Chances are you have already skimmed thru the content inside the mag you are holding in your hands, before starting to read this editorial. That’s only natural and pleases the editorial team. The articles inside were handpicked in the hope they would dispense with your curiosity over what faculty and students of the M. S. Ramaiah University of Applied Sciences were doing in the past year.

These days, I am a restless person struggling to hold on to my own daily work amidst reflections of happenings from all over the world. From the migrant crisis in Europe to the discovery of summer water flow trails on Mars, I can’t help wondering—quite often—how those events might come to shape the future of common citizens like me.

This issue covers a lot between high-end research and backpack adventure. I and my editorial team hope this issue motivates you to build a stronger interaction with the university.

Dr. B. V. Vijay
Editor

Acknowledgments

The editorial team sincerely thanks Dr. S. R. Shankapal, Vice-Chancellor, M. S. Ramaiah University of Applied Sciences for giving the opportunity to bring out this sixth issue of ‘Reflections’. They also thank all the faculty, students and staff who have contributed to the content of this issue.

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Unmanned Ground Vehicle with MAV for Surveillance
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Why Engineering and Medical Research Must Co-Evolve In Universities

In whichever ranking system you look at, it may be surprising but true that among most of the top 100 universities globally, medical and engineering schools have evolved together. Without doubt, that coexistence contributes extensively to high quality research and development of new technologies for the improvement of life. Nevertheless, if we profile a typical Indian university, more often than not, medical and engineering schools do not co-exist within it and it therefore ranks poor globally.

As examples of what can emerge from co-evolution of medical and engineering research in a university, I would draw your attention to the following engineering simulation models of biological systems:

Cardiovascular System

- Heart, vessels, blood
- Function: transport gases, nutrients, wastes, hormones

Dr. S. R. Shankapal
Vice-Chancellor, MSRUAS

Simulation of Large-Scale Brain Models (Eugene M. Izhikevich)

Finite Element Model of a Human Pelvis
Numerical simulation models like those above can predict the behaviour and performance of their respective biological systems. Understanding gained from such simulations would immensely help product designers, software engineers, manufacturers, pharmacists, physicians, clinicians and stakeholders.

The Gokula Education Foundation has a unique advantage of having medical and engineering faculties under its umbrella. M.S. Ramaiah University of Applied Sciences, or MSRUAS as it is known, has seven faculties in Engineering and Technology, Art and Design, Management and Commerce, Science and Humanities, Dental Sciences, Pharmacy and Hospitality and Catering Technology. Likewise, the M.S. Ramaiah Medical College and M. S. Ramaiah Memorial Hospital have world-class health care facilities. The latter has specialist centres in cardiology, oncology, neurology, nephrology and many other areas. MSRUAS also has a unique advanced learning centre where doctors and engineers can be trained on surgical and medical skills.

MSRUAS offers undergraduate, postgraduate and doctoral programmes in inter-disciplinary areas involving medical and engineering research. The Ph.D. programme of MSRUAS is very well accepted by scholars for pursuing research. In addition, MSRUAS is well known among India’s research laboratories for modelling and simulation of complex engineering problems. The university has worked on more than 600 such research projects. Another advantage is that MSRUAS has not only acquired a large number of application oriented commercial simulation tools but has adequate experience in the validation of solutions.

Collectively, MSRUAS faculty have research experience in the areas of mathematics, computer science, biological sciences and engineering design.

If we question what the future of medicine and engineering might be like, we could conceive lots of possibilities. Some of these include full physiological simulation, holographic data input, home diagnostics, multi-functional radiology, humanoid robots, Nano-robots, virtual digital brains, wearable e-skins, embedded sensors, robotic nurse, semantic health records, 3D-printed bio-materials and drugs, artificial organs, customized mobile applications, medical tricorder, augmented reality, artificial intelligence in medical support, gamification based wellness and so on. For these futuristic things to be realized, engineers, doctors, mathematicians, computer scientists and possibly pharmacists, have all got to work in unison.

Are we not well placed for the future? If we started working in unison, don’t you think we could some day rank among the 100 top universities in the world?

Let us converge, work and achieve for the betterment of mankind.

Dr. S. R. Shankapal is Vice Chancellor of M. S. Ramaiah University of Applied Sciences. Prior to becoming Vice-Chancellor, he was the president of M. S. Ramaiah School of Advanced Studies, now a part of M. S. Ramaiah University of Applied Sciences.
Perspectives on Motivation, Pro-Activation and Critical Thinking in Research

Research is a precursor or prerequisite for innovations and technological developments which in turn have revolutionized the style and quality of life of mankind. Although there is no unique definition of research, all the definitions converge on the need for a unique focus of original contributions. Despite the term original contribution being not absolutely subjective, research owes its continued existence, sustenance and prominence to the research community which has embraced it with impeccable integrity and unimaginable serenity. Although research is a constituent of higher learning, it is distinct from the other conventional academic endeavours because of its unique emphasis on analytical and critical thinking required for the realisation of enrichment of knowledge in the chosen domain or topic of research. Very often, one finds a misconception about research itself and mode of getting initiated to it. This is particularly so amongst those who are either completely new to research or very recently entered into it.

While a formal firm educational background is a boon for a sound research career, a combination of passion, patience, perseverance and steely determination is often a more decisive factor contributing to the rate and quantum of success in research. This can be construed as an affirmation of a truth of a strong belief “Temperament is a realistic avenue to garner the strength and willingness to overcome one’s inherent shortcomings”. Further more one can derive a lot of inspiration and motivation from notable quotes and life of great innovators. Thomas Alva Edison is arguably the foremost innovator of all times. By the sheer enormity of success and the breadth of innovation, Thomas Alva Edison is truly a Genius. But through his famous quote “Genius is not Inborn, It comes from 99 % Perspiration and 1% Inspiration”, he exemplifies the importance of hard work and emphasises that the notion of inheritance of intellectual power can be a virtual non-starter in one’s professional career. It is a remarkable motivational statement for any person who plans to set lofty goals and envision success for an illustrious career. Once thus motivated, one can derive tremendous inspiration and insight for the accomplishment of success through a statement of Michael Faraday. According to him, “The Five essential Entrepreneurial skills for Success are Concentration, Discrimination, Organization, Innovation and Communication”. One’s ability to concentrate is a measure of determination and without steely determination, a sustained and successful research career is a near impossibility. Concentration leads to Clarity; Clarity fetches Confidence; Confidence propels Capability; Capability bestows Composure. The above five C’s along with the notable quotes of Thomas Alva Edison and Michael Faraday should enable one to acquire the fortitude, aptitude and attitude to gradually emerge as a successful researcher with consummate ease. Successful research also demands Pro activation. The principles of effective research involve the inculcation of strong motivation to pursue research, internalization of a strong vision of person’s desire, development of an attitude for steady and consistent effort as well as ownership of personal responsibility for success and failure.

Dr. Govind R. Kadambi
Pro-Vice Chancellor (SEG)

There is no easy way out for becoming proactive researcher. One pragmatic and viable way is to derive inspiration from pro-active people and to get associated with the individuals possessing pro-active approach. A constant reminder of virtues and benefits of pro activation and responsibility can facilitate development of a deep focus and unwavering concentration. Pro- activation demands self-discipline. In a sense, Pro activation and self-discipline are the two faces of a success coin. Some important factors which aid practicing self-discipline are clarity and rationale about one’s desire to achieve in the midst of surrounding ambience.

What differentiates a researcher from others is the ability to exhibit the proficient ability of critical thinking. Ability of Critical thinkers to analyse and acknowledge the personal limitations enables them come out with a formulation of possible plan surrounding their core strength. Critical thinkers treat any demanded learning as a goal to be accomplished for further progression. They foresee an ocean of opportunities in the challenges facing or posed to them. Critical thinkers follow and practice the insistence of evidence as a basis for their judgement and are against propagation of bias and emotionalism. One of the significant virtues of Critical thinkers is the open and inquisitive mind exhibited through being receptive to other’s ideas. These attributes make the critical thinkers to become superb System Engineers since the basis of System Engineering can be summarised as “Everything is in without bias and Nothing emerges out without Resounding Rationale”. System Engineering firmly believes that Systems never fail and only the system design is fallible. Through the adaptation of this philosophy of Systems Engineering, it is possible to develop the preparedness for the epitome of owning responsibility in the event of a failure. In essence, this is true character of Pro -active and successful researchers who are always embedded with Voyage of Discovery from Known to the Unknown and the Vice Versa.
Since times immemorial, civilization and culture of nations have always been knowledge driven. Higher levels of knowledge make nations more advanced. In times of natural or man-made crises, advanced nations always have an edge over others. Therefore incessant learning is imperative for existence of mankind at individual as well as at societal level. This need is also perhaps a part of natural evolution. A society comprises several sections. All sections are equally important and are interlinked for fulfilment of needs of the society as an organic whole. Universities greatly undertake the need of enhancing knowledge of individuals and thereby societies. They accomplish the task by education and research.

But knowledge is vast and has no known boundaries. It is an ever expanding universe. Coping with the expansion requires sifting and sagacity that comes with erudition. All universities impart a level of knowledge considered fair by their peers in reasonable and practical time frames for award of degrees. Doing Masters and PhD degrees may give a sense of social recognition and provide a gateway for jobs. However this is just a step in the journey to uncharted parts of universe of knowledge.

For instance, when I started my career in Department of Atomic Energy just after taking my PhD degree, I really wondered, having known all the basics of energy production, what new things are still in store for me learn in the field. Very quickly, I found that the task of building real reactors is extremely complex and requires multidisciplinary efforts. My knowledge of mere understanding of the basic nuclear reactions was insufficient. I had to provide quantitative inputs for all conceivable physics that goes on in a reactor to a chain of team members of other disciplines, who worked similarly in their fields. I became aware of the gaps and uncertainties in knowledge in our own field. These gaps and uncertainties gave impetus to research efforts to fill at least some of the gaps. I came to realize how much we can accomplish in filling the gaps with our knowledge and facilities in a given time frame and manpower. Some gaps and uncertainties require larger inter institutional efforts. This is the reason why national laboratories like DAE and ISRO want to involve academic institutes and universities in generating data, filling the knowledge gaps and reducing uncertainties for improved performance of the systems.

As one knows, choosing a problem worthy of research requires good literature survey in the chosen field and strong motivation. On the other hand, most of the research problems arise naturally in the course of completion of national projects such as nuclear reactors and space missions. The problems tend to be well defined. The solutions are also expected to serve the purposes of safety and cost savings. The solutions worked out often turn out to be novel and get good international recognition and publications. For instance, the radiation shields around fast reactor cores were considered expensive and large. The mission of the research team formed by the organization was to find an alternative material combination that would be lower both in terms of volume and cost.

The work involved physics calculations and experiments, metallurgical tests, chemical compatibility studies and irradiation studies. The studies conducted over four years identified the material (Ferro-Boron) and conducted all the tests to prove its worthiness as a nuclear material for use in fast reactors. The use of the material would bring down the cost fivefold. The team work brought out five research papers in International Journals in the fields of Physics, Chemistry and metallurgy.

For researchers in institutes and universities, national missions offer plenty of opportunities to pursue good research. They also provide education and training in some of the most advanced techniques in addition to that intangible satisfaction.
As a physicist and academician, in this article, I would like to reflect on the paths scientific research has taken in the last two centuries and point to how MSRUAS is working along these.

The beginning of the 20th century was the golden period of modern physics. Considerable progress was achieved in understanding the structure of the atom and the nucleus. This naturally culminated in the development of nuclear reactors. This was also a period in which the scientific research was concentrated in Europe and the scientific work was more of an isolated, individual effort.

After the Second World War, the US marched ahead of Europe in its contribution to the advancement of science. The growth of scientific institutions, big laboratories supported by the industry and the government occurred predominantly during the middle of the 20th century. During this period, the invention of the transistor and laser led to an outburst of activity in the field of electronics and communication. This culminated in the development of computers with massive capacities for computation and fiber optic communication networks for effective communication across the world. Also during this period, understanding of the structure of biologically important molecules provided an impetus to the discoveries in the field of molecular and cell biology. The development of personal computers and the internet, which occurred during the end of the 20th century, has provided enhanced opportunities for communication among scientists and scientific collaboration across continents.

A very prominent feature of scientific research in the 21st century has been the greater emphasis to provide technical solutions to the practical problems of everyday life with utmost urgency. It is not uncommon to find physicists, chemists and mathematicians working along with engineers in industrial labs. This has naturally led to the multi-disciplinary approach to research. A good example of such a trend is in the field of tissue engineering.

The research in this field involves a variety of disciplines such as molecular and cell biology, biochemistry, material science and 3D printing. Both in pure and applied sciences, automation of experimental apparatus and computer based simulation are playing noteworthy roles.

At MSRUAS, we recognize the need to prepare our students for productive research careers in the contemporary world. The diverse faculties in MSRUAS create a conducive atmosphere for multi-disciplinary research. The educational processes at MSRUAS are designed to enhance the capacity for self-learning and instill in student the necessary critical, analytical, practical and soft skills. In India, there has been an increased emphasis on entrepreneurship and innovation owing to economic liberalization and globalization. To top it all, an incubation center at MSRUAS, set up with support of the MSME, Govt. of India, provides students opportunities to face the challenges of entrepreneurship. In summary, I can aver that the academic system at MSRUAS will equip students with good confidence to take on scientific and engineering challenges faced by the nation.
The Voyage of Transformation

“As the time passes by it always bring the best to us”. The day when I got to know that M. S. Ramaiah School of Advanced Studies is providing Masters in Product Design, I started believing in it. “If you want something with all your belief, it always comes to you.” After finishing my bachelors in Mechanical Engineering, it was a hard time to search for a job. After working for almost one year I wanted something new, something more creative. In India there is very less awareness of Design, we all are running behind the crowd blindly. With the guidance of Mr. Gopinath sir I joined M. Sc.[Engg] Product Design. I was still in uncertainty about my decision. But when the foundation course started, a voice came from inside “Yes, this is the place I belong, I always wanted to do this and why I was not aware of this course after my schooling.” The field of creativity and new innovation to make life easy and gorgeous. The course provides all the facilities to grow in all the directions. The module system for master’s course helps one to concentrate in one subject with full devotion. It nourishes the bud of creativity inside us to flourish into a flower of design and teach us to always create new.

As soon as I completed my masters, my good time started. I joined M. S. Ramaiah University as an Assistant professor on 15th July, 2015. After 18 years of student life, it was the time to be in the other side. I started feeling the heaviness of responsibity in my shoulders, although it was a great feeling. Because it is the time to learn more. The respect I had towards my gurus increased more. Now when I stand in the class for any lecture I can feel the importance of the words that I speak out and how deep it can effect a student’s mind.

I will do my best to utilize this beautiful opportunity of sharing and learning. I am glad to be a part or a source to spread the light of design and creativity.
Department of Mechanical & Manufacturing Engineering Offers....

**B. Tech in**  
Mechanical Engineering

**M. Tech in**  
Advanced Manufacturing Technologies  
Engineering and Manufacturing Management  
Advanced Machinery Design
Electrical energy is high grade energy and its generation through Rankine Cycle process from fossil fuels is well established. In recent years the research and development of generating electricity through Organic Rankine Cycle (ORC) from a low temperature sources like waste heat from internal combustion engines, industrial processes and renewable energy is getting prominent importance worldwide. A recent Indo-German study estimated the potential of ORC based power generation in India to be around 574 MW in the Iron and Steel industry, 35 MW in the Glass industry, 148 MW in the Cement industry, 1.4 GW in the solar thermal industry and 2.4 GW in the Biomass industry.

MSRUAS is working on a sponsored project with a private firm for designing, developing and testing of Organic Rankine Cycle power generation from heat sources like biomass, solar, or industrial waste. The project include works like thermodynamic cycle modelling, simulation and optimization of ORC, thermal and mechanical design of system components, performance of different organic working fluids and selection of various auxiliary equipment’s etc.

The simulation results for ORC with solar energy as heat source for the working fluids R-245fa, R-113, R-123 with condenser pressure of 540kPa reveals that the efficiency of 5% of 14% can be obtained and R-123 as a suitable working fluid.

In the first phase, an ORC power plant with a capacity of 10 kWe, is designed, developed and tested at no load and partial load condition for more than 100 hrs of intermittent operation. The results obtained were encouraging and the second phase of work is in progress to improve the efficiency of ORC by superheating of organic fluid, modifications in turbine etc.
Department of
Automotive & Aeronautical Engineering Offers....

M. Tech in
Automotive Engineering
Automotive Product Design
Automotive Powertrain Design

Turbomachinery Design
Aircraft Design

M. S. Ramaiah
University of Applied Sciences
www.msruas.ac.in
Tanks, especially those employed by the Indian army, are known to be typically heavier than their western counterparts. The MBT Arjun typically weighs some 65 T for instance. Most of that weight comes from the tank's armor. Quite naturally, tank's designers are challenged with finding lighter alternatives.

A 7.62 mm armor-piercing projectile fired at 900 m/s can be a challenge to resist. Classified as STANAG threat level 3, battle tanks currently face this challenge by employing high strength steel plates as thick as 18 mm!

A year-long research study sponsored by DRDO was recently completed by Dr. B. V. Vijay, Professor, as principal investigator and Nithin V, Asst. Professor, as co-investigator. One of the objectives of the study was to develop an armor of optimum 'bubble-shape' that would efficiently substitute for flat steel plates. The idea of bubble-shaped armor was conceived by the PI, from the fact that shell-topologies are far superior to plates in resisting load, including impact.

The optimization employed GENSOLV™, a software code developed by the PI earlier for ISRO (Govt. of India) that was successfully demonstrated to yield mass-efficient designs for launch-vehicle structural components.

Optimized Bubbled-Armor 'Wards Off' Projectiles

It doesn’t take effort to figure that the optimum shape is clearly superior to the flat- and the hemi-spherical ones, in regard to resisting the projectile’s impact. While the flat disk is totally penetrated and the hemi-spherical bubble significantly damaged, the optimum shape is resistant to the extent of ‘warding off’ the projectile, post-impact.

Why did the optimum shape turn out to have the most resistance? Here’s a reasonable answer to that: The optimum shape was the result of robust genetic search with the objective of maximizing the ratio 'fundamental modal frequency/structural mass'. Modal frequency in turn goes to determine how fast a shock wave would propagate thru the medium, read how fast impact energy would disperse away from the point of impact. Although another important factor, the modal participation as it is called, is also responsible for the dispersion, this factor wasn’t considered in the optimization.

Seen above is a 'wavelet-decomposition’ of the 'resultant' acceleration record on the optimum bubble’s surface, for a point away from the impact location. The high-intensity red zone in the plot appears centered around 0.0525 s on time scale and around 2.6 kHz on the frequency scale. The presence of 'lobes', that is closed contours, points to oscillatory modal character in the response around this frequency. If we now look at the modal frequency spectrum, determined separately from linear Eigen-solution, in the bar-graph here, we see that the lowest modal frequency is 2.15 kHz. The 'lobes' thus correlate fairly well with the modal frequency. We thus conclude that not only has GENSOLV™ brought out a superior shape for best resisting projectile impact, but has done so with a rather simple modal frequency objective as well.
Department of Electronics & Communication Engineering Offers....

**B. Tech in**
Electronic & Communication Engineering

**M. Tech in**
Biomedical Engineering
Electronics Systems Design Engineering
Digital Signal & Image Processing
VLSI System Design
Signal Processing & Communication Technologies

Department of Electrical Engineering Offers....

**B. Tech in**
Electrical & Electronics Engineering

**M. Tech in**
Electrical Machinery Design
Sensors and Control Systems Engineering
Design and Simulation of Digital Beamforming Transceiver System

B. R. Karthikeyan
Assistant Professor

An antenna array for the communication link for an aircraft system is designed with the beam steering feature. The Vivaldi antenna featured with end-fire radiation is chosen as an appropriate array antenna element due to its polarization characteristics, beamwidth, bandwidth and gain performance. The Vivaldi antenna array (28x1) is designed for 15 dB gain performance with beamwidth of 8 in the azimuth and 87 elevation planes of the aircraft. The designed Vivaldi array is operable in wideband covering 4.4 GHz - 4.6 GHz and 4.8 GHz – 5.1 GHz, for both transmit and receive bands respectively. Without losing significant gain, by applying appropriate phase weighting at the feed ports of antenna array elements, the results show that azimuthal beam steering of +/-45 is possible as seen in the graph here. The mutual coupling between the adjacent Vivaldi elements has been considered in the elemental radiation patterns used in the computation of Phase weights.

In order to accomplish 360 azimuth coverage, six Vivaldi arrays are suggested to be mounted on the airframe, and the suitable mounting locations (Leading edges of Wing and Tail edges) are also identified to realize the maximum performance of the antenna. An azimuthal coverage of 348° has been realized almost satisfying the gain specifications of 15dB. The uncovered 12° can also be covered with a reduced gain of 10dB. RCS computations of individual Vivaldi antenna as well as Vivaldi array have also been performed to infer their contributions on the overall RCS of the aircraft.

The study has thus successfully demonstrated digital beamforming based steering capability for aircraft.

Design and Testing of MAV

Vishwanth. K. Reddy
Assistant Professor

Natural features/tracks on the ground like bridges, forest boundaries, roads, etc may need continuous surveillance. In such cases an aerial vehicle which navigates autonomously over the selected natural features on the ground would come handy. The scope of this project is to develop an image processing testbed for this purpose.

At each instant an aerial image is captured and the orientation of the track in the image is extracted. Relative angle between the heading direction and track orientation is used as navigation control command to the autopilot.

In this project the algorithm for extracting the orientation of a defined track has been simulated and tested using test video sequences.
Department of Civil Engineering

Offers....

B. Tech in
Civil Engineering

M. Tech in
Civil Structural Design
Construction Engineering and Management

M. S. Ramaiah
University of Applied Sciences
www.msruas.ac.in
**Micromechanics of Shear Behaviour of Granular soil Using Discrete Element Method**

Dr. S. D. Anitha Kumari  
Associate Professor

In discrete element method (DEM), particles are modeled as discs or spheres as it is easy to characterize the grain interactions and the contact detection. The particle shape plays a major role on the response of the mechanical behavior of granular matter. On account of this, the effect of aspect ratio on the mechanical behavior and micromechanics of two different assemblies consisting of particles with aspect ratio 1 and 1.5 is studied. The constitutive behavior of the assemblies and the evolution of the micro-structure of the samples under shearing are closely examined and is related to the aspect ratio of the particles constituting the assembly. The spherical harmonic distributions of contact forces and contact normal's along with 3-D histograms are plotted to give quantitative information of the variation of these parameters as the loading progresses.

The behavior of these assemblies indicates that the strength of the clumped assembly is higher than that of the spherical assembly at all confining pressures. This can be attributed to the increased ability of the clumped particles to withstand the directional variation in the anisotropy. This is evident from the magnitude of the anisotropic coefficients associated with the fabric and normal contact force tensors. For both the assemblies, the contribution from the normal contact force anisotropic coefficient plays a major role followed by fabric and tangential contact force coefficient. It also indicates that initially the system is locked kinematically and deforms elastically. The slight inherent anisotropy developed in the assembly consisting of the particles with higher aspect ratio as noted from the magnitude of anisotropic coefficients and distribution diagrams indicates that there is difference in the initial fabric of the structure which can be attributed as one of the reasons for the higher strength associated with the clumped assembly. Moreover, the histograms and distribution functions of the micro-parameters at various stages of shearing for both the assemblies indicate that there is significant loss of contacts in the minor principal stress directions and it is this loss of contacts which lead to the overall anisotropy of the system. In short, the increase in aspect ratio has increased the peak and ultimate strength of the assembly under different confining pressures. This reiterates the fact that the inclusion of the various shape aspects of the particles will change the magnitude of the response of the system.

**Studies on Rate of Strength Development in Geopolymer Concrete With Micronized Bio Mass Silica**

Mrs. Nayana N. Patel  
Assistant Professor

Development of new binders replacing cement by geopolymers from industrial byproducts such as ground granulated blast furnace slag (GGBS), fly ash (FA) and rice husk ash is one of the topics where current research focuses. The new binder materials that can replace Portland cement (PC) by alkali activation, consume less energy and generate less carbon dioxide than PC. Paddy is one of the major crops in India. Every year approximately 120 million tons of paddy is produced in India and rice milling industry generates 22% of husk during milling of paddy. Micronized Biomass Silica (MBS), is obtained by burning rice husk in rotary furnace at 500 to 600 degree Celsius followed by micronization to make a particle size diameter less than 25µm, and contains high content (90% - 95%) of silica in the amorphous form.

This research deals with an experimental study on ambient temperature cured FA, GGBS and MBS based geopolymer concrete (GPC). Sodium based hydroxide and silicates are used as activators. Two grades of concrete M25 and M60 (normal strength and high strength) were developed. Properties such as fresh density, slump flow, rate of compressive strength development at different ages, flexural strength and ultrasonic pulse velocity at the age of 28 days were determined. Fresh density and slump flow measured was 2439 kg/m³, 2460 kg/m³ and 225mm, 230 mm, respectively, for normal and high strength mixes. At the age of one day, around 47% of 28 days compressive strength is achieved in high strength GPC, compared to 10% of normal strength GPC. Rate of strength development of normal strength GPC was slow compared to high strength GPC.

The compressive strength test was done at the age of 1, 3, 14 and 28 days and average of both the mixes are taken. In case of High Strength Geopolymer Concrete (HSGM) the strength attains 47 % of its total strength in one day and 79.1%, 97% in 3 and 14 days respectively whereas in case of Normal Strength Geo-polymer Concrete (NSGM) only 10% of 28 day strength had been attained in one day and 47.2%, 77.05% in 3 and 14 days respectively.

The objective of this work was to study the feasibility of the use of micronized biomass silica as source material for geopolymer concrete (GPC). GPCs of normal strength and high strength were developed using low molar concentrations of sodium hydroxide. The hardened properties of the concretes were studied and the results were compared with that of normal conventional concrete.

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**DISCUSSION**

The study of micromechanics of shear behavior of granular soil using discrete element method sheds light on the role of particle shape and aspect ratio in determining the strength and anisotropy of granular assemblies. The inclusion of various shape aspects of particles significantly affects the response of the system, highlighting the importance of particle shape in geotechnical engineering applications.

On the other hand, the research on rate of strength development in geopolymer concrete with micronized biomass silica showcases the potential of using rice husk ash as a sustainable and inexpensive source material for geopolymer binders. The results demonstrate the viability of developing high strength geopolymer concrete using sodium hydroxide and silicates, with significant improvements in compressive strength compared to normal strength mixes. This study contributes to the development of environmentally friendly construction materials that can replace traditional binders like Portland cement.

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**REFERENCES**


Department of Computer Science & Engineering Offers....

**B. Tech in**
Computer Science & Engineering

**M. Tech in**
Computer Science & Networking
Real Time Embedded Systems
Automotive Electronics
Application of Time Series in Hyperspectral Imaging

It is said that one picture is worth hundred words, but hyperspectral imaging says one image cube is worth thousand images. Hyperspectral image processing needs huge image data to be processed. It involves heavy computational load because these data cubes contain images acquired at a large number of contiguously sampled spectral wavelength bands. To overcome this problem, dimensionality reduction techniques are often employed. These techniques should ensure no sacrifice in image quality. Hyperspectral data is generally processed by automatic algorithms and hence image quality evaluation needs quality metrics rather than human quality assessment. It is also possible that hyperspectral data cubes are processed for dimensionality reduction and the data quality is assessed using quality metrics. This forms the basic premise for a research proposal submitted by the Department of Computer Science and Engineering, MSRUAS to DRDO.

For stress detection, it is sufficient if the hyperspectral data contains few bands so as to preserve the trend in the reflectance spectrum. Hence dimensionality reduction is suitable. Hyperspectral data processing is useful in many applications, some of which are discussed below. In agricultural sector, the hyperspectral image processing helps in the assessment of vegetation stress, based on the photosynthetic activity in the crops. Also, it helps in accurate assessment of pigment contents like chlorophyll, carotenoid, and water content. Spectral characteristics of the materials in the hyperspectral scene have the capability to discriminate the objects, thus helping in anomaly detection and target detection. Image object identification using classification and feature extraction techniques is another application which involves hyperspectral data processing. Hyperspectral data processing employs Feature Extraction techniques to extract the required feature from images under consideration. A famous technique for feature extraction is the Principal Component Analysis (PCA), which reduces the dimensions while retaining the relevant and important features. However, PCA cannot process nonlinear data effectively. There are many non-linear feature extraction algorithms such as Wavelet Packet Analysis (WPA), Laplacian Eigenmap (LE) and so on. For evaluating the image quality, metrics like producer's accuracy, user's accuracy and overall accuracy can be used. Also, Peak Signal-to-Noise Ratio (PSNR), Mean Square Error (MSE), Maximum Squared Error (MaxSE), ratio of squared norms called L2RAT and Entropy can also be used. Most recent research uses Euclidean distance of cumulative spectrum (ECS) as a distance measure for image quality evaluation.

Thus, there is a scope for development of an efficient time series based dimensionality reduction technique suitable for hyperspectral data processing in any application and investigate on efficient application dependent image quality evaluation metrics. The above said research involves obtaining hyperspectral data used in a variety of applications like agriculture, vegetation prediction and assessment, anomaly detection, image object classification. Later an efficient dimensionality reduction technique has to be developed for a generic class of applications, based on time series analysis. The research work can evaluated for image quality using quality metrics.
Faculty of Art & Design Offers....

**B. Des in**
- Product Design
- Visual Communication
- Fashion Design

**M. Des in**
- Product Design
- Commercial & Retail Design
- Rural Product Design
- Fashion Design
- Computer Animation & Game Design

M. S. Ramaiah
University of Applied Sciences
www.msruas.ac.in
The symbolism and ritual significance of festivals in Ghana is rich. In Southern Ghana, the Akan and the Ga-Dangme carry their chiefs and kings in palanquins when they appear in their state durbars.

A figurative palanquin connected with the totem of its owner is a special kind of litter (wheelless vehicles) used in the Greater Accra Region in Ghana. With these figurative palanquins the Ga create ethnic differences between themselves and their Akan neighbours that only use simple boat- or chair-shaped litters.

During an informal talk between Dr. OseiDarkwa, president at Ghana Technology University College (GTUC) and Dr. S. R. Shankpal, Vice Chancellor, MSRUAS, the design requirement of a motorized palanquin emerged which can be used as an alternative to the traditional palanquin in the Greater Accra Region of Ghana which included people carrying the King or the chief.

Technical design requirements included the form to be built with light but strong materials with reasonable speed range of 50-60 kilometres per hour, a voluminous seating space for the king/chief, to be modular so that it is easy to assemble, ergonomically designed driver’s cabin with appropriate ventilation and good visibility. The catch being that driver’s cabin had to be concealed from the people around.

On the aesthetic side, to build a local appeal in the motorized palanquin, relevance of colour and texture in Ghanaian clothing and fashion styles were studied and considered to embrace the cultural and traditional aspects of Ashanti diaspora.

Based on the design brief, a plethora of rough sketches, concepts and hand renderings were generated as the outcome of a rigorous iterative process of ideation, design and concept visualization. Concept selection was followed with rapid prototyping to build a mock-up model. Exterior styling of the motorized palanquin was achieved by integrating the colours, textures and patterns of Ashanti culture.

Under the able mentoring of Dr. S. R. Shankpal, Vice Chancellor, MSRUAS, members of the Department of Industrial Design at MSRUAS took this challenge along with Techno Centre, ideated and designed two palanquins for the royal family.
Faculty of Management & Commerce Offers....

**MBA in**
- Marketing Management
- Human Resources Management
- Operations Management
- Financial Management
- Small Business and Entrepreneurship

**MHA in**
- Masters in Hospital Administration

**M. Com in**
- Accounting and Taxation
- Banking and Finance
My journey with MSRSAS started during February 2007 as MBA teaching faculty. All these days, I really enjoyed the module based delivery system, which is one of the most challenging job to prepare all the teaching materials, like class delivery notes, assignments, case studies, video studies etc. in advance and deliver according to the present industry requirements. At later stage of module delivery, I use to be very happy for the right noble feedback from students in the consecutives module delivery, which unquestionably provokes me a lot to do more for the students as well as to the humanity, as they are able to face challenges from outdoor world. I really felt on the top of the world, especially when the passed out batch students called and said they are in a very good positions in a corporate world.

It is the uniqueness of this University for the faculty members, to effectively involve in research and other sponsorship related projects with the help of cross domain experts from various departments. As a Principles Investigator, with the help of young engineers as my team members form our Techno Centre, recently we have successfully completed a consultancy project entitles “Sensorized Motor Trends” and submitted to SKF. In an appreciation letter issued by SKF, they had mentioned that their Global partners, has conveyed the use fullness of our project report and have taken steps for further implementation of strategic decision making process in other countries too. They have also mentioned that our university / Institute has been considered for future consultancy and potential projects.

Another consultancy project entitles “Technology Gap Analysis for Mysore Printing Clusters” which I am involved as Principle Investigator, working with dedicate team form our Techno Centre. This project was awarded to us from TIFAC, Department of Science and Technology, New Delhi. I personally consider this, as a prestigious project to work for and we are in a final stage to submit the report to TIFAC New Delhi. In fact the general secretary from Mysore Printers Clusters Association on has appreciated our work and said that the suggestion and recommendations given by us, would certainly help them to retain for market sustainability in a competitive environment.

Businesses and Funds

Prof. G. Devakumar
Associate Professor

Dr. Suman Chakraborty
Assistant Professor

Much of the empirical research on mutual funds has not given any significance to the work force those who has been retired from their regular employment. Even existing literature and research findings does not documents considerable work on the perceptual difference between the investment behavior between retired and non-retired investors. The study investigates the extents of deviation between a retired and non-retired investors on three important parameter such as preference for an investment option, perception on the riskiness of the investment option selected and finally the duration for which money will be invested. Responses have been collected from only those retail investors, who have invested in ten investment options: a) Fixed Deposit in Banks and Indian Post Office, b) Insurance Schemes, c) Public provident fund, d) Debenture, e) Equity, f) Mutual Fund, g) Bullion, h) Real Estate, i) Postal Schemes, j) Others (including investment in derivative contracts and commodities). Though this study is limited to retail investors of Odisha and confined to retail investors whose annual income is not more than ten lakhs rupees, but it can be further applied to entire spectrum of investors. The study also explored few unique variables which influences the investors to invest in mutual funds schemes and with regression modelling technique, put an effort to measure the beta of such independent variables. From the analysis of the data, it was found that both retired and non-retired retail investors invest less in case of increased medical expenditure.

Objective to invest is significantly influenced by demographic factors such as age, occupation and the income level of investors. Findings from the factor analysis indicate that twelve variables significantly influence the retail investors decision to invest in mutual funds, these are, a) Past performance of the fund, b) Consistency in dividend payment, c) Tax benefits, d) Benefits of medical and accidental insurance, e) Fund assure capital protection, f) Benefits of systematic investment plan, g) Good advertisement policy, h) Better options available other than mutual funds, i) Performance of Indian stock markets, j) Health condition of family members, k) Increasing / decreasing medical expenses, and l) Family obligation.

Results of regression analysis exhibit that the performance of any fund and inherent benefit of medical and accidental insurance in a mutual fund scheme influences the investment decision of the retail investors positively. Similarly, presence of medical and accidental coverage for a particular amount in a scheme drives the investment in mutual funds among the retail investors. Furthermore, it is found that increase in medical expenditure and financial obligation within the family deters the retail investors from investing in the mutual fund schemes.
Academic Research Offers....

Doctoral Programme

www.msruas.ac.in/doctoral_research
Signal Localization

B. R. Karthikeyan
Assistant Professor, ECE

The localization of wireless signal is about the estimation of Direction of Arrival (DOA) of the signal emitted from a far-end region. The acoustic signal, electromagnetic signal and seismic signals are localized by estimating its DOA and range for variety of civilian and military applications. The acoustic signals such as speech, audio signal and noise emitted from engine, generator or special machines shall be used for estimating its origin of the signal. Similarly, the electromagnetic signals radiated from the radars, wireless nodes and mobile nodes shall be localized using DOA estimation techniques.

The DOA estimation is carried through an array of sensor elements. High sensitive acoustic microphones are used as sensor element for speech and audio signals. The antenna operating at corresponding frequency bands act as a sensor element for electromagnetic signals. The array of hydrophone elements and array of seismic sensors are used for the DOA estimation of water waves and seismic waves respectively. The signal detected (received) through the array of sensors are sampled to convert into digital samples. These digital samples are processing using signal processing algorithms for the estimation of DOA and range of the emitted signal. The azimuth angle, elevation angle of the spherical coordinate system can be estimated through the 2D-DOA estimation schemes. The phase delay and time delay of arrival (TDOA) between the sensor elements are the key parameters computed through array signal processing algorithm and utilized for the DOA and range estimation.

The estimation of DOA and range with higher accuracy is a challenging task. A variety of techniques can be found in the literature to deal with the higher estimation accuracy. The covariance between the sensor data is computed. The Multiple Signal Classification (MUSIC) is one of classical algorithm based on subspace decomposition of the covariance matrix. This subspace decomposition technique laid a foundation to the variety of modern algorithms to produce super resolution in the DOA estimation. For the case of electromagnetic signal, the polarization of electric field vector can also be used to further improve the estimation accuracy. The radars for detection of aircrafts, systems for the detection of water waves and early warning systems for Tsunami and earth quake prediction and sniper detection systems in the battle field are widely adopting this localization techniques.

As a part of sponsored research project, an acoustic localization is carried in our lab with an array of microphone sensors, detected the acoustic signal and estimating its DOA.
Micro Air Vehicles (MAV) are a category of unmanned aerial vehicles (UAV's) whose sizes can be restricted and are equipped with autonomous capability. These MAVs can be used for vigilance or observation of hazardous environments which are beyond the reach of ground vehicles. The main aim of this project is to provide a fully autonomous hovering MAV platform for future testing of various sensors and vision system in real flight on VTOL MAV. This research will showcase the capability of Helicopter MAV system of 1Kg class category which can be productized with further development into a practical aerial surveillance solution for Urban City Security and Disaster Management needs. At MSRUAS design and development of micro air vehicle was carried out by Ishwar Mara, Shivaraj D, Shivkumar and Srikrishna under the guidance of Mr. J Madan, GM, Techno-Centre.

Multiple studies were conducted to identify the right materials to build the helicopter. The four main studies were in the area of power & drive system, actuator & blades, chassis design and COTS mechanics. The studies were conducted with the goal of designing a helicopter system that would achieve higher efficiency, maximum chassis stiffness while maintaining a lower overall system weight. Keeping all the above parameters in mind three concepts were selected and one concept was finalized. FEA tool was used to validate the strength of the chassis. Dynamic behavior of the chassis was studied by conducting the experimental modal test and simulation by FEA tool. Experimental and FEA results were in good agreement. Figure shows two micro helicopter with rotor diameter 630mm and 350mm respectively. After successful testing of 630mm rotor diameter helicopter, 350mm rotor helicopter was built with fully autonomous capability.

EMAG Design & Analysis of BLDC Generator

Aircrafts need an onboard source to power all the various electronic components. This need is addressed by installing a DC generator. The present project is essentially concerned with Electromagnetic simulation, Computational Fluid Dynamics and improvement of a secondary three stage Brushless DC (BLDC) Generator. The said BLDC generator, which is designed to provide a required DC output at a constant rated voltage at acceptable ambient temperatures, acts as a backup in case the primary DC generator fails. It is also capable of handling overloaded condition for a short duration of time.

The Brushless DC (BLDC) Generator comprises: Permanent Magnet Generator (PMG), Main Exciter (ME) and Main Generator (MG). The AC current developed by the Permanent Magnet generator is rectified and input as field excitation for the Main Exciter. The rectified output from this is further given as field excitation to Main Generator, which gives a constant DC output at the required ratings. EMAG & Thermal analysis of BLDC generator was carried out by Mr. Sumukha H N & B K Swathi Prasad.
The rotors and stators were modeled as stacked lamination sheets where the lamination factor is defined. The winding configurations and connections were defined in detail by building a circuit in a separate module and were imported into the main electromagnetic simulation module. When the three phase windings cut across the magnetic field (which in turn are generated by giving a field excitation in the field windings), EMF is induced. E-mag analysis was carried out to improve various electrical & mechanical parameters to get desired output at allowable ambient temperatures. The loss values obtained at various components like windings and cores were subsequently provided to the CFD team for further thermal analysis of the generator assembly.

**BLDC Generator Thermal Analysis & Flow Improvement**
LDC Generator EMAG design is validated using conjugate heat transfer (CHT), where core and copper losses are applied as heat loss in CHT analysis. In initial design main generator was placed in the middle of the yoke region. Hence it created huge flow blockages which lead to high temperature generation. Many design modifications were done for the initial geometry. The effect of the modifications explained below on the flow and thermal characteristics of the generator was analyzed, compared and tabulated. Mr. Parikshith Mallya & Mr. Rohith Panduranga worked on the CFD analysis & improvement aspects.

The effect of the modifications explained below on the flow and thermal characteristics of the generator was analyzed, compared and tabulated. Mr. Parikshith Mallya & Mr. Rohith Panduranga worked on the CFD analysis & improvement aspects.

END fan modifications: Two geometry modifications were done for the END fan in the final improved geometry with CFD simulations. For one of them, blade profile is kept same as original but outer diameter is increased to reduce gap to 1.5mm from 6.5mm. For the other, entire END FAN is scaled up so that gap is reduced to 1.5mm.

Outlet modifications: Four modification in the outlets of final improved geometry were made and a CFD study was done to check out the effect of these modifications on internal flow and temperature. In one case, length was increased, in second, the number of outlets was increased. In third, the width was increased and in final case, both length and width has been increased. Based on the different geometrical modification there will be a drastic reduction in maximum system temperature.

Finite Element Analysis of Direct Gear System

The Directing Gear System is used for naval applications and are made up of Housing, Gears, Flat form, Sonar array and Sheet metal covers along with various electronic equipments. The structural design of the entire body was taken up by naval organization. At MSRUAS finite element analysis of was carried out by team of project engineers Ishwar Mara, Pradeep T S, Nagaraju Thadur and Sandesh Pawar.

The above figure shows geometry and finite element model of the direct gear system respectively. It is evident from the finite element model that only structural components are meshed and rest of the components are replaced by lumped mass.

Load carrying capacity of the direct gear system was ascertained using FEA tool. Direct gear system was subjected to various static and dynamic (shock) loads. Safe operation of the DG gear system was ensured after performing several iterations of simulation and studying its behavior under static and dynamic loading conditions via FEA tool.
Techno Centre Engineering

www.msruas.ac.in/techno_center
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- Vehicle Dynamics
- Control Systems
- RF and Microwave Engineering
- Mathematical Modeling and Simulations
- Embedded Systems and OS
- Materials and Manufacturing
- Digital Signal and Image Processing

...and many more

Continuous Professional Development
&
Life Long Learning

M S Ramaiah University of
Applied Sciences

www.msruas.ac.in/training_learning
## Corporate Feedback

<table>
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<th>Sl. No.</th>
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<th>Topic</th>
<th>Date</th>
<th>Feedback</th>
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<tr>
<td>1</td>
<td>Mercedes Benz R&amp;D India Private Limited</td>
<td>Automotive Electronics</td>
<td>6th, 7th and 8th July 2015</td>
<td>Very informative and well-structured course</td>
</tr>
<tr>
<td>2</td>
<td>Rune</td>
<td>Material Sciences</td>
<td>11th &amp; 12th May 2015</td>
<td>A good program</td>
</tr>
<tr>
<td>3</td>
<td>Mahindra Two Wheeler Division</td>
<td>Manufacturing Process</td>
<td>21st &amp; 22nd Nov 2014</td>
<td>One of the best training programs in my career</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Excellent training program. Content of training is excellent, way of explaining is excellent</td>
</tr>
<tr>
<td>4</td>
<td>TACO</td>
<td>Suspension Design</td>
<td>21st May 2015</td>
<td>Overall it is very good. It is suggested to have training courses for working employees here in Pune</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>Excellent presentation from both the faculty</td>
</tr>
<tr>
<td>5</td>
<td>Continental Automotive Components</td>
<td>Automotive Communication Protocols and Diagnostics</td>
<td>10th to 14th August 2015</td>
<td>The knowledge and way of explaining of the faculties were remarkable</td>
</tr>
<tr>
<td>6</td>
<td>Mahindra &amp; Mahindra Limited, Chennai</td>
<td>DFMA</td>
<td>8th &amp; 9th July 2015</td>
<td>The training was very interactive with good examples</td>
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### Program Summary

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<th>Program</th>
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<td>Seminar</td>
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<td>STP</td>
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</tr>
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</table>

7 | Taqgat | Engineering Refresher Course | 3rd August to 12th August 2015 | Do visit our company frequently for providing us with some more useful knowledge |
8 | General Motors - Technical Centre | PGET - Product Familiarisation | 11th to 14th August 2014 | Interaction was encouraged. Concern and requests were addressed. |
9 | Geometric Global | Automotive Interior and Exterior Design | 10th and 11th August 2015 | Trainers knowledge in Plastics is very good & his explanation is very clear with examples & pictures |
| | | | | The knowledge about the materials is very good |
10 | Robert Bosch Engineering & Business Solutions Limited | Automotive Basics | 25th Feb 2015 | Excellent animations to understand the concepts clearly |
11 | Mahindra Trucks and Buses Ltd. | Vehicle Dynamics | 19th & 20th May 2015 | Very informative. Good to strengthen basics |
12 | VE Commercial Vehicles Ltd | Casting Technology | 24th & 25th February 2015 | Faculty’s Knowledge was excellent & presentation was too good |
| | | Sheet Metal Forming and Joining | 26th & 27th February 2015 | The content of training is very good. Trainer has shown some theoretical case study. |
I had spent three years in industry when I took an important decision of my life to pursue my higher studies. It was a hard decision not because of different personal expectations that had to be met, but because now I had to meet the expectations of my organisation and my family as well. I could not quit my job as I had a financial responsibility towards my family. I was in search of a reputed institution which will give a new direction to my career, an institution whose policies do not hinder my normal work and an institution where I can study when I work.

One of my colleagues recommended M.S. Ramaiah School of Advanced Studies. This institute is managed by Gokula Education Foundation which has given a lot of reputed educational institutions to the society that is popular all over India. I opted for Electronics Systems Design Engineering course under Post Graduate Engineering and Management Programme which was offered in collaboration with Coventry University, UK.

My life in MSRSAS was filled with many memorable moments. MSRSAS took special care by providing complete course details with expectations at the beginning of the course, this helped us to plan, prepare and perform better in every module. MSRSAS has highly qualified and able teaching faculty, with each one of them having a unique knowledge base and experience. The uniqueness of MSRSAS is that every lecturer had the ability to deliver a customised package of the module they teach without compromising the essential content. A lot of emphasis was given for practical approach in problem solving using different hands-on tools widely used in industry. This feature attracts a lot of working professionals.

The speciality is that every evaluation had a challenging unique practical problem statement where the evaluation was focussed on student’s approach in solving the problem. The emphasis was more on research and to bring it to practice. A course on soft skills development helped us with personal awareness and to develop as a professional with awareness.

MSRSAS has a very good library with huge collection of references and research work. The library staff were extremely helpful in getting us various research papers. Laboratories in MSRSAS have all modern measurement and analysis tools, latest computers and modern computer aided design, simulation and analysis tools. Infrastructure like library, laboratory, sports center and canteen are world class in MSRSAS.

I will be graduating from MSRSAS in 2015 with mixed feelings. I am happy for having given a new direction to my career with the help of MSRSAS without compromising on my career and family expectations. Sad as I will miss my fun-filled college days spent in MSRSAS. Campus life was no less than family life where we celebrated every festival and happy moments together. I recommend this research cum professional journey in MSRSAS to all my friends. I wish MSRSAS many more successful years in shaping the career of many more young engineers like me and making them educated, able and responsible citizen of this nation.

I got enrolled as a student of Aircraft design course in 2012. I was focused in completing my higher studies and didn’t want to do it just for the sake of having a degree in hand. First impression which I got from faculty was strong enough for me to believe that I was at correct place. The course, tenure and examinations are so strategically planned and designed that I never had to compromise my other liabilities with my studies. At academics front, no scope of syllabus was compromised just because it was a part time course. We were motivated to contribute our expectations towards the continuous improvement of the course material.

I worked under the guidance of Dr. Srikari, HOD (AAE) and Mr. Suman MLJ, Assistant professor (AAE) for my dissertation. They were supportive enough to clear my doubts and obstruction within their busy schedule. I was always motivated to look into the problem and understand the “Why&How” part of it. Dissertation was the turning point of my academic and professional career. I learned skills, read lot of papers to gain insight of the composites, understood the current trend of composite structure. This leveraged a leap transition in my career as well. I successfully changed my work domain and established myself as promising engineer in my work place.

I want to express my immense gratitude towards Dr. M.D. Deshpande and Dr. H.K. Narahari, they made my tenure at MSRSAS unforgettable. I feel proud to have attended their lectures and understand the topics they had taught. My respectful thanks to each and every faculty member who taught and guided me in the studies. Being an alumna of MSRSAS is indeed a feather in my cap.
Sampark

MY EXPERIENCE AT MSRSAS

I am Sabarinath D., finished my B. E. (Mechanical) in 2008 and then started working for General Electric (GE) in Gas Turbine Engineering Division. First of all, I thank MSRSAS for offering such a specialized course on Rotating Machinery Division (RMD), as a part of Post Graduate programs; also, I was very fortunate to get admission for the course in 2011, even after 2 months of its start date. I preferred RMD course for my PG degree, as it was much related to my Job profile and thought this will enhance my knowledge in working area.

Curriculum was set-up in a very thoughtful manner where it helped me to start from Basics of Turbo machinery and then learnt basic CAD/ CAE and its importance and then moved on to learn how different fields of Science and Engineering influence in design of Rotating machinery via., Heat Transfer, Fluid dynamics, Materials, Fatigue and Vibrations modules. Last module of the course was a really interesting one, which helped me to associate the learning’s from all the previous modules and understand how those individual pieces help in making a successful Turbo machinery design.

Module based curriculum was very helpful for me, where I was able to dedicate the complete 2 months time for one subject and then moved on to other; rather than focussing on multiple things at one time. Also, the lab sessions under each of the module were set-up in a way where it helped me to correlate the theoretical knowledge and enriched the module outcomes. And, I wanted to thank and mention specifically about the lab sessions, availability of CAD/ CAE and lab equipments at college premises, which helped us to get the practical exposure of the related subjects at one place.

Being a part-time student, I felt the assessment of Module learnings through ICAs and Final module assignment helped me to have good amount of time to think through the learnings while solving assignment and also able to correlate the learnings with my regular job. Apart from technical learnings, this assessment method also helped me to improve my Report writing and presentation skills, which is one of the foremost skills required in today’s scenario. Time frame and schedule of the thesis work was very apt for me and the in-between presentations helped to gauge myself and work accordingly.

Finally, I should say my many thanks to the entire faculty including the lab faculties for their flexibility and kindness towards all of us during the entire curriculum, during the module times and during the lab sessions and especially during the final thesis work.

Aiyyappan

I would like to begin with my sincere thanks to MSRSAS and the enriched professors for the wonderful guidance and support throughout the course, Engineering and Manufacturing Management, which is nicely structured and delivered to meet the need of today’s engineers, capable of meeting the global manufacturing standards as well as marching towards excellence in everyday work life. In today’s highly competitive globalized market, engineers are to be agile in the field of engineering, manufacturing and management activities. The course has a wide coverage on various engineering and manufacturing techniques viz. product design, process design, manufacturing technology, supply chain management and automation. The system part of manufacturing is well addressed through Kaizen, team building, lean, production planning, manufacturing strategy and project management. The entire course was very interactive with live case studies and simulations, which helped to understand the practical applications and benefits of various techniques which were taught in the course. The module based teaching of the entire course was very new to our present education system, which was very well tailored to reduce the burden of the student and at the same time ensuring the understanding of the Individual through written examination, Lab exercise, Presentation and Assignment. The assignments are well structured to earn our interest to explore and learn new things in each module. The clarity on the evaluation and assessment of each module are much better through the dual evaluation system. The group and Individual project helped us to practically apply the learning’s in the manufacturing Industries which was enabled by our mentors and professors.

Akashdeep Howladar

After a lot of searching, I found that in our country very few academic institutions provide courses with a systems engineering view towards engineering design, one credible institution I found was MSRSAS. By investing the last two years on working towards this M.Sc [Engg] in Electronic Systems Design Engineering I now am better equipped to realize the impact of engineering undertaking across sectors and markets. This would let me choose which niche I should target for establishing my own start-up or invest in existing technology start-ups. The faculty of Electronics gave deep knowhow of their subjects and explain abstract notions clearly. I am thankful for the courses offered at M.S.R.S.A.S that has given me the confidence to deal with dynamic market situations.
Innovation is the Heart of Knowledge

MSRUAS Department of Science and Technology
Govt. of India Partnership
TIFAC
Technology Information Forecasting Assessment Council

Center Of Relevance and Excellence (CORE)

MSRUAS established a TIFAC-CORE in Digital Image Processing in April 2003 to perform state-of-the-art research in Digital Signal and Image Processing Interacting with Industrial Sponsors and Government Research agencies.

Technology Commercialization and Facilitation (TCFA)

MSRUAS is one of the few institutions in the country to be identified by TIFAC as a TCF Agency. Established in June 2009, the school helps and supports product innovators to commercialize their innovations. The school believes that encouraging young entrepreneurs helps in growth of the country.
MSRUAS in Print Media

Business Standard

Paladion Networks partners with M S Ramaiyah University

Launches M.Tech programme in cyber security, information assurance

Arty Kann | Bengaluru

March 16, 2015 Last Updated at 20:31 IST

Information security provider Paladion Networks on Monday said they are partnering the MS Ramaiyah University of Applied Sciences to launch a Masters in Technology (M.Tech.) programme in cyber security and information assurance.

The two-year course, co-designed by Paladion, will offer curriculum including security and intelligence and analytics, governance, risk and compliance and security operation centre, among others. The university is most likely to start offering the course from May this year with an intake of 20 students, said S K Sharma, vice-chancellor, MS Ramaiyah University of Applied Sciences.

“This is another tailor-made course for the industry that our university is offering,” he said.

After completion of the course, these students will have the option for paid internships at Paladion Networks following which they will be placed in the company, he added. Mohan Goyal, chief executive officer, Paladion Networks said, “The market for cyber security professionals is large and demand is growing much faster than the average IT job.”

“While the need for cyber security professionals is huge, the industry readiness among students who pass out from such courses is lacking,” he added.

With the new programme, both the university and the information security provider try to address the problem of lack of innovative solutions in the space. It also creates an ecosystem where both the students and teachers can understand and work with the skill requirements of the IT industry.

According to the Ministry of Information Technology, India requires 1,10,000 cyber security professionals by the end of this year. Information security analysts will jump by 17 per cent by 2022, said Bureau of Labor Statistics, USA recently.
On-Renewable energy sources are becoming extinct which has availed Renewable energy sources (wind, solar) to meet demand of electric power across the globe. Various constraints in utilizing solar power are technical complexity and expensive for utilizing bulk power from solar energy. Thus wind energy can be the other alternative in place of solar energy, forms the cleanest form of electric power generation to meet electrical power demand. Larger fluctuations in the electric power demand leading to disturbance of frequency in the generation side of the wind farms resulting to injection of high reactive power into the system. This adverse effect on the system has provoked to develop a control strategy to minimize reactive power flow (improving power factor), via the pitch angle control. The thesis titled “Reverse Power Flow control in DFIG (Doubly Fed Induction Generator) system for Grid connected Wind Farm” aims at modeling power components of DFIG system, developing control strategies at grid and pitch side, perform simulation using MATLAB/SIMULINK software. Thesis focuses on controlling DFIG system connected to grid by delivering constant power. The basic control of the DFIG system is modeled with wind turbine, vector control with PID (Proportional Integral Differential) controllers in RSC (Rotor Side Converter) and VSC (Grid Side Converter) and Grid system. The power co-efficient curve of wind turbine determines that when pitch angle is zero, power co-efficient hence the rotor real power is maximum. This variation promoted to develop ‘TS-Fuzzy logic’ so that reactive power (reverse power flow) is minimized along the power co-efficient curve.

Simulation results are tabulated and scrutinized for a given wind profile at various speed for analyzing effect of Reverse Power Flow. The simulation studies shows that power factor is improved from 0.75 to 0.993 at wind speed of 11.5 m/s and thus reduced flow of intern reactive power in closed loop operation is achieved with faster response. DFIG system is also subjected to various fault conditions by creating faults at specified time intervals and the behavior of the system is analyzed and tabulated.

Datta Prasad
EMP (PT-2012)
Mentor: Swathi Prasad B.K.

As aircraft continue to evolve, the requirements for their development are becoming more stringent. Stealth capabilities are a major requirement of modern aircraft both manned and unmanned. The major contributor to radar cross section is from the engine face. The fan face can be hidden from radar by developing an inlet duct that is offset so that there is no direct line of sight from the entrance of the inlet duct to the engine fan face. This prevents a direct path for radar beams to strike the engine fan face and return to the receiver. But because of the complex shape involved there are secondary flows in the duct, which will affect the engine performance making it essential to understand the flow behaviour inside the duct to incorporate any flow control techniques to improve performance.

Current study investigates the effects of Rib Turbulator inside the Serpentine Duct and their effect on Distortion Index. The computational study has been carried out on baseline serpentine duct to know the flow behaviour and then Rib Turbulator is added to the structure to investigate its effects on the flow behaviour. CATIA V5 is used for modelling the duct as well as the Rib Turbulator; ICEM CFD is used for discretising the geometry; and CFD tool, FLUENT is used for the analysis.

The baseline results were in same trend for static pressure values on upper and lower wall of duct as of published experimental results. With the Rib Turbulator installed in the duct, an improvement in static pressure recovery was observed with decreased pressure loss by 21.67% and the reduction in distortion values by 58.69% were observed. Performance at AOA of 2° and 4° are also calculated where pressure loss shows a downtrend by increasing to 265% and 100% respectively and distortion values shows an uptrend by decreasing to 63.58% and 53.56% respectively.

Pradeep S
ACD (PT-2012)
Mentor: H. K. Narahari
Doing more with less is the formula for success in this era and the drive towards miniaturization in next-generation electronic components and systems is on. Presently all the full-duplex communication protocols use different channels for transmitting and receiving. In most of the systems, the transmitting channels of the first system are connected to the receiving channels of the second system and the transmitting channels of the second system are connected to the receiving channels of the first system. By using the Single Wire Full-Duplex technique, both the transmission and reception is possible through single channel. The concept is designed by reviewing the SPI (Serial Peripheral Interface) and UART (Universal Asynchronous Receiver/Transmitter) protocols, as they are the commonly used full-duplex communication protocols. Bi-directional data transfer happens through a single wire in this concept. The data is transferred through voltage in one direction and the data is transferred through current in other direction. The concept is designed to use with the existing full-duplex communication protocols like UART and SPI. The Single Wire Full-Duplex System is designed and developed using high performance discreet components with low propagation delay, rise time, and fall time. A thorough feasibility study is done using the software simulation and the concept is physically checked by mounting the available components on the general purpose PCB. A circuit is designed by considering all the learning’s from the feasibility study. A PCB is designed, fabricated and assembled. The assembled PCB is tested for the full duplex operation using UART protocol, by transferring data simultaneously between two laptops. In asynchronous mode Single Wire Full-Duplex Communication channel is working with baud rates: 110, 300, 600, 1200, 2400, 4800, 9600, 14400, and 19200. After 19200 baud rate, some amount of data loss is observed on master side RX signal. The data loss is because of the glitches in the master side RX signal, caused by the master side TX signal transients. However when using the single wire full-duplex communication with a synchronous communication protocol, the glitches may not come into consideration because the data is fetched with respect to the edges on the clock signal.

Sujith Kumar Reddy B.
ESDE(PT-2012)
Mentor: Ugra Mohan Roy

In the thesis a structural model that describes the torsion box of an aircraft vertical tail is used to present the capabilities of shape optimisation. Three different baseline models of torsion box were defined, for which the dimensional parameters of Boeing B777 was chosen for the study. Optimisation for the first two models was carried out using aluminium material and other by composites. Baseline shapes are then analysed for modal characteristics using MSC NASTRAN. GENSOVL is used for the optimisation, a MATLAB code which drives NASTRAN as a solver. During the optimisation new grid coordinates are generated for the baseline models to yield improved frequencies and reduced structural weight.

Shape optimization for the two frame and one grid baseline designs was carried out using GENSOVL. In the case of aluminium, dimension change of ±2.5% was allowed along chord of the structure and ±5% across chord. For this allowed change, optimized shape that were obtained had +17 to +22% higher fundamental frequency, accompanied by +2 to +3% drop in structural mass. In case of composites, dimension change of ±2.5% was allowed along chord of the structure and ±2.5% across chord. For this allowed change of shape, the optimised shape had +10% higher modal frequency however with increase in mass of +0.4%. These optimum shapes are bound by user-specified minimum and maximum limits on the deviations from the baseline.

GENSOVL is able to yield good improvement in modal frequency with a modest change in structural shape. Thus structural shape optimisation is a design methodology highly needed in advanced engineering and needless to say in aircraft design.

Rakesh Kumar P.
ACD (FT-2013)
Mentor: B. V. Vijay

Shape Optimization of Vertical Tail Torsion Box Structure for Commercial Aircraft

Design and Development of Single Wire Full-Duplex Communication System
Effect of Bonding Technique on Debonding of Complex Composite Skin/Stringer Configuration

Debonding/Debonding is one of the predominant forms of failure in laminated composite structures, especially when there is no reinforcement along the thickness. To utilize composite structures that are more damage tolerant, it is necessary to understand how delamination or debonding develops, and how it can affect the residual performance of the parent structure. A number of factors such as residual thermal stresses, matrix-curing shrinkage and manufacturing defects affect damage growth in a composite structure. It is important to assimilate which manufacturing or assembling technique fits the best.

The objective of the current work is to identify the best joining technique for an un-symmetric lambda shape complex stringer, in order to avoid or delay debonding of skin-stiffener composite specimens. Adhesive bonding and Co-curing/Co-bonding is investigated through three-dimensional finite element analyses. Commercially available software HYPERMESH and ANSYS were used to do the 3D meshing and analysis. Adhesive bonded structure was analyzed by contact analysis and co-cured structure was analyzed by cohesive zone modeling technique (CZM).

Under multi-axial loading, adhesive bonded configuration showed larger stresses compared to co-cured configuration. The former skin-stringer configuration de-bonded 83.8 % more than later in normal direction and 61.04 % in x-direction. It is concluded that for unsymmetrical lambda shape stringer, under given multi-axial, co-curing is the best method of manufacturing.

Vandana Chaturvedi
ACD (PT-2012)
Mentors: Srikari S. and M. L. J. Suman

Interior Design of Mobile Catering vehicle for Industrial Area

Mobile catering business has become a ubiquitous feature of urbanization in many countries around the world. It is growing rapidly because the life style of the people is changing. In streets, parks and other places we can see the mobile food catering vehicles are parked and selling food for the customers. The customers will select the food catering service based on their cleanliness, quality of food and hygiene surrounding. There is no vehicle is designed only for this business, vehicles are modified based on the vendors requirements to run the business. It is difficult for them to design a vehicle; because the design should be attracting the customers meanwhile it should be acceptable for them to run the business. So these problems is solved here by designing an interior for a catering vehicle which should satisfy customers and vendors by following ergonomics and user friendly design.

The design process is started by conducting study on the existing catering vehicle and discussion with the users of the catering vehicle. User study was done by visiting the people in the selected area and asking the questionnaire to them and asking for their requirements to add if a new vehicle is modifying for the same business. The method of Quality Function Deployment was adopted to derive the technical features of the product from the user needs and based on that the Product Design Specification was finalized. Vehicle has been finalized from QFD method and 5 concepts for the interior have been created and selected and finalized a concept based on the customer’s requirements. A digital model of the concept model has created in design software and rendered. A mock-up model of 1:10 scale for the selected concept was built to check the concept.

The final concept design is so ergonomic and will help the vendors to cook and serve comfortably from inside. It doesn’t need more space to park. The expense to start a business with this vehicle is less and affordable for the vendor in this business.

Deepak C.
APD (PT-2012)
Mentors: Mithun S. K. and Shivakumar H. G.
Design and Development of Interactive Art Installation for Concept Studio

It is important Rapid urbanization and fast industrialization Interactive art installation is a special form of art which makes the user to engage with the installation to obtain a very unique effect. It is a fairly recent evolved form of art that came into existence because of the development of newer technologies thereby enabling artists to expand their horizon significantly. Interactive installations use a wide variety of gadgets such as micro-controllers and sensors. It also makes use of natural materials such as wood and wool. Interactive installations are very famous around the globe due to their use of technology and visual realism. The evocative properties of the installations are very high with the power to even manipulate a person's psychological feelings.

The scope of this project is to design and develop a working model of an interactive art installation for a design concept studio. The users of this product are mainly designers and in some cases clients. Hence we need to have a purpose for the design. The users were psychoanalyzed using various techniques like ethnography and the scenarios in a concept studio were understood. Since the installations are very site specific, it cannot be used elsewhere. The installation is designed for designers who are not able to get out of a particular train of thought and want to expand their ability to think boldly. The concept simulates three human senses – audion, vision and tactician, thereby making the designer think beyond his usual routine. Ethnography and questionnaire survey of designers help in understanding what they usually do when they want ideas. Product Design Specifications are generated after needs are identified. Using various techniques of concept generation such as morphological analysis and analogy method, concepts were generated and developed accordingly.

A 1:1 scale working model is built and is validated with a user group. An electric harp is thus developed which when played, generates a real time equalizer. The installation uses the concept of Ultraviolet lights glowing fluorescent material when activated by the micro-controller. The fluorescent material is blown inside a glass tank and the lights are turned on whenever there is a music signal of the harp. This helps in activating creative part of brain and thereby helps him think bolder and better.

Pratheek Achar T. P.
PD (FT-2013)
Mentors: Lohit H. S. and Chiranjit Barui

Design a Heavy Duty Truck for India

It is important Rapid urbanization and fast industrialization has increased demand for better fright and transport service. Trucks dominate freight transportation with intercity and intra city transportation and in direct correlation with industry growth. The main objective of the project is to design a Heavy Duty Truck for the future (year 2025) which can connect emotionally to the driver, provide optimal driving comfort and stand out among its competitors.

Research was carried out with various methods. Data was collected through literature survey, product study, market study and user study. For understanding customer needs, questionnaires were prepared. From QFD and PDS many initial ideation concepts were generated. Five concepts are selected by reviewing the sketches and Photoshop renderings. The detailed digital model was created for the selected concept using Alias studio. Concepts were then evaluated with few industry experts on the basis of the overall appearance, aesthetic sense, topic context & future user friendly. Physical scale (1:20) mock-up model was created by using CIBA block as the base material which was milled using VMC milling. The milled model is refined by hand for the final finish & detailed features were added. The model was painted to dark sky blue colour to reflect the concept design. The mock-up model was used to collect feedback from the jury.

Shailesh R. Shroff
PD (PT-2012)
Mentors: Lohit H. S. and C. Gopinath
An innovative product with societal acceptance is the one that aids the comfort and convenience in everyday life. Shopping has become an essential and day-to-day activity in our life. Considerable amount of time has been spent by customers in the queue for billing and get through the security. Focusing on this particular issue, a system has been designed which solves the problem by providing instant billing and the total number of items.

ARM based system has been designed with RFID feature and is interfaced with IR sensors and Weight sensors for better controllability. The developed system has two phases of detection, first is RF based scanning of unique identification number of an item and second is detection of items using IR Sensor. The responses of both the phases are compared and analyzed to eliminate the possibility of incrementing the number of counts of item without scanning or vice versa. System requires acknowledgement from both IR sensor and RFID reader. 125 KHz RFID reader is able to scan the tag at the maximum distance of 4 cm whereas IR sensor detection range is maximum to 5 cm. Weight sensor has also been incorporated to have more control over the accuracy of the system. Weight sensor has been used to monitor the items taken out of the cart. Weight sensor can withstand 10 Kg of weight.
Design of Futuristic Monorail for Bengaluru City

The primary intention of this futuristic monorail vehicle design is to improve the transportation environment in Bengaluru city. The monorail is designed for the year 2030 by considering various aspects of styling of both interiors and exteriors. The monorail is designed for Bengaluru and the design language is used such that it fits the lifestyle of Bengalureans. The current scenario transportation in Bengaluru has different modes of public transit systems and the majority of the population relies on road transport. The population of Bengaluru is increasing drastically and as a result the traffic condition is debilitating due to low capacity-volume ratio of the roads. Due to this, people are opting for public transit system as they think it is a lot safer than their own vehicles. The demand for travelling in comfort in public transit has increased, owing to the rise in the middle to upper class categories of population who use public transit systems. In addition to this, the need for an eco-sensitive transport is also the need of the hour as the climatic condition of Bangalore is deteriorating rapidly. The metro systems do not connect all the areas of Bengaluru which has propelled the need of the monorail system.

This project about design of a futuristic monorail for Bengaluru city focuses on usability, functionality and aesthetics to suit the public needs and aspirations of transportation. The focus is kept on the psychological and behavioral pattern of daily travelling people, elder people and school children. Studies were conducted on existing monorail system all over world and their evolution by literature surveys and followed by Ethnography research. Data was analyzed by using Quality Function Deployment (QFD) and Product Design Specification (PDS) was prepared for the monorail.

Various design concepts of futuristic monorail based on life style board, mood board, visual theme board and trend research were explored. The designs were evaluated on the basis feasibility, usability and functionality. Concepts sketches were generated as per PDS and rendered using Photoshop. The final two concepts of monorail were selected based on weight ranking method and were digitally sculpted by using ALIAS and PRO-E tools, rendered and animated by using KEYSHOT for visual validation. A mockup model (scaled 1:30) with rigid foam was built and finished with exterior finish and graphics.
I love motorcycle and bike riding! – You would have heard this from many youngsters. Bike riding and touring on bikes is on the rise especially with Royal Enfield bikes (read it as, Bullet) and I’m no different. I have traveled to Leh-Ladakh, Rameshwaram, Kerala and many local places in Karnataka on my Royal Enfield Thunderbird 350. Having done all these rides, I was looking for something big! After some search and suggestions from friends, I found Bhutan, Land of the Thunder Dragon to be interesting. Mere description from my friends about Bhutan’s beauty and culture was enough to convince me. Immediately I started to draft my plan for this expedition. In the course of preparing my plan I stumbled upon numerous blogs/articles/websites describing Bhutan’s rich cultural diversity; how the country still continues to be enigmatic and keep pace with the rest of the world. One new thing I got to learn was the word Gross National Happiness (GNH). At first you start thinking what is this and how can a country not worry about GDP! But after having visited the country I wonder why most of us cannot follow on the similar lines. A few people from my country had done this expedition and when I checked out their pictures I was spellbound. What attracted me more about this beautiful country was the colorful dzongs and how people still preserve their culture with a sense of pride.

My expedition started from Bengaluru. I and two of my friends took a flight to Bagdogra. The next day we started our bike ride from Siliguri to border town of Bhutan, Phuentsholing. As soon as you cross the border, the sense of warmness is palpable. Being Indians, we had the privilege of taking a permit on spot with a valid ID proof. The officials at the immigration counter were cordial and we got our permits in no time. At a distance of stone’s throw you find the RSTA (Road Safety and Transport Authority) which issues the permit for your vehicles. Even this was a hassle free affair as the official there were very friendly. We had a good lunch and started our ride to the capital city, Thimphu.

What was unfolding in front of us as we pushed our bikes (Royal Enfield) on the hilly terrains covered with clouds is something inexplicable. You can see lush green mountains waiting to greet you and prayer flags all along the roads whispering in your ears. It felt like the flags were silently praying for our safe journey. All along the stretch one can very clearly see the Bhutanese culture well preserved, for example the houses built reflect their tradition. People in Bhutan greet you with an open heart and an infectious smile, which is very comforting as you push through those unknown terrains. At few places where we stopped for little snacks and tea, you feel the strong and friendly relationship that exists between both countries. India and Bhutan share a wonderful rapport and cordial relationship which is heartening to see and experience.

As Indian tourists you will be totally comfortable in the capital city as almost everybody speaks Hindi and there are ample hotels which serve Indian food. On our way to Punakha we stopped at the Chimi Lhakhang temple famous for ‘The Divine Madman’. After a quick visit to the temple we continued our ride to Punakha Dzong. From a distance you can tell the very existence of a marvelous structure. The scenic and picturesque beauty of Punakha built at the confluence of the Mo Chhu and Pho Chhu rivers is a sight to behold.

We managed to see the famous Tiger’s Nest on our ride. This is one place which was right there on our list after Punakha Dzong and was synonymous with Bhutan trip. The great Guru Rinpoche flew on the back of a tiger and built this mega structure on a cliff hanging in the air. The height is 900 meters (2700 feet) where the Tiger’s Nest is perched comfortably and is occasionally covered by clouds.

It was shocking and also heartening to see an 80 year old granny trek to the Tiger’s Nest. Added to that she had knee replacements for both her legs, her spirit and travel enthusiasm was a sight to behold. We left Thimphu with a heavy heart and it was a nostalgic ride back till the border town, Phuntsoling.

The moment we crossed the border town Phuntsoling and reached India, it was like somebody hit us with a hammer and woke us up! We were back to India and the paradise was gone. The Last Shangri-La was at a distant staring us and telling Tashi Delek!!! The prayer flags were still staring at us and telling us Kaadinchhey La for visiting our country!!!

It was 6 PM in the evening when we reached busy bustling Bengaluru city. I switched off the airplane mode and was pulled back into the world of Whatsapp, Facebook, Gmail and ssssssssssssssss!!!
Tadoba- Andhari: Where Tigers Might Seek You Out!

Just Google 'Tadoba-Andhari Tiger Reserve' or TATR for short and you are sure to come up with umpteen pics of tigers, leopards, Gaur, Sāmbhar deer and a variety of other fauna from travelers. So, what's different about TATR from other reserves like Periyar or Corbett? It's just that you are a lot more likely to come back with a big smile- that you had at least 1 sighting of the king, if not two or three, as in our trip to that place in Dec 2014.

Like always, a trip never takes off without enough research on how to get there, where to stay and so on. So after some weeks of poring over stuff on www.team-bhp.com, the three of us (I, my wife and kid) checked into Sanghamitra express starting in the morning from Bengaluru. We were bound for Chandrapur, the nearest station to TATR. The night's journey was a challenge for a light sleeper like me, although it was a 2- Tier A/C class. Thank the legendary NVH (Noise, Vibration and Harshness) of our railways for that!

We freshened up at Chandrapur in the morning at some so- so hotel and a cab picked us up in the afternoon to TATR for the 1st safari before checking in to our resort, Tiger's Heaven, Navegaon gate, by late evening. This safari, at the Moharli gate, was not too impressive but as we had 3 more to go, hopes of sighting(s) stayed with us.

Next morning, by 5 AM, we were on the resort jeep running over a dusty track from the resort to Navegaon gate where we had to complete ID formalities before entering the reserve. An hour later, we had our first sighting of a leopard hiding itself in a tree some 50 m away.

There are countless Sāmbhar deer in TATR and allow visitors close clicking without panicking.

Next morning's safari started off as usual, with renewed hopes of sighting and it did happen. Some 2 h into the safari, our sharp- eyed guide picked up one Sāmbhar call and the driver scrambled to get there before others did. We spent the next 20 min leisurely clicking at the 7- 8 y old king here.

Next day it was time to start back, but not before having another safari, this one from the Moharli gate.

We had nearly finished with this drive when that magnetic sound of some Sāmbhar's call changed things. Some few min of following the call and Maya, a tigress well known in TATR, cut across our path. Before I could get a good pic however, we had to get past some 5- 6 jeeps ahead of us. We made it, but too late! Maya had disappeared (like her name)!

Tigers do seem to seek you out at Tadoba- Andhari.
Tanjavur- Rameshwaram- Madurai

It was a dream for most of us to ride on RE from Bangalore to Rameshwaram. The headcount was fluctuating like the share markets! Sometimes it went up and then came down crashing. We were a team of 10 members for B2R ride with three RE bikes and one backup car.

With the help of Google, we were ready with the plan for three days.

Day 1
Kengeri - Hosur – Krishnagiri – Salem – Namakkal – Trichy (Ranganatha Swamy temple) – Tanjavur (Brihadeshwara Temple) ------ 435 KM
After travelling 352 kms from Bangalore we reached Trichy and the sun really got better of us. We badly wanted to escape the irritating and humid conditions by reaching our destination. We could feel the heat waves that was hitting us and our skins were literally burning. Only good thing was the roads. Full credit goes to the government and the people who have maintained the roads to such wonderful levels. The people are also very helpful and honest. At one instance we got back our valuables which by mistake we had left at the temple. The guys came searching for us on bikes and gave the valuables. I was moved by their honesty.

We had a quick visit of Ranganatha Swamy temple and then headed straight to Tanjavur. We had only one hour to get ourselves ready before the Brihadeshwara Temple closed for the day. Luckily we made it in time and were able to spend some quality time at the temple. The ambience is so calm and soothing that for a moment we forgot the whole day’s ride and also that it was Tamil Nadu state!

Day 2
Tanjavur – Devipaanam - ECR stretch – Rameshwaram - Dhanushkodi – Rameshwaram (Temple) – Pamban Bridge --- 267 KM
Today was a big day for most of us. What was funny is that the entire ride had numerous temples and even the final destination, Rameshwaram is one of the famous religious place. We left early in the morning around 06:00 and took the wonderful ECR stretch (East Coast Road). The early morning ride on those smooth tarmac is a blissful experience.

Finally after few hours of ride we reached final DESTINATION – Pamban Bridge. The stretch where you see the bridge is a picturesque one with water on both the sides. As soon as you reach the bridge, you are greeted by numerous small boats on the right and on the left you find the famous railway track. We were lucky to see a train pass by as we reached the bridge. We came back again in the night to spend some time. It was one amazing experience sitting under the moon and chatting with buddies.

The temple is a gigantic structure and the carvings are breath taking. It is famous temple down south and is one of the famous four pilgrimage destinations in India.

Day 3
Rameshwaram – Madurai – Salem – Krishnagiri – Hosur - Kengeri --- 635 KM
Few of my friends wanted to visit Rameshwaram temple and complete the 22 theertham bath. From there we went to the house of Dr. APJ Abdul Kalam, the missile man who is an inspiration to millions of young Indians. There are numerous of his achievements on display and what caught my attention was the number of doctorates. We stood there and took a count of it. The final number was a cool 40!!!!!! People including me die to get just one PhD in our life and here is a man who has 40 to his name.

We left Rameshwaram around 12:00 in the afternoon and finally bid adieu to Pamban Bridge. From there it was a non-stop ride to Bengaluru and one of the most challenging rides. The heat was at its peak and the temperature refused to die down. We reached Bengaluru next day early morning 04:00 am and the entire stretch we were on bike.

Thanks to my all friends who were so adjusting and ensured that we stick to the plan. Kudos to all the riders. After this ride, there is a sense of pride and achievement.
Of all the states of India, Rajasthan has a special mystic charm to it. The eventful history that is associated with almost every city in Rajasthan, is bound to take us back to our roots especially with respect to our rich culture and heritage. Udaipur, the erstwhile capital of Mewar, houses some of the most beautiful palaces and huge forts including those of the majestic City Palace besides Lake Pichola, the lavish Jag Mandir Palace standing attractively in the middle of the lake, humongous Kumbhalgarh and Chittorgarh forts. The royal tradition of Udaipur is always seductive in its beauty, elegance and grace conjuring myriad images that compels one to remember the city forever.

Udaipur - a city of lakes is known for being the birthplace of Maharana Pratap, for heroics of Rana Pratap’s horse Chetak at Haldighati, unconquerable fort of Kumbhalgarh, grace and elegance of Chittorgarh fort and Nathdwara which is one of the Pancha Dwarka temples and a famous temple of Lord Krishna. Less known facts about the place are the terrain and splendour panorama of Udaipur, which is situated in the Aravalli range. Aravalli range, weathered and humbled by time is among the oldest hills on planet Earth.

Lesser-known fact about Udaipur and its surrounding areas is that the region is a host of rare kind of migratory birds. I was fortunate enough to capture some of these migratory birds – Red-wattled Lapwing, Red-vented Bulbul, Spotted Owlet, Wagtail, Woodshirke, and many other species during my travel in and around Udaipur.

Overall, one can witness hundreds of years of history at Udaipur - the death of Maharana Pratap’s horse, Chetak at the Haldighati bloodshed; the tradition of honour and glory at Chittorgarh; the integrity and valour of Rajputs; the hardships and difficult terrain lands of Aravalli ranges and the colourful migratory birds. It is these very contradictions that remind us that Mewar is truly unique. The fact that paradoxes co-exist is itself a celebration of life.
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