that too without any need of human DNA! Many microbial species have co-existed and lived in evolutionary relationship for hundreds of years. Most of these organisms are harmless and hence known as commensals. However, they can become opportunistic pathogens if natural immunity has been compromised. These microorganisms play an essential role in digestion and development immunity. In contrast, some of the microbial species are causative agents of deadly and chronic diseases.

Surprisingly, the microbial communities are also specific to the body parts they inhabit. Human gut alone harbours upto 1000 different species of bacteria. In the return of a safe abode that we provide in our body, they help in food digestion, they avert the attack of harmful microbial species and prevent formation of ‘enemy camps’ in our intestine.

They help in production of vitamins B and K and also work to modulate and ‘train’ our army of immune cells to recognize the harmful microorganisms. Surprisingly, scientists have discovered that the gut microbiota of slimmer humans is better in breaking down food as compared to obese humans. The benefits of gut microbiota have been realized by the world and have led to the development of ‘Probiotics’ industry. Our skin houses several microbial species and they again form first line of defence against the pathogens. However, some skin bacteria colonize oil glands and cause acne. Sweat which is odourless becomes smelly due to microbial activity. Interestingly, the uniqueness of sweat smell correlates with the unique amalgamation of microbiota it supports! Little do we know that ‘mites’ or ‘Demodex’ live in our eyelash and eyebrow follicles? They roam and mate on our face and reproduce, lay eggs in the follicles! Creepy! Most of us know about intestinal worms, roundworm, hookworm and tapeworm that suck our blood and cause deficiency diseases.

Last but not the least are the viruses! The vast diversity of viruses living on and in a human body have given birth to a new term ‘virome’ which includes viruses that infect human cells and also those that infect the bacteria or bacteriophages that live in human body. These also are involved in different processes such as immune modulation and obesity. It would sound unbelievable to many that microbiome not only alters the physical conditions but has a power to control our psyche. The infection of a protozoan Toxoplasma gandii causes ‘fatal attraction syndrome’ in rats. Infected rodents have slower reaction times and are more likely to be eaten by cats! Similarly, infected humans showed slower reaction times and were more likely to be involved in road accidents! The human microbiome project is still revealing interesting facts and I feel that it is just a tip of the iceberg.

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Liquid Biopsy

Cancer is considered to be one of the leading causes of fatality worldwide. According to WHO, the number of new cancer cases is expected to rise by about 70% over the next 20 years. Identifying cancer in the body is a painful process which involves removal of a piece of tissue or a sample of cells from the body to be analyzed in a laboratory.

Liquid biopsy is the sampling and analysis of non-solid biological tissue, primarily blood. This technique is mainly used as a diagnostic and monitoring tool for diseases such as cancer with the benefit of being non-invasive. Although FDA has approved and validated this procedure but its clinical implementation is yet to be widespread.

This process removes the need for invasive surgeries, which are painful and expensive, by testing the signs of cancer from a simple blood draw. It has been made possible by advances in sequencing the human genome because cancer can be detected by genetic mutations. Some of the cancer mutations can show up in microscopic fragments of DNA in blood because tumor-related circulating free DNA, RNA or proteins are released by tumor cells in the blood.

Depending upon the condition studied, there are several types of liquid biopsies. Some of them are:

1. Circulating tumor cells (CTCs) and cell free tumor DNA (cfDNA) are collected in case of cancer.
2. Circulating endothelial cells (CECs) are sampled for heart attack diagnosis.
3. Cell-free fetal DNA (cfDNA) is extracted from maternal blood in prenatal diagnosis.

Liquid biopsy is not only used in detecting cancer at an early age but it is also used to help in planning the treatment, to find out how well treatment is working and detecting if cancer has returned. Multiple samples of blood can be taken over time which helps in understanding the molecular changes taking place in the tumor.

Circulating cfDNA is highly fragmented and exists at very low concentration, but cfDNA enrichment technology enables nearly full recovery of cfDNA from both necrotic and apoptotic cells. Detection of such mutations is important to monitor tumor progression before they reach a size amenable for diagnostic imaging. It also helps uncovering tumor heterogeneity, which may influence treatment decision-making. Exosomes and microvesicles in the family of extracellular vesicles are purified and analyzed and represent a source of variability for data integration in the field.

The research is still underway whether liquid biopsy is the full-proof method for detecting cancer. Much of the research is focused on how to detect and analyze the “circulating tumor DNA”. But since it is found in a very low concentration, Hong Kong scientists looked for DNA from Epstein Barr, which is a virus that causes nasopharyngeal cancer. But since Epstein Barr DNA is related to many other conditions such as plain EBV infection, the results of liquid biopsy done on volunteers produced many false positives. But as said earlier, it may not be obvious from scans that a patient is in danger, and where solid biopsies are not feasible or imaging is inadequate, studies are starting to demonstrate that CTC levels can reflect more on metastatic potential.

Hence absence of evidence is not evidence of absence.

Author

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The self-explanatory term “vertical forest” also known as green wall or living wall is a self sufficient vertical garde attached to the exterior or interior walls of a building, where deforestation and pollution have become a serious trouble and more of concern in big cities with depressed air quality. As the pollution level is going high the required green cover is shrinking. Urban living and lifestyle has raised the number of apartments in metropolitan cities. This has led to the invasion of high rise all over the developed countries. For a nature lover, it is very difficult to have their own garden especially when they are residing in a condo. Hats-off to the techno world by which the vertical garden theme can let you indulge in gardening and prove your love towards flora. This can be attained by cultivating a vertical garden in the apartment balconies or any other appropriate place.

This will help create green walls in limited space of your apartment. A vertical garden will give your home a chic look by acting as an elegant home décor as well as it freshens up the air. Famed with distinct rare titles as vertical forest—Bengaluru (India), Bosco Verticle-Milan (Italy), la Tour des Cédres (Switzerland), Vertical Green (Singapore) are catching everyone’s eyes with its welfare.

These steel buildings are made of entirely of reinforced concrete. The design was tested in a wind tunnel to ensure the trees would not topple from gusts of wind (tested at Florida International university with wind test 67m/s). At least one-fourth area of each floor is reserved for flora. They can bear sufficient load imposed by the plants. When such structure are made the botanists and horticulturists are consulted to ensure that least care is needed to maintain the building. Chiefly, indigenous species are planted on the building.

The nature loved buildings have made the wild cities good for health. Numerous comforts are accounted like they help to mitigate smog hence reducing urban heat, moderating temperatures in the building in the winters and summers also attenuating noise. These multi aptitude building can act as doctors too, fascinating us by speeding up recovery time for patients through biophilia. We know Flora and fauna have a everlasting bond. Many garden pests come up being attracted by the greenery making the residents edgy. Moreover planting the concept is high-priced. At such heights, trees perish after a year or so.

What the architectures have done until now is simply to continue to add new peripheral environments to their cities. They have created these breathing buildings in immense metropolitan environments. They have imagined a new model of city that is not about extending and expanding but a system of small, green cities and China is taking first step by building the Nanjing Towers and once they’re complete in 2018 they’ll be Asia’s first ever vertical forests.

Authors

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Description: Google recently launched a new version of Google Earth on android. Fly through landmarks and cities like London, Tokyo in stunning 3D, then dive in to experience them firsthand with street view. Google has teamed up with some of the world’s leading storytellers, scientists and non-profits to bring the planet to life with Voyager, a showcase of interactive guided tours. E.g. with Natural Treasures from BBC Earth, journey to six habitats—from islands to mountains to jungles and learn about the unique and thrilling wildlife in each.

If you wish to create a link to specific part of the video then here's how to send them a link which starts the video from the desired point on the timeline. Simply scroll to the point where you want the shared video to begin from, right click on the video and select ‘Copy video URL at current time’. Then paste the link in an email or message.

If you wish to spell the letters ENOTSUIDROW in one word, the word is "NOTES".

The maximum number of Ferrero Rocher chocolates eaten in one minute is 9, achieved by Peter Czerwinski in Mississauga Canada, on 4 January 2012.

Which one of the following - A, B, C, D, or E is the odd one out?

3. 50% of people use Google as a search engine the other 50% use it to check if their internet is connected or not!
4. 3 Stages of life:
   a) Birth
   b) What's going on?
   c) Death.

1. Student submits blank answer paper in exam.
   Teacher: “why is your paper blank?”
   Student: “Because sometimes silence is the best answer”.
2. 1 stone is enough to break a glass.
   1 sentence is enough to break a heart.
   1 second is enough to fall in love.
   Then why is 1 chapter is not enough to pass the exam???

1. A ___ current is electricity that moves in only one direction.
2. A device that either raises or lowers the voltage of electricity.
3. When perspiration evaporates from the surface of your skin, your body ___ heat.
4. Sound travels through ___.
5. A change of state of matter is ___ change.
6. When we fry an egg, it changes when it interacts with which form of energy.
7. A measure of quantity of matter in an object.
8. ___ is needed to do work.
9. Female sex cells.
10. A metal which can be magnetized.
11. Lens to make things look bigger.
12. Transparent material that disperses light to form a spectrum.

Fun Fact
The maximum number of Ferrero Rocher chocolates eaten in one minute is 9, achieved by Peter Czerwinski in Mississauga Canada, on 4 January 2012.

Picture Puzzle
Which one of the following - A, B, C, D, or E is the odd one out?
The 2018 Dodge Challenger SRT Demon is so powerful that it is the first ever Guinness-certified production wheelee car. Ladies and gentlemen, it is the fastest quarter-mile production car of the world, the most powerful V8 production car in the world, first ever front wheel lift in production car, and produces the highest G-forces ever experienced in a production car. Dodge's latest monster muscle car is a mega-power drag race special, and its name is Demon. Muscle cars over the years have tried to become performance cars, sports cars and even drift cars. But while doing all this, they had lost out the most important flavour which defines them - raw power and straight line acceleration.

The 2018 Dodge Challenger SRT Demon is built with just one aim: to obliterate any other production car in a 1/4 mile drag. As a result, the red demon shoots from 0-50 kmph in 1.0 second, producing 1.8g, 0-100 kmph in 2.3 seconds, and crosses the ¼-mile mark (400 metres) in a record-breaking 9.65 seconds while going at 225 kmph. The problem is that SRT Demon did so well that it got banned from the drag strip for being too fast. Yes! the NHRA (National Hot Road Association) of the USA has banned this car from its competitions as it is faster than their set bar for a production car.

Also, to help you shame Ferraris and Lamborghiniis on the streets, all customers who buy the new 2018 Dodge Challenger SRT Demon will receive one full day session at Bob Bondurant School of High-Performance Driving. It even gets drag-spec radial tyres for you to launch ahead and leave behind even the Grim Reaper himself. So, what makes the Challenger SRT Demon such a, well... demon on the drag strip? The answer is not as simple as you would expect it to be. To begin with, the car is powered by an 840PS, 6.2-litre HEMI Demon V8 engine which produces 1044 Nm of mountain-moving torque. These figures, though make the Demon the most powerful production V8 in the world, are insignificant. Why is it so? Because it's not about how many horses the car packs, but how it puts it on the tarmac which matters. And this is where the Demon gets clever (geek talk alert).

The SRT Demon uses a TorqueFlite 8HP90 eight-speed automatic transmission with TransBrake. It locks the transmission output shaft to hold the car in place before a standing start. This lets the driver increase the engine rpm up to 2,350 without overpowering the brakes, resulting in quicker power delivery and up to 15 per cent more torque at launch. It also features a new Torque Reserve feature which becomes active once engine speed passes 950 rpm.

The one thing which might upset some buyers is that the 2018 Dodge Challenger SRT Demon, in its bid to lose weight, comes with just one seat. So, while you become the fastest man on the planet launching your car, your friends can only appreciate this from the outside. But if you insist on keeping them inside the car, Dodge will install the front and rear passenger seats for a price... which is $1. Other than the optional extra seats, the SRT Demon has all the bells and whistles which one can expect from a 21-century car. It has air conditioning and an 8.4-inch Uconnect touchscreen infotainment system on which you can track the supercharger coolant temperature and know in real time when the supercharger is at the optimum temperature before making another run.

All the above performance numbers and figures come with a catch, or rather in a crate. The Daemon only produces about 808PS of power and to get the extra 32PS, you need to purchase the Demon Crate. The crate brings with it components which fully unleash the car's potential at the drag strip and is fully customised with the buyer's name, VIN and serial number.

It contains parts like a conical performance air filter, passenger mirror block-off plate, drag-specific narrow front-runner wheels and also a demon-branded tool bag with a foam case which fits into the SRT Demon trunk. SRT Demon's setup will allow for numerous user-configurable performance parameters. Street mode permits multiple levels of engine performance and three levels of individual suspension and steering “feel and response.” Drag-mode options include the selection of multiple levels of engine performance, one level of transmission speed and firmness, traction control, and suspension and steering feel and response. Well, it looks like I am in love with a demon!
Traditional electronically controlled and software driven mechanical systems are things of the past. Today mechatronics products can be connected to the internet, offering both internet driven capabilities and communicating back to the original manufacturer. It appears like both have nothing to do with mechanical engineering; however, mechanical engineers need to take broader considerations into account while designing the mechatronic products. Traditional mechanical engineering skills alone cannot land you in a prospective job in this computerized world of Industry 4.0.

Many students passing out from mechanical engineering cannot figure out what to do next? Only a few lucky ones get the opportunity in their curriculum to learn about robotics, artificial intelligence, machine learning and IoT related technologies and how to apply them in real world solutions.

The core courses like materials, fluids, mechanics, thermodynamics, production satisfied industry and a professor on a tenure track had a toll free delivery of lectures in classes, despite hearing the complaints about young engineer’s lack of job preparation from the industry. If the mechanical engineering curriculum has some interdisciplinary courses, then those courses are not designed keeping in mind the mechanical perspective of the course. Almost every manufacturing industry is trying to leverage these technologies to improve business and operation by forging a closer collaboration between a human, machine, product and the customer. This is called Industrial Internet of Things or Industry 4.0, which is desperately seeking these skills from entry-level mechanical engineers to bring on the table.

Today from designing a medical implant to engineering a turbine jet engines everything requires digital skills of implementation of sensors, data measurement and connectivity. It is important to include sensors that can gather information about product operations and success, which will allow the product to be assessed remotely for use of proactive service issue, guidance on usage and design future generation products.

The latest version of Creo 4.0, 3-D CAD software, which introduces new capabilities for the Internet of Things, additive manufacturing, augmented reality, and model based definition. Creo 4.0 includes core modeling enhancement and new functionalities for designers. Product developers can take advantage of Internet of Things based functions to better understand how products are used and to improve design decisions.

Practically all controls will be electronics and software driven. It means that mechanical engineers need to refresh the supplier base to include those offering motors, pumps and valves that can be controlled by software.

Just like a smartphone has the ability to upgrade themselves over an internet connection, the mechanical aspects of the mechatronic system cannot be done but the mechanical engineer can start including more functionality and capabilities of the system, which can be controlled and increase the long lifecycle and hard to service products. The idea is if the software is upgraded in the future, the mechanical capabilities have to be controlled. Innovation should come from mechanical engineers to defeat the reserve judgment that they are not coming anymore, and the pendulum is swinging fast and hard towards mechanical engineering. Just wait a little bit.

Author

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One of the first questions most people have about robotics is “what is a robot?” followed immediately by “what can they do?” In popular culture, the term “robot” generally connotes some anthropomorphic (human-like) appearance.

How Can a Machine Be Intelligent?
Artificial Intelligence (AI) may be a general term that suggests the employment of a PA to model and replicate intelligent behavior. Analysis in AI focuses on the event and analysis of algorithms that learn and perform intelligent behavior with lowest human intervention. These techniques can be applied to various issues that arise in artificial intelligence, e-commerce, diagnosing, gaming, arithmetic, military designing. Artificial intelligence in robotics is one of the foremost exciting and controversial field in artificial intelligence.

The real challenge of AI is to grasp how natural intelligence works. Developing AI is different from building a man-made heart. Scientists do not have a straightforward, concrete model to figure from. We have a tendency to recognize that the brain contains billions and billions of neurons, which we expect and learn by establishing electrical connections between totally different neurons. However we do not recognize precisely whether all of those connections add up to higher reasoning, or low-level operations.

What Can Robots Be Used For?
The short answer is that robots can be used for just about any application that can be thought of. The long answer is that robots are well suited for applications where
1) A human is at significant risk (nuclear, space, military)
2) The economic or menial nature of the application result in inefficient use of human workers (service industry, agriculture)
3) For humanitarian uses where there is great risk of life deterring an area of land mines, urban search and rescue.
4) Or as the well-worn joke among roboticists. Robots are good for the 3 D’s jobs.

Social implications of robotics
While many applications for artificially intelligent robots will actively reduce risk to a human life, many applications appear to compete with a human’s livelihood. Don’t robots put people out of work? One of the pervasive themes in society has been the impact of science and technology on the dignity of people. Robots appear to amplify the tension between productivity and the role of the individual. The connotation is that these individual have an irrational fear of technological progress. A robot could be great if it improves the quality of life for an elderly person as a supplement for frequent visits and calls with family. Using the same robot as an excuse to neglect elderly relatives would be the inverse. Like any enabling technology from the kitchen knife to nuclear fusion, the tool itself isn’t good or bad – it’s the intent of the person using it.

Current Development
We are already at the point where we have to consider what the next step of robotic evolution looks like. According to robotics engineers, it appears that at some point in the near future the next step could very well be Humanoid Robots. The evolution of humanoid robots is happening at an ever-quickening pace. These advancements are occurring not only in their mechanics but also with the incorporation of artificial intelligence.

ATLAS
One of the humanoid robots that has garnered the most attention is ATLAS, developed for DARPA by Boston Dynamics. ATLAS has been through several incarnations since its inception in 2013 as part of the DARPA Robotics Challenge. The primary goal of it is to develop ground robotic capabilities to execute complex tasks in dangerous, degraded, human engineered environments. The focus is on robots that can utilize available human tools, ranging from hand tools to vehicles.
ATLAS is intended to aid emergency services in search and rescue operations, performing tasks such as shutting off valves, opening doors and operating powered equipment in environments where humans could not survive.

In the 2015 DARPA competition of robotics ATLAS was able to complete all eight tasks as follows:
1. Drive a utility vehicle at the site.
2. Travel dismounted across rubble.
3. Remove debris blocking an entryway.
4. Open a door and enter a building.
5. Climb an industrial ladder and traverse an industrial walkway.
6. Use a tool to break through a concrete panel.
7. Locate and close a valve near a leaking pipe.
8. Connect a fire hose to a standpipe.

PETMAN
Protection Ensemble Test Mannequin (PETMAN) is a humanoid robot being developed for the US Army to test the special clothing used by soldiers for protection against chemical warfare agents.

It is based on the similar mechanical design and walking algorithm used for the four-legged robot, BigDog, which can carry heavy payloads in rough terrains. The PETMAN can self balance on its two feet and move freely, walk, crawl and perform suit-stressing calisthenics as well as squat thrusts to test chemical exposure. It can also balance when shoved. The robot provides realistic test conditions by exhibiting human physiological characteristics during physical exertion such as temperature control, sweating and humidity, inside the protective clothing. The PETMAN can be used to perform various other tasks dynamically in emergency situations, such as search and rescue operations in fire, nuclear and other hazardous conditions, without human exposure.

ARM
The hand, developed by iRobot with support from Harvard and Yale, is part of DARPA’s Autonomous Robotic Manipulation (ARM) program. ARM aims to move beyond “remote manipulation systems that are controlled directly by a human operator.” The goal is to build systems that are robust, dexterous, and low-cost. The DARPA hand uses Kinect to zero in on the object’s location before moving in to grab the item. It can pick up thin objects lying flat, like a laminated card or key. The hand’s three-finger configuration is versatile (can pick up a wide range of shapes, textures, and sizes), tough (used as a baseball tee), and strong (maintaining its grip on 50-pound weights). Although its Kinect sensor begins to incorporate some autonomous capability, the hand still requires an operator for manipulation of objects in its fingers. But the ARM project is divided into hardware and software. The displayed tech is in the former category, and presumably, the latter category is still being developed. The hand isn’t yet cheap by everyday standards, but the production cost has been dramatically reduced. Hands fabricated in batches of 1,000 or more can be produced for $3,000 per unit. According to DARPA, that’s an order of magnitude less than the current cost of $50,000 per unit for similar technology.

Conclusion
While such technology may find use in hazardous situations on the battlefield defusing IEDs, perhaps it’s not hard to see how there may be as many or more peaceful applications in factories or even at home. However, these are still just workhorses and advanced tools of human mimicry. For these creations to get to the next level, they have to become self-aware and eventually autonomous. Once these humanoid robots merge with fully autonomous intelligence, we will have witnessed the next stage of evolution toward the full Transhumanist dream of The Singularity, the moment when computer intelligence surpasses that of humans to such an extent that humans become practically redundant.

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Student, 2nd Year, Computer Science & Engineering
Vibration: A Boon or Curse

Introduction - Invention of the musical instruments like whistles and drum developed interest in people towards vibration. Greek philosopher and mathematician, Pythagoras was the first to investigate musical sounds on a scientific basis. Since then, people have critically investigated the phenomenon of vibration and developed different theories to formulate the problems and their solutions. Initial development of vibration was based on natural phenomenon and physical systems. In recent times, many investigations have been done on engineering applications, such as design of machine structures. Vibration is more concerned with mechanical engineers, structural engineers, mining engineers, production engineers, maintenance engineers, aerospace engineers and many others.

Vibration concept: Any motion which repeats itself at an interval is called vibration or oscillation. It is a mechanical phenomenon whereby oscillations occur about an equilibrium point. The oscillations may be periodic such as motion of pendulum or random such as movement of tyre on a gravel road. Any system having mass and elasticity is capable of vibratory motion. Vibrations cause a disturbance in medium that becomes the source of wave.

Amplitude of wave measures the amount of energy it carries in the direction of wave. Vibratory system comprise means for storing potential energy (spring), means for storing kinetic energy (mass or inertia), and means by which the energy is gradually lost (damper). It involves the altering transfer of energy between its potential to kinetic and vice versa. Damper is used to dissipate fractional energy at each cycle of vibration to avoid the accident and failure of the system.

Vibration as a Boon: Most human activities involve vibration in one or other form. We hear due to vibration of our eardrums and see because of vibration of light waves. Breathing takes place due to vibration of lungs, walking involves oscillatory motion of legs and hands. The use of vibration equipment is expanding rapidly. It is now widely used in physical therapy, rehabilitation and professional sports. It is also used for beauty and wellness application. Vibration is desirable in cases like musical instruments, massages, signalling device, human activities and many other areas.

Vibration as a Curse: Forces and motion are utilised by mechanical equipments to perform work. These elements sometimes produce undesirable effects, even if it is more carefully designed. These adverse effects of vibration, shocks and noise disturbances range from simple annoyance to shorten equipment life through failure of component. Vibration is undesirable in cases of design and manufacturing of equipments, structures. Although, there are many events of failure of systems due to vibration, which caused loss of money, resources and most important human life.

Two examples of failure due to vibration are: failures of chimney in England in 1900 and Tacoma narrow bridge in 1940 have happened because designer didn’t consider the effect of vibration. Chimney structure was collapsed under effects of vibration/resonance which occurred due to wind blow. Wind blow across chimney at a particular wind speed range caused vortex shedding phenomenon which appear and disappear at a particular frequency. This phenomenon induced fluctuating force of same frequency on chimney and lead to resonance. Resonance caused a large increase in amplitude and hence failure took place. Similarly, Tacoma narrow bridge collapsed due to wind induced energy which produced resonance phenomenon.

Challenges: One of the problems of vibration engineering is the protection of people, instruments, machines and structures from the effects of harmful vibrations. Vibration tends to have many advantages and a lot more disadvantages, challenging engineers to put lot of efforts so that society can make take its advantages. Engineers are also challenged to control its disadvantages to minimize loss of human-life, time, money, materials. Vibration analysis has a vital role to play in society for improving living conditions and ensuring smooth functioning of industrial equipments, minimizing the loss due to failures.

Author

Dr. Ran Vijay Singh
Professor, Mechanical Engineering
Biotech Highlights

Guest lecture on the topic entitled “India’s international climate policy - facts, limits, and changes” was organized by Department of Biotechnology, Manav Rachna International University on 13 January 2017. The chief guest was Dr. Harbans L. Chandra who enlightened the students about the various key parameters of the climate policy including green house gas emission, ground water contamination etc.

On the occasion of National voter’s day on 25 January 2017, students of biotechnology department participated enthusiastically in taking the pledge. The Pledge imbued within the students the feeling of patriotism with stronger faith in democracy.

A team from Manav Rachna Educational Institutions comprising Dr. Nidhi Dikwania (Assistant Professor, MRU), Neera Kapahi (Associate Professor, MRU) and four students from MRU, Kritika Sharma (B. Arch.), Garima Ahuja (B. Tech. Biotechnology), Sukhbir Kaur (B. Tech. Biotechnology) and Pooja Yadav (M.Sc. Energy and Environment) attended the International Summer School Co-designing Better Urban Living and Wellbeing (29th May - 9th June 2017), Lahti University of Applied Sciences, Finland.
Auto Highlights

“AUTOMOTIVE TRAINING & RESEARCH CENTER (ATRC)” under MHRIC Centre of Excellence at Dept. of Automobile Engineering organized a camp titled “HONDA 2-WHEELER FREE CHECK-UP CAMP” on August 05, 2017 for all MREI associates during 09:00-13:00 HRS.

Following services were offered in the camp free of cost for a HONDA 2-wheeler:
1. Washing of 2-wheeler
2. Engine oil level check
3. Brake adjustment
4. Clutch free play checkup
5. Air filter cleaning
6. Battery terminal checkup
7. Horn checkup

Total fourteen number of HONDA 2-wheelers were serviced and delivered after satisfactory test drive by technicians and owners. The feedback from the vehicle owners was taken and the event was welcomed and appreciated by stakeholders. It was very encouraging and learning experience for students of automobile engineering as they were given an opportunity to learn skill set and hands on practice of their chosen field.

Civil Highlights

A wall graffiti competition ‘D-WAR’ was organized by Civil, Architecture & Design Cluster (MHRIC) on 1st & 2nd February, 2017. A total of 25 teams consisting of more than 100 students from various institutions of Delhi, NCR participated in the event.

1st prize was bagged by two teams.
- Nikita Nagda, Pooja Giri, Tanvi Sharma, Banashree Garai from B-Arch, MBB and
- Rahul Gupta, Sashik Gaura, Shariqa Hyatt, Siddharth Jain from CSE, BSc Mathematics and BSc Chemistry, MBB respectively.

2nd prize went to Fateh Singh, Rishabh Chaudhary, Parag Sharma and Pranav Singh from Mechanical & ECE Department, MBB.

Student (Inderpreet Singh) of Civil Engg Department won Gold medal in Inter University football (Men) Tournament held on 17th February 2017 at MNIT Jaipur.
- Dilawar, Debodhi & labal won Bronze medal in Inter University Badminton (Men) Tournament held on 17th February 2017 at MNIT Jaipur.
- Sumit Shekawat, Ankita Chaudhary, Abhijeet Kundu, Thungbemo J Oyang won silver medal in Inter University Basketball (Men) Tournament on 17th February 2017 at MNIT Jaipur.
- Ashish Jakkar, Karun Kumar Sharma, Niket Reja won silver medal in inter college cricket tournament (men) on 17th Feb'17 at MNIT, Jaipur.
Every year faculty members of Civil Engineering Department visit the industrial training sites of the final year students to monitor their learning outcome.

A total of 12 students of Civil Engineering Department participated in IIT BOMBAY Technical fest AAKAAR held on 4 & 5th March 2017.
- Anurup Singh, Swarn Chaudhary, Tarun Verma, Anuj Kumar, Sachin Dahya, presented project on Seismic Structure in IIT BOMBAY technical fest AAKAAR.
- Ritual, Anni Lakhman, Anmol Bansal, Yatish Gupta, Hrithik Garg, Navdeep Singh, Rishik Giri, presented project on Hydraulic Bridge in IIT BOMBAY technical fest AAKAAR.

Project Carnival on Building resilience and rural area held on 28th March 2017 in Manav Rachna International University Faridabad. The Department of Civil Engineering hosted projects falling under Building Resilience/Rural Area theme. A total of 10 projects participated in the workshop.

One Day workshop on “Stabilization of Solid Waste using industrial by-products” organized by the department of Civil Engg on 3rd April 2017.

Faculty member Ms. Chhavi Solanki of Civil Engg department presented paper on “Analysis Of Aquifer Systems & Groundwater Contamination Due To Heavy Metals In Parts Of Sahibabad Industrial Area Along Hindon River” in an international conference. The international conference was organized by JAMIA MILLIA ISLAMIA on 27th & 28th July 2017 on “Water Pollution & Health”.

ECE Highlights

FPGA Workshop for 4th Semester Electronics and Communication Engineering was organized by MHRIC & ECE Department of FET, MHRIT. A one-day workshop on “Digital System design using FPGA” on 23rd Feb 2017. The workshop was attended by 4th sem students of ECE, FET, MHRIT. It briefly covered introduction to FPGA Architecture, Programming fundamentals of VHDL, Integrating steps on Altera Quartus II software. Also, hands-on session on Altera Cyclone IV development kit was delivered.

innoskill, the annual technical event to celebrate the Birthday of Founder Visionary Dr. O.P. Bhalla was organized on 3rd and 4th April, 2017. The various Workshops and events that were organized under this mega event were:
1. Fibre to Home (FTTH Connect) a workshop by Reliance Jio where the students were given hands-on training on how to lay down fibres cables.
2. Best Run Business Run SAP a workshop was also conducted.
3. A Workshop on Behavioral Skills was conducted.
4. A Workshop on Virtual Reality was held for the students by Grey Kernel Technologies.
5. A workshop on 3D Printing was held for the students by TechB Private Limited.

Besides Workshops, various Competitions were organized for the students that included RoboSoccer, Line Follower Robot, LAN Gaming etc. The Mega Event culminated with prize distribution to the winners.

EEE Highlights

The Department of Electrical and Electronics Engineering, FET, MHRIT organized a 5-DAY SKILL DEVELOPMENT TRAINING PROGRAMME (16th - 20th January 2017) for EEE students. This training was conducted by NATIONAL POWER TRAINING INSTITUTE (NPTI), FARIDABAD, a National Apex Body set up by the Ministry of Power, Government of India for Human Resource Development in the Power Sector. NPTI has more than 30 years of professional expertise in the field of H.R.D in the Power Sector with industry-specific technical interface and is one of the best institutions of its kind not only in India but also in the world, fulfilling the demand of the Power sector and allied Energy sector.

Department of Electrical & Electronics Engineering, Faculty of Engineering & Technology, Manav Rachna International University organized a special lecture for the students on “Overview of Smartgrid” by Prof. Ramesh Bansal, Head (Power), University of Pretoria on January 10, 2017 (Tuesday) at 10:00 am. The session was started by Prof. Bansal with “Challenges and Opportunities for Innovation in Smart Grid”. He discussed about:

• Smart energy Management.
• India smart grid forum.
• Operational Efficiency.
• Smart Transmission grid.
• How the power has been distributed.
• How to save the power using smart grid technology.
ME Highlights

SOLAR ENERGY CLASSES for 6th semester Mechanical students was organised by Mechanical Engineering Department, Faculty of Engineering and Technology on 27th March 2017 and 28th March 2017 at I-Block, Sukhoam Lab. Resource person: Mr. Hemant. The emphasis was to make students understand the importance of solar energy application in the present day Scenario. Different equipments of Sukhoam have been shown to the students which are solar-electrical equipments. Mainly the solar panels developed by Sukhoam were shown and it has been explained how solar energy is converted to electrical energy. Also remote control applications for solar/electrical energy has been explained.

International Conference was organized by Department of Mechanical Engineering Faculty of Engineering and Technology, MRRU & technically supported by IEEE at A block Auditorium on 5th, 6th & 7th January, 2017. The gathering was honored by the presence of Dr. K. R. Murli Mohan - Head, Big Data Initiatives Division, DST as Chief Guest, Dr. A. P. Mittal - Member Secretary All India Council for Technical Education (AICTE) as Guest Of Honor, Dr. S. K. Goel - Managing Director M/s Starwire India Pvt. Ltd. Faridabad Guest Of Honor, Dr. N. C. Wadhwa - Patron of the conference & Hon’ble Vice Chancellor, Manav Rachna International University, Dr. M. K. SONI - Conference Chair and Executive Director & Dean, Faculty of Engineering & Technology Manav Rachna International University, Dr. Manoj Nayak - Convenor of Conference & Head of Department Mechanical Engineering.
CSE Highlights

Project namely “Dentist Posture Belt”, developed by B. Tech students Mr. Sujit Roy, Mr. Rishav Verma, Mr. Karan Bhardwaj, was shortlisted for the Faridabad Industries Association (FIA) Project Competition and won the ‘Best Project Award’, in the Award Ceremony held on May 06, 2017. The students had to present and demonstrate their respective projects on April 22, 2017. An innovative approach had been undertaken to develop an adjustable waist belt along with the coin-sized collar with the pretext that the posture will be improved over the course of time. They were adjusted to the average limits of standard value for operator position and distributed among 10 dentists to be used by them in the clinical work. The results evaluated over a period of one month showed definite improvement in posture.

Students of Department of Computer Science and Engineering (CSE), Faculty of Engineering and Technology, Manav Rachna International University participated in “CSI Haryana State Student Convention” held on 17th – 18th February 2017, Dronacharya College of Engineering, Gurugram was the host institute for the state student convention. Various Technical Events were organized in the convention and our students participated in 3 Technical Events namely ‘Android Application Development’, ‘Code Debugging’ and ‘Fact and Furious’ and bagged the Prizes, as follows:

i. Sahil Verma and Pooja Saha got 1st Position in Android Application Development.
ii. Rohandeep Khurana and Vedant Sood got 2nd Position in Fact and Furious.
iii. Sahil Kukreja and Naman got 3rd Position in Code Debugging.

First year B. Tech CSE student Vaibhav Jha has authored a book namely ‘Hack the World before World hacks you’, ISBN 9781366802430, published by Lulu, on March 5, 2017. He also is the Founder & CEO of DimCats, Founder & Chief Mentor to DRiC.

Faculty members Ms. Shabbi Tyagi and Ms. Priti Nerwal attended POSSE 2017 in Bologna, Italy from 1st - 2nd July, 2017.
A 10 days showcase program was organized by the Department of Computer Science and Engineering, Faculty of Engineering and Technology, Manav Rachna International University on Experiential, project-based learn-by-doing learning approach using Java Programming (Online) from 13th February, 2017 to 24th February, 2017, held at its MRIU campus, Faridabad. The resource person for the program was Prof (Dr) Lynn Carter, from Robert Carter Academy, USA. He is a former Professor of Carnegie Mellon University, Pittsburgh, Pennsylvania, USA. It was attended by four Faculty members and five Students of B. Tech 6th semester.

The conference aimed to encourage development and promote scientific information exchange between faculty, researchers, engineers, students and practitioners working in India as well as abroad, in the field of “Networking, Cloud Computing, Analytics and Computing Technology”. The conference saw participants from various reputed organizations such as YMCA University of Science and Technology, Faridabad; Banasthali University, Rajasthan; Jawaharlal Nehru University, Delhi; Amity University, Gurugram; Shah Sainam Ji Institute of Technology & Management, Sirsa; Jaypee Institute of Information Technology University, Noida; IRE group of Institution; NSIT, Dwarka; Dr. Ambedkar College, Nagpur; JLN Govt. College, Faridabad, GSSS Khandoli, Faridabad etc.

Department of Computer Science and Engineering (CSE), Faculty of Engineering and Technology, Manav Rachna International University hosted academic day on- ‘IBM ICE (Innovation Centre for Education) Day’ on January 17, 2017, at MRIU Campus.

The objective of this event was to give the software engineers of tomorrow an edge over their peers, in the understanding and usage of industry-leading IBM enterprise class software and have one to one interaction with IBM employers and professionals.
RAILWAYS RUBBER SLEEPER CONCRETE

The most important role of sleepers in railroad system is the conveyance of train load from rail to the ballast. In future, railways traffic will be even faster than today and the demanded load capacity of the train will probably increase. The demand of railway sleepers has increased with the improvement of railways. The composition of composite and concrete can remove the weakness of concrete under tension. The relationship between concrete and composite has great effect in development of both of these materials. The main functions of sleepers is holding rails to correct gauge and alignment, provide firm and even support to rails, transfer the load evenly from rails to wider area of ballast through an elastic medium between rails and ballast and providing longitudinal and lateral stability. Ballast is a highly non-linear granular material and its behavior within the track structure is influenced by the formation and sub grade conditions. The track support, and its deterioration with time, is therefore heavily dependent on a large number of parameters. There are many crucial areas of the track where very high vertical and horizontal loads produce large track settlements and hence require significant track maintenance in order to retain the track geometry. Where ballast settlement and deterioration is occurring on a high-speed (280 km/h) swing-nose crossing in Germany. The main area affected is around the point motor set and thus a high degree of settlement in the unreinforced ballast aggregate and hence track geometry faults, particularly at the rail discontinuities and over the tie-tout radio voiding under the sleepers which generate higher track forces and hence higher track geometry due to the positions of the track components, such as drive motors and stretcher bars. In addition, the constant track maintenance breaks down the ballast thus generating a highly contaminated ballast structure, generating further geometry issues and water accumulation. There is therefore a need to reinforce the ballast in these zones to reduce ballast settlement and degradation and hence create a geopavement, which has a higher degree of strength and resiliency. Polymer treatment has eliminated the need for ballast maintenance over the 10 year treatment period (previously the site required maintenance interventions every 3-4 months to correct vertical and lateral track geometry). After 500,000 load cycles the geo composite showed no signs of deterioration and was still totally free draining.

The situation becomes self perpetuating causing the track geometry to deteriorate rapidly. In turn this can cause progressive plastic accumulation of strains in the formation and hence further deterioration in track geometry. The crossing (or any other highly loaded track asset) then requires a higher degree of track maintenance in order to retain track geometry (i.e. safety and passenger comfort). However, assets like these are very difficult to correct in track geometry due to the positions of the track components, such as drive motors and stretcher bars. In addition, the constant track maintenance breaks down the ballast thus generating a highly contaminated ballast structure, generating further geometry issues and water accumulation. There is therefore a clear need to reinforce the ballast in these zones to reduce ballast settlement and degradation and hence create a geopavement, which has a higher degree of strength and resiliency. Polymer treatment has eliminated the need for ballast maintenance over the 10 year treatment period (previously the site required maintenance interventions every 3-4 months to correct vertical and lateral track geometry). After 500,000 load cycles the geo composite showed no signs of deterioration and was still totally free draining.

AUTHOR

Mr. Devinder Thakur
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LIGHT WEIGHT CONCRETE

Concrete is used more widely than any other substance except water (approximately 10 km cube of concrete is used every year) because of its many advantages. The 10.5 billion tonnes-a-year concrete industry is thus the largest user of natural resources in the world. It is estimated that the demand for concrete is expected to grow to 16 billion tonnes a year by 2050. Ordinary concrete, typically contains about 12 percent cement, eight percent mixing water and 80 percent aggregate by mass. This means that, in addition to 1.5 billion tonnes of cement, the concrete industry is consuming annually nine billion tonnes of aggregates together with one billion tonne of mixing water. The Romans used concrete extensively from 300 BC to 476 AD, and it contained quicklime, pozzolana and an aggregate of pumice. Many structures built by them, for example the Colosseum in Rome, and the Pantheon (which has the world’s largest concrete dome), still exist today as a testimony to the durability of Roman concrete. After the Roman Empire, the use of burnt lime and pozzolana was forgotten and their use received attention only recently.

Modern reinforced concrete is due to the invention of cement by British engineer John Smeaton in 1756, Joseph Aspdin in 1824 and RCC by Joseph Monier of France in 1859. Traditionally, concrete was made by mixing aggregates with cement and water. Even though the concept of water–cement ratio was known through the research of Duff A. Abrams in 1918, more water than necessary was added for ease of workability (For complete hydration of Portland cement, only about 36% water i.e. w/c of 0.36, is needed). The excess water, which is not required for cement hydration remained in the capillary pores and evaporated in due course. This resulted in drying shrinkage and capillary porosity, and is the main cause of corrosion of reinforcement. In due course, chemical admixtures were invented and used to improve characteristics of concrete (for example plasticisers/super plasticizers are used to reduce the water content of a concrete while maintaining workability, accelerators and retarders are used to speed up or slow the hydration of concrete). In addition, research recommended the use of very fine-grained materials, called mineral admixtures, to improve the properties of concrete or as a replacement for Portland cement (blended cement). These mineral admixtures include industrial waste products such as fly ash, ground granulated blast furnace slag, silica fume, rice husk ash and metakaolin. Such chemical and mineral admixtures are being used routinely in India and abroad.

Author

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Mitigating Fatalities and Economic Setback Through Earthquake Safety

India attained its independence in 1947 and is home today to more than 1.2 billion people. India being a seismically active country has almost 55% of its area under the threat of moderate to severe earthquakes. But, even though mandatory earthquake resistant construction standards have been existing in the country since 1983, mechanisms are not in place for strict compliance. About 96.5% of India’s construction is of non-engineered type and the rest is RC framed systems which too shows high vulnerability towards earthquake shaking. Each building to be built is only one of its kind ever, and no research and testing is performed on that building, unlike factory made products like aircrafts, ships and cars. With an exception to high rise RC frame buildings, most housing construction is done by self styled contractors without any engineering input. Consequently, the expected knowledge base for planning and design along with lack of perception of risk, has never been available to make the housing earthquake resistant. The high levels of risk are also attributed to the type of housing typologies in practice which range from random rubble stone masonry in mud mortar to non-engineered brick masonry buildings. The cumulative dominant materials of choice according to Census 2011 housing data are: mud and unburnt brick (22%), burnt brick (48%) and stone (14%) which together account for 84% of houses in the country. This is in great contrast to contemporary emphasis of Architectural and Civil Engineering practices.

Though appropriate techno-legal regime in the building bye-laws and development control regulations of the municipalities exists, structural safety assessment is not undertaken by ANY municipal authority anywhere in the country as of today. This arwy and challenging situation demands systemic changes towards mitigating impending earthquake disasters. We need to ensure earthquake safe new constructions & also identify means to retrofit existing building stock to earthquake resistant standards. The repository of knowledge will have to be in public domain with public awareness and participation towards minimizing the economic losses and fatalities. Due to varying geology and seismo-tectonics at different locations, currently the country has been divide into four seismic zones-II,III,IV and V[IS:1893-2002] to provide a guideline to the level of earthquake shaking expected. The main challenge of professionals today is to meet the Double Demand i.e. the building should be able to withstand the imposed deformation without damage under small intensity shaking and with no collapse under high intensity shaking. The behavior of a building is controlled by Configuration, Stiffness, Strength and Ductility. The important aspects affecting seismic configuration of buildings are overall geometry, structural systems, and load paths. Natural period of a building is also a key parameter to judge seismicity. It usually increases with increase in stiffness, mass, height. Buildings tend to oscillate in the directions in which they are most flexible and have larger translational natural periods. Buildings with simple shapes undergo acceptable seismic behavior while those with complex shapes undergo significant due to stress concentration at re-entrant corners in the building. Inertia forces are generated in buildings during earthquake shaking at locations where masses are present. Mass should be uniformly distributed in plan and elevation. It is a common practice to have water tanks at corners of the roof top which is asymmetric in mass in plan. Also, multi-storeyed tall buildings have service floors with heavy mass compared to regular floors. This causes sudden change in mass along the elevation thus twisting of buildings occurs during earthquake. Irregularity in stiffness of plans occur due to use of columns of different sizes, presence of structural wall on one side of buildings, presence of staircase or elevator core at one corner of the buildings. Stiffness irregularity in plan causes twisting of buildings under lateral load staircase in buildings causes the effect of short column and twist of the building due to stiffness irregularity in plan. Short column effect is caused by the intermediate loadings which divides the adjoining columns into shorter segments and causes column failure. Buildings constructed on slopes in hilly regions are having features like unequal length columns along slope, lack of proper foundation well embedded into soil underneath to provide fixity during shaking. Also, when two buildings are too close to each other, they may pound on each other during strong shaking. Also, when two buildings are too close to each other, they may pound on each other during strong shaking. With increase in building height, this collision can cause a greater problem. When heights of buildings do not match, the roof of the shorter building would be lower and at the mid-height of the column of the taller one which can be very dangerous and therefore proper gap should be provided to avoid an kind of pounding. This is usually found in buildings having alphabetic plan shapes separated at the junctions of the different wings which meet each other from different directions, two parts of a building are of different heights; the two parts tend to swing differentially, buildings rest on two different soil masses that differ in their flexibility; the different soil strata make the two parts oscillate differentially under the same shaking, and buildings having two different masses within them need to be separated at the junction. Many buildings constructed in recent times have a special feature – the ground storey is left open for the purpose of parking i.e. columns in the ground storey do not have any partition walls between them. Such storey is known as soft storey or weak storey based on stiffness or force respectively. This type of building behaves like inverted pendulum swaying to and fro. It is also observed in many buildings that column is discontinued at lower storey of a building called floating column, which is not desirable. Also care should be given to those structural elements which are supporting other as structural member. Supporting structural elements should be stronger than those that are being supported by them e.g. beams stronger than adjoining braces, beam-column joints stronger than the adjoining beams/columns, columns stronger than adjoining beams, foundations stronger than adjoining columns and soil strata underneath stronger than foundations. In masonry structures, horizontal inertia force developed at the roof transfers to the walls acting either in the weak or in the strong direction. If all the walls are not tied together like a box, the walls loaded in their weak direction tend to topple. It has large mass and hence attracts large horizontal forces during earthquake shaking. Horizontal bands like lintel band, roof band, and plinth band should be provided in masonry buildings to improve their earthquake performance. Depending on geotechnical conditions, structural configuration and loads, a suitable type of foundation must be chosen. If soil type is hard, isolated footings may suffice under individual columns. But, these foundations must be tied to each other with beams at top of the footings or within the footing depth to resist relative movement between column bases. On the other hand, if soil underfoot is soft, other foundation types may become necessary, e.g., raft or pile foundations. If the site is susceptible to liquefaction, either ground improvement must be undertaken or the foundation must be carefully designed, such that it can carry the load even after the vulnerable soil layers have liquefied.

Though all the factors governing earthquake safety have not been covered in this article, some may be interdependent, but an attempt to create awareness has been made. Owners and developers have the responsibility of ensuring that their buildings are functional, safe and durable, in addition to being economical and aesthetical. Quality must be ensured by all stakeholders involved in the building delivery process, including architects, structural engineers, draughtsman, contractors, site engineers, artisans and maintenance engineers. Each activity needs to adhere to a pre-specified procedure laid down in design codes and standards.

Earthquake, a natural phenomena, itself may not be devastating but construction of non engineered structures can cause huge loss of life and property. The mankind does not have a bearing on the occurrence of earthquakes but the losses can certainly be minimized by earthquake resistant construction.

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CURRENT AFFAIRS

India, Myanmar sign 11 MoUs in 11 different sectors.
- MoU on Maritime Security Cooperation
- Cultural Exchange Programme for year 2017-2020
- MoU on Cooperation in Medical Products Regulation MoU on cooperation

04 September 2017
The United Nations Security Council (UNSC) will hold an emergency meeting to discuss an international response to North Korea's latest nuclear test. North Korea tested a hydrogen bomb that could be mounted on a missile and is its biggest nuclear detonation. The countries namely the United States, Britain, France, Japan and South Korea requested the urgent meeting.

National Aeronautics and Space Administration (NASA) astronaut Peggy Whitson finishing a 288-day mission that put her over the top as the American who has spent the most cumulative amount of time in space. The oldest female astronaut in the history of space exploration was the first female International Space Station commander and holds the record for number of spacewalks by a woman.

30 August 2017
Jasleen Kaur Josan becomes the first Indian Sikh woman to be selected by NASA for the Mars Expedition happening in 2030. After Kalpana Chawla, Jasleen Kaur Josan becomes the 2nd Indian Woman and 1st Sikh woman to be selected by NASA for the Mars Expedition happening in 2030. The mission called the Orion Mission will be the first manned mission to the red planet and candidates were selected from around the world.

21 August 2017
British scientists have developed the world's smallest surgical robot which could transform daily operations for tens of thousands of patients. A team of 100 scientists and engineers have used low-cost technology originally developed for mobile phones and space industry. The robot, called Venfile, mimics the human arm and can be used to carry out a wide range of laparoscopic procedures. The robot is set to be launched next year.

05 August 2017
Helix Taxi, a Private helicopter service provider and Bangalore International Airport Limited (BIAL) have partnered to launch HelixTaxi services from Bengaluru Airport. The helicopter service will initially be launched from Bengaluru Airport to Electronic City and gradually expanded to other parts of the city.
31 July 2017

The world's smallest spacecraft ever launched has successfully been placed in low Earth orbit by Indian Space Research Organisation (ISRO) PSLV rocket. It is named as Skips, the 3.5cm x 3.5cm space probe weighs 4 grams each and can run on sunlight. The probes are part of breakthrough initiatives, a $150 million program aimed at sending micro-gravity chips to star systems beyond the solar system in search of extraterrestrial intelligence.

07 July 2017

India ranked a high 23rd out of 165 Nations in a Global Index that measures the commitment of nations across the world to cyber security. The second Global Cybersecurity Index (GCI) was released by the UN telecommunications agency International Telecommunication Union (ITU).

The top 3 most connected countries to cyber security are Singapore, The United States, Malaysia, Oman, Estonia.

22 July 2017

Mayak satellite is the third brightest object in the sky only after the Sun and the Moon. The satellites that was launched included an Earth observation Kanopus-V IR satellite, the multi-payload, and 72 smallsats. Mayak means beacon in English. It is a standard payload that has been developed by Moscow Polytechnic University (MAMU). The satellite will orbit the earth, about 370 miles (600 km) high, giant mylar reflector with a surface area of 170 square feet.

05 July 2017

North Korea has successfully tested an intercontinental ballistic missile (ICBM). United States Pacific Command tracked "the single launch of a land-based, intermediate range ballistic missile" lifted off from an airfield northwest of Pyongyang. The missile, the US and South Korea was an intermediate-range projectile, landed inside Japan's exclusive economic zone. The missile could reach a maximum range of roughly 6,700 km on a standard trajectory.

19 July 2017

Ability of Science and Technology-launched Sahum Hearing Screening device, a low-cost indigenous screening device to detect a congenital hearing loss in newborns. The device was formally launched in New Delhi by the Minister of State for Science and Technology YS Chowdhury.

The device has been developed by the School of International BioDesign (SIB) start-up Sahum Innovation Labs India Private Limited.

22 July 2017

Scientists from ETH Zurich in Switzerland have developed a 3D-printed soft silicone heart that closely resembles and functions like the human organ. It is not a exact biological replica of the actual but can help to save lives of people who suffer from cardiac failure. The 3D-printed soft artificial heart is a silicone mailbox with complex inner structure, it weighs 390 gms and has a volume of 679 cubic centimeters.

04 July 2017

India successfully test-fired its developed quick reaction surface-to-air short range missile (QR-SAM). it was test-fired in a launch complex-3 at the integrated test range (ITR) at Chandipur.

The QR-SAM has been developed by the Defence Research and Development Organisation (DRDO) and other establishments.

03 July 2017

India is getting ready to commission its high-tech giant power – Prototype Fast Breeder Reactor (PFBR) on the shores of the Bay of Bengal at Kalpakkam near Chennai, Tamil Nadu.

This will generate electricity commercially using the fast breeder route. These fast reactors can help extract up to 70 per cent more energy and safer than traditional reactors.

The world's only commercially operating fast breeder reactor is situated in the Ural Mountains of Russia at the Belyayskov Nuclear Power Plant.

13 July 2017

Scientists from the University of Cambridge, United Kingdom have discovered the smallest star in the universe. It has been named as EMN 10553-57Ab. The star was identified by Super WASP, a planet-finding experiment run by several universities. EMN 10553-57Ab located about 600 light years away. It is slightly larger than Saturn in size and may possibly have Earth-sized planets with liquid water in its orbits.

29 June 2017

China launched its most powerful naval destroyer, the Type 055, at the Shanghai port.

It is one among the largest warships in the world. The Type 055 vessels will weigh more than 12,000 tonnes and are far more powerful than India's latest Project 15B "Visakhapatnam" class destroyers.
27 June 2017
SpaceX successfully launched and landed the second Falcon 9 rocket in roughly 48 hours. The technology, which requires aircraft to be equipped with certain equipment, is undergoing testing involving eight of the initial batch of Iridium NEXT satellites. The new satellites carry payloads for joint-venture Arianespace’s space-based, real-time tracking and surveillance of aircraft around the globe, which has implications for efficiency, economy, and safety especially in remote airspace over the oceans.

24 June 2017
India launched the world’s lightest satellite weighing 64 grams called KalamSAT. It is the only Indian payload in the National Aeronautics and Space Administration (NASA).

20 June 2017
Sweden pledged to reach net-zero greenhouse gas emissions by the year 2045 in an ambitious move to tackle climate change. The move makes Sweden the first country to significantly strengthen its climate change targets since Paris Agreement 2015. The first climate report will be presented in the second half of 2018, and first action plan will be presented in the year of 2019.

19 June 2017
Indian Space Research Organisation (ISRO) working on a new propulsion system known as the Electric Propulsion (EP) system that is set to usher the era of cost-effective satellite launches. The Electric Propulsion (EP) system converts solar energy into electrical energy, which in turn is used to change the velocity of a satellite in space. This technology was first used as a technology demonstrator in Geostationary Communication satellite (GSAT-9) or the South Asia Satellite.

15 June 2017
China successfully launched its first X-ray space telescope to study black holes, pulsars, and gamma-ray bursts. The 2.3-tonne telescope was sent into an orbit of 550 kilometers above Earth. The Hard X-ray Modulation Telescope (HXMT), named Insight will allow Chinese scientists to observe magnetic fields and the interiors of pulsars and better understand the evolution of black holes.

13 June 2017
China launched world’s largest floating solar farm in Anhui province. The 40-megawatt power plant has 140,000 panels renting on a lake. As per the Report, China has been the world’s largest investor in clean energy since 2012, spending $88 billion on the wind and solar power in 2016. The plant is built in Huainan City, Anhui Province, by Sungrow Power Supply, a Chinese company specialising in renewable energy.

10 June 2017
China is planning to send mini-ecosystems comprising of potato seeds and silkworm eggs to the Moon by next year. According to the researchers, the silkworms will hatch and create carbon dioxide, while the potato plants will generate oxygen. The main objective of this mission is to prepare for future moon landings and positive human inhabitants.
Agricultural Biotechnology is now a reality that will dominate the 21st century for agriculture and human well-being. Apart from broadening the genetic base, transgenic technology has helped in improving crop productivity, plant protection and nutrition. Transgenic crop plants have globally grown since one decade ago. A total cover of 81 Mio ha. in 17 countries is being estimated worldwide under transgenic technology. A total of 81 Mio ha. in 17 countries is estimated to increase food demands by 2025, average cereal yield must increase by 80% on an average. So, biotechnology uses its tool of agricultural research and development that contribute to food security to enhance sustainable agriculture in developing countries for farmers. Hence, the problems of food security, poverty reduction and environmental conservation are sort out in the developing world. Therefore, it helps us to do the things that we couldn’t do before and do it in a more precise and safe way by allowing us to cross genetic barriers that we were unable to access in plant breeding and conventional genetics. Conventional breeders brought along several other genes with the gene of interest like insect or disease resistant that is desired in a new variety. Those extra genes had a negative effect and took years to remove them. But, biotechnological tools have given us more precise ways to obtain the desired genes only. Intensive efforts are also being made to channelize plant metabolism into producing industrial feedstocks, pharmaceuticals and nutraceutical products. So, transgenic technology is a powerful tool and an important technique that can be used for obtaining transgenics with many traits of interests and desirable qualities in several crop varieties in the near future.

Genetic transformation has the possibility to transform crops to increase resistance to pathogens and insects and it is moving towards commercialization rapidly. Like, biotech rice has already been released temporarily in Iran. However, large scale cultivation of biotech rice against biotic stresses will be released soon for commercial cultivation in China and other countries. Multilocational field trials of biotech eggplant, tomato, cauliflower, rice are underway in India and expected to be given regulatory approval for commercial cultivation.

GMO’s containing more unsaturated fatty acids, higher yielding peas, delayed ripening qualities of banana and pineapple are included for the near future research. Several modifications in the genome of soybeans have been made to obtain desirable traits leading to healthier foods. According to Nobel laureate Norman Borlaug, it is estimated that to meet the projected food demands by 2025, average cereal yield must increase by 80% on an average. So, biotechnology uses its tool of agricultural research and development that contribute to food security to enhance sustainable agriculture in developing countries for farmers. Hence, the problems of food security, poverty reduction and environmental conservation are sort out in the developing world. Therefore, it helps us to do the things that we couldn’t do before and do it in a more precise and safe way by allowing us to cross genetic barriers that we were unable to access in plant breeding and conventional genetics. Conventional breeders brought along several other genes with the gene of interest like insect or disease resistant that is desired in a new variety. Those extra genes had a negative effect and took years to remove them. But, biotechnological tools have given us more precise ways to obtain the desired genes only. Intensive efforts are also being made to channelize plant metabolism into producing industrial feedstocks, pharmaceuticals and nutraceutical products. So, transgenic technology is a powerful tool and an important technique that can be used for obtaining transgenics with many traits of interests and desirable qualities in several crop varieties in the near future.

Transgenic crops are estimated through a rough calculation of techniques like high-throughput screening, functional markers etc. Stress resulting from living organisms, which can harm plants, such as viruses, fungi, bacteria, parasitic weeds and harmful insects are the biotic stresses, while the effect of non-living factors which can harm living organisms including drought, extreme temperature, salt, minerals etc. are abiotic stresses. The problem of biotic stresses caused by pests, diseases and abiotic stress of weeds is being addressed by current cultivars primarily. The next wave of cultivators will greatly extend biotechnology into the control and prevention of crop diseases and abiotic stresses with draught tolerance trait available in next 5 years which will be followed by salt tolerance.

Authors

Dr. Pushpa C. Tomar
Associate Professor, Department of Biotechnology
Ms. Charu Rajpal
Student, Department of Biotechnology

Q1) What is that you miss the most about Manav Rachna International University?
Ms. Sunayana: I miss my friends group, carefree and fun filled days at CRIM, classrooms and lectures, cultural and technical fests.
Q2) What is the most important thing that Manav Rachna International University taught you?
Ms. Sunayana: Apart from imparting technical know-how, college life had taught me how to balance life, how to prioritize your activities so that you can enjoy your life. Another thing which I learned was jobs opportunities just not simply fail in your lap. For each of your dreams to become a reality a sheer hard work and dedication is required.
Q3) What’s the most unique quality of MIRU?
Ms. Sunayana: It is the commitment for students both in/out of classrooms.
Q4) What were your thoughts when you joined the university and how did they differ from your thoughts when you passed out?
Ms. Sunayana: At the time of joining the college, I expected that college will groom me to be proficient in my field after four years of college and I was not disappointed.
Q5) What major curricular had you actively participated in?
Ms. Sunayana: Apart from academics I was active member of fine arts group.
Q6) How has the technology changed ever since you passed out of the university and are these changes positive or negative?
Ms. Sunayana: Definitely technology has grown very fast since I have passed out of the college. Technology has matured from dial up internet connections to Internet over fibre, from land line to smart phones. Latest trends being Internet of Things(IoT), Artificial Intelligence (AI) and Cloud. Technology has changed in both positive and negative ways. It has made our lives easier, brought the knowledge in the whole world at our finger tips and has opened the doors of opportunities which otherwise was not possible.
Q7) What suggestions can you give to combat the negative impacts of technology?
Ms. Sunayana: Technology is like a two-edged sword. It is very important that we use technology in the smartest and most responsible manner, so that we are solving problems, not creating more for the future.
Q8) What is your work culture in DRDO?
Ms. Sunayana: DRDO is one of the elite government organization where best of the mind comes to work. In DRDO Work Culture and ethics are very high. You get to work in your field of interest. There are always seniors and mentors to help you out in case you are stuck up with some technical problem.
Q9) How should the present students get updated with new technologies and how will it help in grabbing opportunities?
Ms. Sunayana: Keeping abreast with latest technology in market surely provides an edge over others. Students should get updated with latest technologies by reading Tech journals, being member of technical societies, getting professional training and certification in Internet Of Things, Machine learning, Artificial Intelligence, Encrypted communications to name a few.
Q10) What are the golden opportunities in DRDO for students of MIRU?
Ms. Sunayana: DRDO is the right place if one is interested in research and development. Working in DRDO gives the feeling of proactiveness that one is contributing in making country self-reliant in technology. DRDO conducts its own examination for recruiting for the post of scientist. It provides opportunities to its scientist to get higher qualification from prestigious universities and also provides.
CHANGING TRENDS IN
TECHNOLOGY

From sending doves to pass on a message and waiting for a reply for days,
To sending a whatsapp and reverting ASAP look how different now are the ways.
Carrying books is so old school,
Using tabs is the new trend and is so cool.
Remember carrying a compass and maps and how it was a big pain?
Now we have GPS, a thought which was once called insane.
For all the hardships we once had, now there are solutions,
Solutions that further evolve and bring in a revolution.
All these solutions will not go in vain,
However, not only do they come with a boon but also with a bane.
Technology, you see, is like a double edged sword,
It is used both by the innocent and the fraud.
Don’t you forget that life is way beyond T.Vs and tabs and phones,
Remember to go out and exercise your muscles and bones.

Author

Ms. Shubhi Saxena
Student, 1st Year,
Electronics and Communication Engineering

From Editor’s Desk

A hearty thanks to all the students & faculty members who have contributed to the magazine by submitting their technical articles. Due to large no. of submissions, we were not able to publish all the articles. But we will try to publish in the next issue.

Articles are invited for the next issue. The articles should be authored in an original text. Plagiarism is strictly prohibited. We expect articles written at the level of general audience. Therefore the equations and mathematical expressions within the articles are not recommended.

Authors are requested to include a brief biography of 4-6 lines in their articles with high resolution author’s photographs.

The next issue will be published in March 2018. You can submit your articles on the email id - fetmagazine@manavrachna.edu.in by 20th January 2018.

Happy Writing!!

- Bindiya Ahuja
Editor
Ingenieur Sphere, FET Technical Magazine