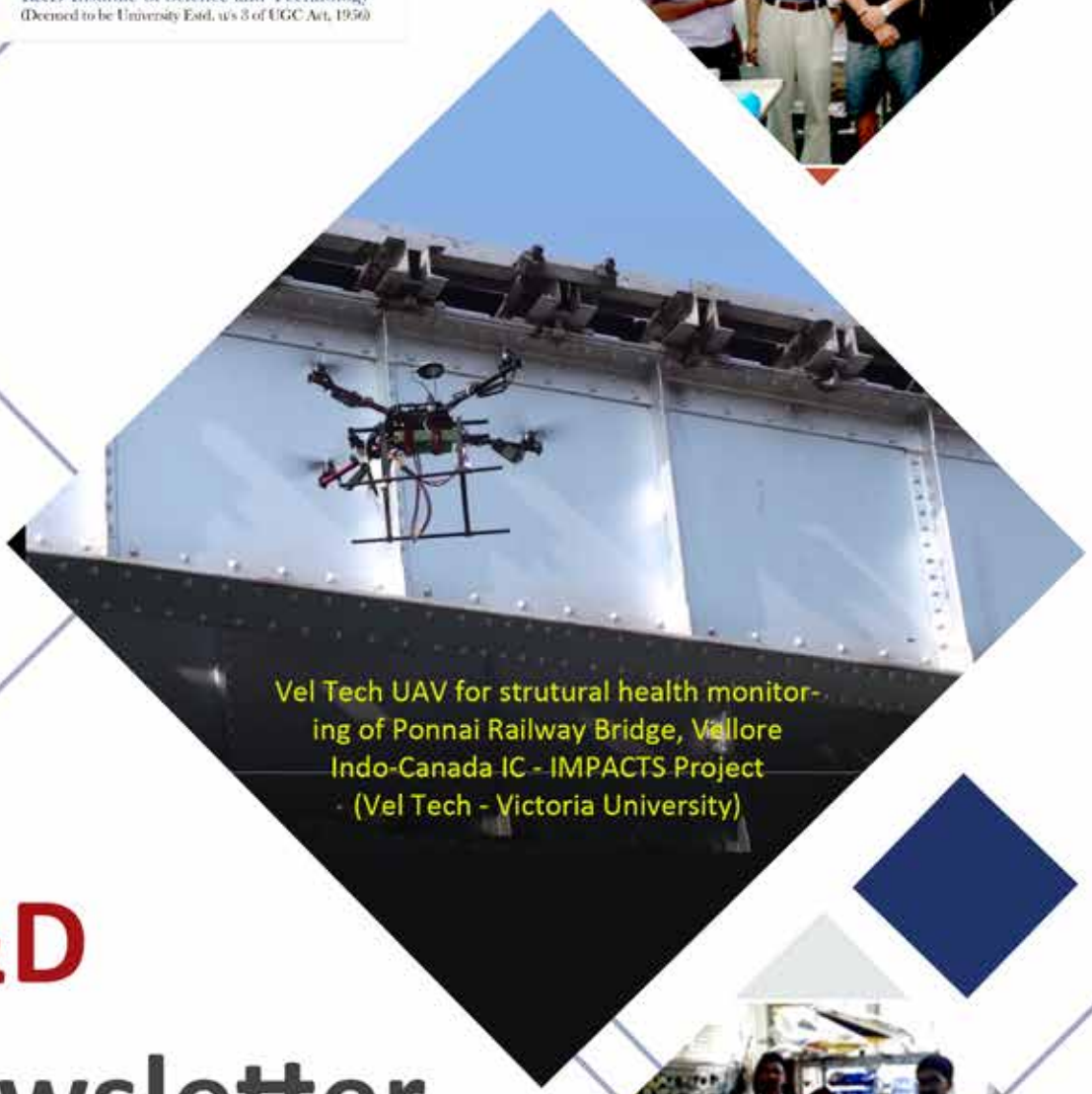
Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)



Vel Tech UAV for strutural health monitoring of Ponnai Railway Bridge, Vellore
Indo-Canada IC - IMPACTS Project
(Vel Tech - Victoria University)

R&D Newsletter

November 2017, Issue 1

R &D Projects
Achievements
Research works
Awards

Col. Prof. Vel. Dr. R. Rangarajan and Dr. Sagunthala Rangaraja with Prof. Takaaki Kajita, Nobel Prize Winner 2015 - Physics

Foreword

It is our pleasure to introduce this first edition of the newsletter. We intend to make it a regular publication and to use it to keep you in touch with news and developments which relate to the R&D activities at Vel Tech.

This newsletter aims to share information, news and insights on R&D related activities of faculty members at Vel Tech and encourage them to disseminate research findings and knowledge to the student and research community.

This newsletter covers the information about research projects in thrust areas and allied subjects. Research achievements from the funded projects, research consultancy, research collaboration with foreign universities, students' internship in abroad, recently funded projects, and awards received by faculty members for solving industry relevant projects are also highlighted in this edition.

Our faculty members and students are mentored by experts from various reputed institutes and industries in terms of knowledge sharing on state-of-the-art research, research proposal review, and to create opportunities for joint proposal, internships, research facilities etc. The details of experts who have visited Vel Tech and the expected outcomes are also included in this news letter.

We would welcome suggestions from readers and contributions for future editions. In particular, we want to include information of interest from faculty members' research related activities. Finally may I thank all the faculty members for their work to produce this first newsletter. In the meantime, I hope you enjoy this first edition.

Dr. U. Chandrasekhar
Pro Vice-Chancellor

Flow Simulation - Computational Fluid Dynamics (CFD) Project on Annular Combustor Developmet

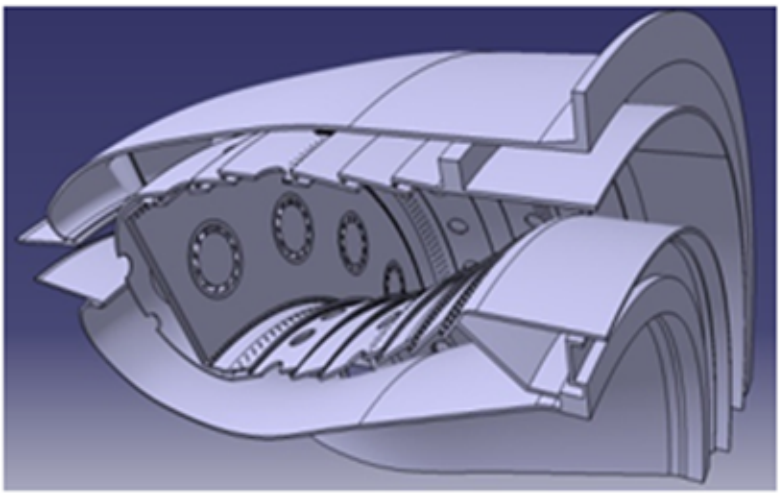
Dr. S. Senthil Kumar
Associate Professor,
Department of
Aeronautical Engineering

The computational fluid dynamics is a numerical tool which predicts fluid flows quantitatively along with other physics such as heat, mass transfer, phase change, chemical reaction and mechanical movement etc. by solving the relevant science-based mathematical equations numerically on computer hardware.

It has been vastly used in various fields of engineering, namely aerospace, automobile, chemical, marine, civil, biomedical, environmental, and electronic cooling for predicting scientific knowledge and improving the performance of natural and engineering systems.

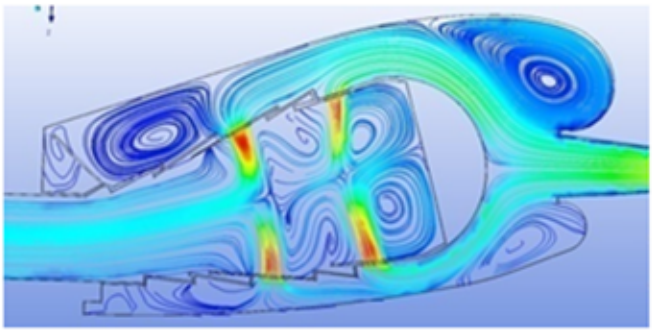
Dr. S. Senthil Kumar, Associate Professor, Department of Aeronautical Engineering has carried out research in relevant domains at IITM, Chennai, Dublin City University, Ireland and Commission of Atomic Energy (CEA), France prior to this present research project at Vel Tech on annular combustor development through an integrated approach using CFD and rapid prototyping.

This project is funded by DST under the early career research award scheme with an outlay of 29.9 Lakhs for the period of two years (2015-2017). The project is under progress and some of the importance findings are highlighted here. Both the virtual and physical models of an optimized annular combustor with minimum total pressure loss that is less than 10% are developed through an integrated approach which requires less time for design, development and testing. Physical combustor models are fabricated using rapid prototyping and used for water flow tunnel testing. CFD cold flow visualization results are in good agreement with the water tunnel findings. This approach would be very much useful in predicting the cold flow losses during the design stage of gas turbine combustor development.



3D virtual model of combustor

Flow Pattern through 2D Annular Combustor Model



CFD Simulation

2D Water Tunnel Testing with a Rapid Prototyped Model

Nanocomposites

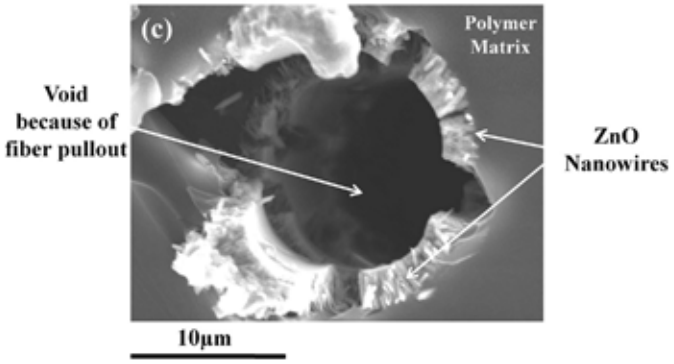
Dr.S.Gowthaman,
Associate Professor,
Department of Mechanical Engineering
Director R & D

Nanomaterials are considered important because of their small size, huge surface area and their unusual effect on the mechanical, electrical, optical and magnetic properties of materials.

Dr Gowthaman conducted research on "ZnO Nanowires - Synthesis and Applications" under the aegis of DST-Early Career Research award for amount of Rs. 25.5 Lakhs.

Prior to joining Vel Tech, Dr Gowthaman has worked on composites research projects supported by funding agencies like NASA, US Army, ONR, & Wright Materials Research at North Carolina A&T State University (USA) and by DSTA at Nanyang Technological University (Singapore).

Enhancing the interfacial strength of composites using ZnO nanowires

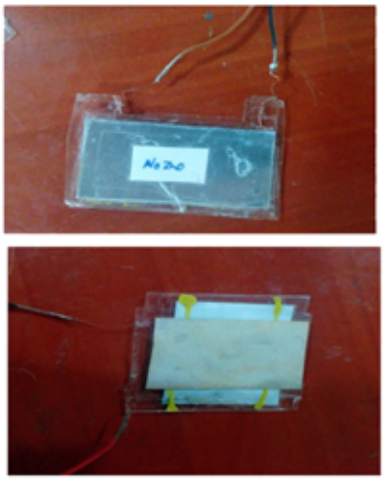


SEM pictures of fracture surfaces

- Cohesive failure of ZnO NW coated composite – attributed to strong interfacial adhesion

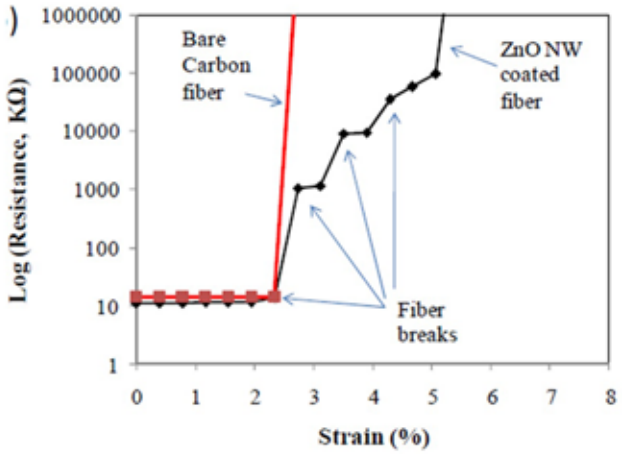
- Interfacial strength of composites with ZnO NW increased by 430% on average

Nanogenerators



In an aluminium substrate, the power produced from the ZnO NW coated nanogenerator (1 cm x 1 cm) with 1MΩ load was 8.10 nW.

Sensors for damage detection



The sensitivity and range of ZnO NW coated carbon fiber composite to measure internal crack (damage) in the specimen was increased significantly.

Solar Thermal Systems- Research focus in our Institution

Mr. S. Subramanian,
Assistant Professor,
Department of
Aeronautical Engineering

The research on solar thermal systems in our Institution focuses on improving the efficiency of CST systems by optimizing the thermic fluid flow in collector pipes. The past funding for research on solar thermal includes a project titled "Heat transfer estimation of various thermic fluids for solar thermal applications" funded by Institute of Engineers, India.

The project work emphasizes on optimizing the fluid selection to match the heat transfer characteristics required for moderate (300°-450°C average temperature) capacity parabolic concentrators. The work carried out includes analysis of fluid convective heat transfer at varying operating loads and its effect on overall efficiency of the process.

Solar thermal energy systems – known as Concentrated Solar Thermal or 'CST' systems - are versatile, reliable and flexible. Solar thermal delivers power to meet peak electricity demand, it can include thermal energy storage to deliver power day or night, and it can be coupled with other fuels such as gas and biomass for fully dispatchable electricity supply. Solar thermal can also reduce coal consumption in coal-fired electricity plants, by delivering solar generated steam to augment existing steam systems.

Solar thermal energy harnesses the sun's heat to generate power. Reflectors concentrate the sun's energy onto a thermal receiver; A fluid (such as water, oil or molten salt) or a gas passes through the receiver where the concentrated solar energy heats it to very high temperatures – from 350°C to over 1,000°C depending on the system. The fluid or gas is referred to as a 'heat transfer medium' – HTF.

The research on solar thermal systems in our Institution focuses on improving the efficiency of CST systems by optimizing the thermic fluid flow in collector pipes. The solar thermal research includes analytical study of heat transfer characterization of different thermic fluids, Numerical prediction of flow characteristics inside solar collectors and experimental work on prototyping Stirling engine for solar thermal applications and by that optimizing the design for a moderate range solar thermal system.

Projects on solar thermal systems usually attract students of Mechanical, Aeronautical and Automobile Engineering and the past projects include "Analysis of Stirling cycle for solar applications" and "Design of Stirling engine for CST applications".

With the sun shining bright, the future of research on concentrated solar energy is highly hopeful.

Prototype Stirling engine mounted on the aperture of parabolic dish (left) and fluid analysis setup for convective heat transfer estimation (right)

Industry Relevant Research - RANE Engine Valve Limited, Chennai (Funded by DST-TSD)

Dr.R.Mariappan,
Associate Professor,
Department of Mechanical Engineering

High Temperature Oxide Dispersion strengthened Austenitic Alloy for Engine Valves

Oxide dispersion strengthened (ODS) steels have excellent high temperature strength, corrosion and oxidation resistance. Especially, it shows distinguished advantages both for high swelling resistance under heavy radiation and excellent creep resistance. The presence of stable nano-sized precipitates with high number dislocation density formed in the steel matrix is the reason for the excellent high temperature properties. Oxide particles introduced into Fe matrix should inhibit the movement of dislocation, stabilize this structure and eventually result in the improved creep strength.

Hot pressed 21-4N Austenitic ODS Steels

Metallurgical and Materials Research group (Dr. R. Mariappan, Associate Professor, and Department of Mechanical Engineering) in Vel Tech has collaborated with RANE EVL for developing oxide dispersion strengthened stainless steel for high temperature valve applications. The alloys that are most commonly used are 21-4N (EV8) stainless steels for intake and exhaust valves. 21-4N stainless steels have some service limitations at the temperature above 650 °C due to its poor tensile strength and lower creep resistance. By adding the oxide particles with 21-4N steels, he operating temperature can be extended up to 800˚C.

Vacuum Hot Press

Similarly higher nickel and chromium content (approximately 8wt% and 23wt%) in the composition enhances the high temperature performance and longer life than the existing 21-4N stainless steels. Addition of nano oxide particles in the 21-4N stainless steels, which extend the service temperature up to 900˚C, which fulfill the high temperature performance of 23-8N steels.

RANE Engine Valve Limited is part of RANE group of companies involved in the manufacture of valves and valve train components for various engine applications. RANE EVL incepted in the year 1959, it is one of the oldest engine valve manufacturers. This is the largest manufacturer of engine valves in India with an 85% market share.

Oxide Dispersion strengthened 21-4N alloy were hot pressed at 1150˚C with pressure of 55MPa and vacuum level of 10-3 torr. Further the hot pressed samples were solution treated and age hardened treatment.

Organic Chemistry Research Lab

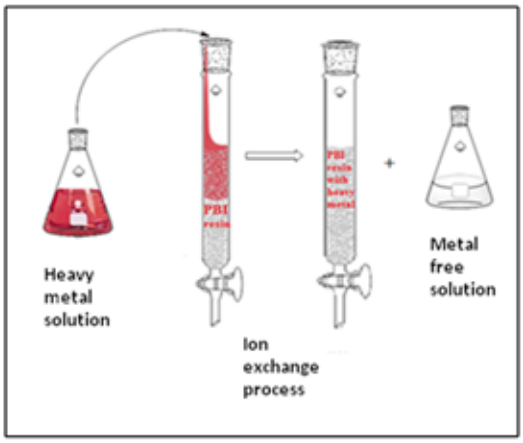
Dr. Ramesh Kumar,
Associate Professor,
Department of Chemistry

Organic Chemistry Research Lab is dedicated to carry out research in the field of synthetic organic chemistry to design, develop and optimize cost effective synthetic routes to drug intermediates as well as active pharmaceutical ingredients.

Developing new ligands for extraction of trivalent actinides and lanthanides from nuclear fuel cycle is other areas of research. In this lab, Dr. Ramesh Kumar carried out research on "Synthesis of Novel Mono-dentate Phosphorous Ligands and their Application in Transition Metal Catalyzed Asymmetric Reactions" under the aegis of DST SERB Start-Up Research Grant (Young Scientist 2014-2017). The use of readily available substrates or convert the achiral molecules into chiral molecules by synthetic manipulation into useful chiral auxiliaries, which can be used as ligands. He has focused on the asymmetric hydrogenation, allylic alkylation, allylic amination and hydrosilylation using the synthesized ligands with transition metals.

Fume Hood Exhaust

Dr. Ramesh has been developed new polymeric resins for the extraction of heavy metals like U(VI), Th(IV), Pd(II) and radioactive nucleids Pu(IV), Am(III) and Eu(III) from the nuclear waste from nitric acid medium.



Heavy metal removal using ion exchange column

This work is having a potential application for the removal of nuclear waste generated from the back end of the nuclear reactors at Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam. This work has been supported by UGC under the research scheme UGC DAE CSR collaborative research project (2014-2017). The project entitled "Development of Polybenzimidazole based membranes and synthesis of novel extractants for the extraction of trivalent actinides and lanthanides" involves synthesis of trivalent novel tridentate ligands and PBI based membranes for separation of lanthanides and actinides from nuclear waste. Based on the batch extraction and column studies, these polymers seem to be a potential candidate for applications towards the volume reduction of waste solution by converting the liquid waste into a solid form.

Rotary Evaporator

Interaction with National Formosa Universiy (UAV Research)

Dr. E. Balasubramanian,
Associate Professor,
Department of
Mechanical Engineering

The Indo-Taiwan collaboration between Vel Tech and Tamkang Universities started in the year 2013 has remarkable achievements in the development of flapping wing mircro aerial vehicles. A 10g Ornithopter with a wing span of 20cm has been designed and image processing frame work is developed for the control of SWARM of Ornithopters under the sponsored research project and it was completed in July 2016. Prof. L J Yang of Tamkang University invited many Vel Tech students for research and faculty exchange. The students of Vel Tech have been trained at his research lab in design of micro mechanisms, aerodynamic analysis, wind tunnel testing, development of control architecture and high speed photography. In addition, various conferences have been organized by both Tamkang and Vel Tech. Recently, Dr E Balasubramanian has delivered a talk about deployment of unmanned aerial vehicles to inspect railway bridges and heritage structures in the International Conference on Intelligent Unmanned Systems, Tamkang University, Taiwan during August 2017.

Dr E Balasubramanian receiving a certificate from Prof.AugusBudiyono, RMIT University, Australia

He also chaired few sessions of the conference. Various key note talks in the research domains of underwater vehicles, humanoid robots, Tailless Insect-Mimicking Flapping-Wing MAV, hybrid vehicles, fault tolerant controls and beetle mimicking have been delivered. He also visited National Formosa University and explored the possibility of student and faculty exchange programme. Prof. Franklin and his research team working on the development of High Altitude Long Endurance Vehicle (HALE). Their lab equipped with high end flight simulators, wire cut machines for wing fabrication and controllers to built UAVs of different wing spans. The solar powered HALE UAV has tremendous demand on diverse applications and two of our Vel Tech students have undergone research training in the development of HALE – UAV.

Dr.Bala with Prof. Franklin and his UAV team at National Formosa University

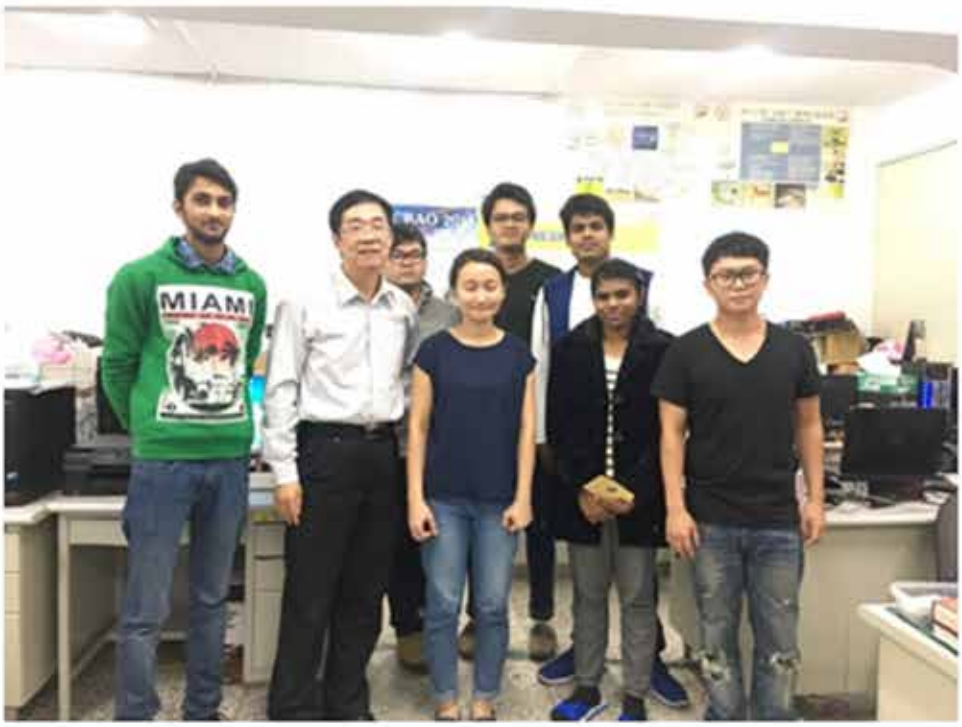
MOU with National Kaohsiung Normal University (NKNU)

Research on Flapping wing vehicles – Vel Tech students at Tamkang University, Taiwan

Vel Tech students Nikhil Panchal, NirojKapri, Pushkar Kumar of Final year in Department of Electrical and Electronics Engineering have undergone research internship during January – April 2017, at Tamkang University, Taiwan under the supervision of Prof. L J Yang.

They have developed a printed circuit board with interfacing of magnetometer and barometer for the control of micro aerial flapping wing vehicles. The flight control board is successfully tested and results are published in the International conference on intelligent unmanned system (ICIUS) held at Tamkang University, Taiwan during August 2017. They have mentioned that, it was a wonderful experience to learn new technologies and culture at Taiwan.

They are passionate in continuing their research and they are presently pursuing their Master Programme at Tamkang University.



Vel Tech students with Prof. L J Yang and his students at Tamkang University

Indo – Canada Collaboration (DST: IC-IMPACTS)

Inspection of Railway bridges using UAVs

The Indo-Canada collaboration effort made tremendous impact on inspecting southern railway bridges of across Tamilnadu and Andhra using Unmanned Aerial Vehicles (UAVs). Principal investigators Dr Rishi Gupta, University of Victoria, Canada, Dr E Balasubramanian and their team and also railway engineers.

carried out bridge inspection during March 2017 across palar river which is more than 500m length having 20 spans.

The railway bridge engineers have appreciated the work and in complementing, they would like to perform complete 3D mapping of railway tracks of about more than 150km length in near future with our Vel Tech team.

Patents Filed as a result of funded projects in UAV domain

1. Dr. Balasubramanian Esakki & Dr. U. Chandrasekhar has filed a provisional application for Indian patent on the title ofAmphibian Unmanned Aerial Vehicle for Multi-terrain applications in October 2017.

2. Dr. Balasubramanian Esakki & Dr. U. Chandrasekharhas applied for a patent (Appln. No. 20174024946)on the title of Elevated Civil Infrastructure Health Assessment Using Rotary Wing UAVs.

UAV based 3D Mapping of Heritage structures:

A 30 feet Hanuman statue is 3D mapped with an aid of UAV. A dense cloud data points collected with high definition camera is converted as meshed and solid model for further analysis and evaluation. The project is funded by DST – IC IMPACTS scheme and Rs 41,15,947 is sanctioned for Indian Side and CAD 75,000 is allocated on Canadian partners for the period of three years (Oct 2016 - Oct 2018).

A 30 feet Hanuman Statue is 3D mapped using UAV

Students research on HALE - UAV at National Formosa University, Taiwan

Vel Tech students Mr. T.Chandrashekhar, 3rd Year and Mr M Sri Vardhan Raj, Final year Aeronautical undergone 2 months rigorous internship programme during June – July 2017 at National Formosa University, Taiwan. They have been involved in the development of solar powered, High Altitude Long Endurance Vehicle (HALE) which is about 10m in length and weighs 16kg. They worked on wing and fuselage design under the supervision of Dr. Chungyan Lin and Dr. Kang shih hao.

The students mentioned that the test flights are performed at Taiwan local airport and they are proven to be promising. The experience of working with Taiwan team provided greater insights to learn in developing aircraft structures in undergraduate level. These students are planning to develop similar vehicle of about 5m wing span in near future at Vel Tech.

Mr. T. Chandrashekhar and Mr. M. Sri Vardhan Raj (Vel Tech-Aero Students) at UAV lab of National Formosa University

MOU with National Formosa University (NFU)

Opportunities of Funded Research Internship at RRCAT

Raja Ramanna Centre for Advanced Technology (RRCAT), Indore is a unit of Department of Atomic Energy to expand the activities carried out at Bhabha Atomic Research Centre (BARC), Mumbai, in two frontline areas of science and technology namely Lasers and Accelerators.The Centre has indigenously designed, developed, and commissioned two synchrotron radiation sources. The Centre is also involved in development of a variety of laser systems and their utilization for applications in industry, medicine and research.

The laser systems developed include high power CO2 lasers, flash lamp and diode laser pumped Nd lasers, semiconductor lasers, chemical lasers, excimer lasers and high energy/intensity pulsed lasers. The industrial applications being pursued include cutting, drilling, welding, surface modifications and rapid manufacturing.

Research opportunities at RRCAT

RRCAT offers opportunities to the students pursuing M.Tech. degree in Science and Engineering from Vel Tech for carrying out project work towards partial fulfilment of their post graduate degree. This scheme has no prescribed training programme/ curriculum. Each selected student has to carry out the project individually under the guidance of a Scientist/ Engineer of RRCAT, on all working days. The project duration is from minimum six months up to twelve months. Free hostel accommodation is normally given to the outstation students. Students are also eligible for financial assistance.

Research opportunities at RRCAT

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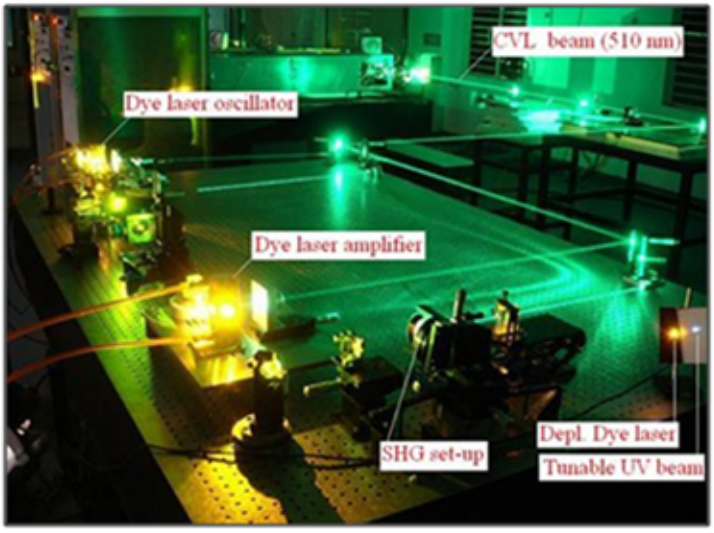
Orientation Course on Accelerators, Lasers and Related Science and Technologies (OCAL) at RRCAT

RRCAT conducts an 8 week duration certificate course titled "Orientation Course on Accelerators, Lasers and related Science and Technologies (OCAL)" every year for 8 weeks during the months of May to July for post-graduate students from all over India.

The students selected for the Orientation Course are provided free lodging and boarding and financial assistance. Interested faculty/students can visit website www.rrcat.gov.in



Design Tinkering Works and Interaction with NITI Aayog

Recognising the need and importance of the maker practices as a part of STEM education, NITI AAYOG has catalysed the setting up of design tinkering labs across the nation under the ATAL Mission wherein schools are equipped with IOT kits, 3D printers, robotics and electrical measurements systems. The objective is to promote creativity, design thinking and problem solving among the students through integration of structured workshop sessions in the collaborative format into the teaching-learning eco system. Learning in these instances is not the result of instruction but is the result of unhampered participation in supportive settings.

Through involvement of STEM teachers and students in formulating of new ideas and products, they get involved in a never-ending learning and feedback process an environment that provides continuous validation. In this regard, Dr. U. Chandrasekhar addressed functionaries of NITI Aayog and also representatives of a few ministries including Ministry of S&T on the pertinence of 3DP to tinkering laboratories and multitudinous modes of integrative 3DP into product development efforts.

Through real-world case studies taken from innovation laboratories, aerospace establishment, automotive companies and biomedical units, he illustrated use of various 3DP technologies and ensuing ramifications corresponding to time-compression and design-freedom. During this interaction Dr. U. Chandrasekhar mentioned that Vel Tech successfully demonstrated the use of 3DP, electronics and sensors into teaching-learning practices of high schools and reached out to more than 650 teachers through workshop sessions in different parts of Tamil Nadu and enabled them in integrating CAD and 3DP into design tinkering and learning sessions.

Dr. U. Chandrasekhar with Mr Amitabh Kant, CEO, NITI Aayog
(Design Tinkering and 3DP session, September 2017)

Research Consultancy in AM for the Industries

In the area of design tinkering and additive manufacturing the following research consultancy were taken up and completed successfully by Dr. U. Chandrasekhar, Pro Vice Chancellor

• **Project for Wipro3D– Wipro3D** is a dedicated vertical in Wipro Infrastructure Engineering services with total focus on providing turnkey solutions in the domain of additive manufacturing. The consultancy work of Dr. U. Chandrasekhar was development of selective laser sintering based solutions for aerospace applications. This project with a budgetary outlay of Rs 6.30 lakhs was completed and the project deliverables were submitted. In collaboration with Wipro3D a detailed project proposal related to nearnet shaped manufacturing of ceramic parts was developed and submitted under the national call on advanced manufacturing technologies.

• **Project for ARK Infosolutions Limited** - ARK Infosolutions operates in the domain of CAD enabled design solutions, 3DP and manufacturing with pan India operations. The project related to design tinkering and 3DP was completed with a budgetary outlay of Rs. 2.25 lakhs and the project deliverables were successfully delivered.

ISRO Awards Sponsored Research Funding on Advanced Antenna Research focusing on Space Applications

Mr. R. Prasanna
Assistant Professor
Department of Electronics and Communication

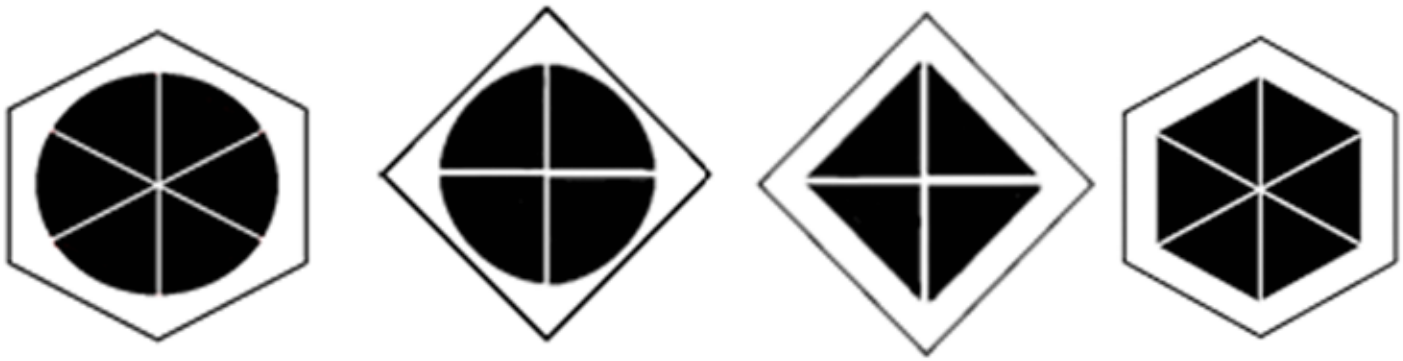
The project proposal on Design and Development of Optimized Miniature Antenna Modules with duality function for Inflatable Satellite Antenna Setup, submitted by Mr.R.Prasanna to ISRO RESPOND Scheme is approved by ISRO RESPOND Panel at ISRO-SAC with a funding amount of Rs.33.30 lakhs for the development of advanced design using new kind of materials for the space antenna design.

The objectives of the project are

- Design and development of an optimized, miniaturized, antenna module with duality function for inflatable antenna setup
- Design and development of an optimized retractable umbrella structure
- Development of a lab scale prototype of graphene based rectenna cluster integrated with retractable dome/dish structure

The project involves the following activities

- Graphene based Printed Patch Antenna (Prototype).
- Graphene based Antenna array integrated with Umbrella shaped retractable Dish/Dome Structure (Prototype)
- Graphene antenna integrated with Rectenna which can convert the electromagnetic wave into voltage (Prototype)



Proposed Geometric changes for the individual array element of the antenna Embedded on Dome Inflatable Setup

DRDO awards Extramural Research Project (ER&IPR Project) to Vel Tech

Dr. U. Chandrasekhar
Pro Vice-Chancellor

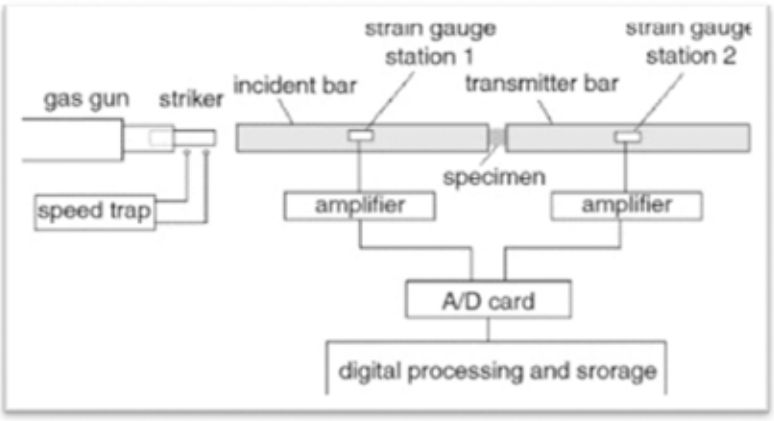
The project proposal on generation of data on high strain rate data of additive manufactured materials submitted by Dr. U. Chandrasekhar, Pro Vice Chancellor is approved by the DRDO ER&IPR board as a two year project.

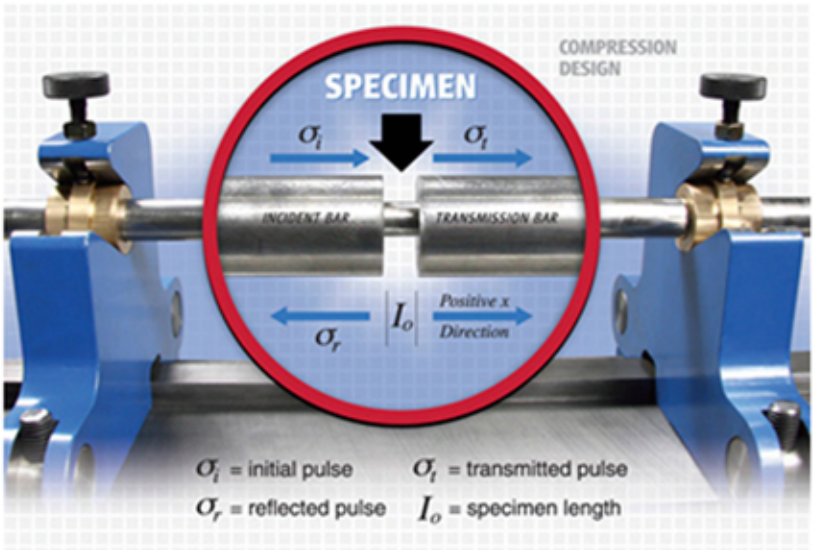
The project was reviewed by the scientists of Defence Material Research Laboratory (DMRL), Hyderabad for its innovation and relevance to the ballistic applications. Dr. S. Gowthaman, DRD is the Co PI for the project. The primary inputs on the practical relevance and utility were provided by the Terminal Ballistic Research Laboratory (TBRL), Chandigarh.

The primary outcomes of the project are

- Dedicated Split Hopkinson Pressure Bar (SHPB) test rig
- Experimental data on high strain rate performance of AM materials
- Technique for controlled fabrication of voids (mesostructures) to tailor the dynamic properties of AM materials

The project involves setting up of a Split Hopkinson test rig in which laser sintered test specimens will be tested at high strain rate of (102 to 104/s) and the dynamic test data will be generated





Schematic of a typical Split Hopkinson Test Rig to be developed for high strain rate testing

Submitted Research Proposals to Government Funding Agencies

Faculty from various departments of Vel Tech submitted comprehensive research proposals to various departments based on- (a) Background work carried out in the research domain in Vel Tech (b) Alignment of the thrust area of the research call with the research interest of the faculty (c) Pertinence to the vision, mission and goals of the department and Institution and (d) Availability of research facilities at Vel Tech research park or partner's institution.

Total Number of proposals submitted in (August-November 2017) = 25
Number of faculty involved in the preparation of submitted proposals = 15

The R & D proposals submitted by faculty from Aero, Auto, Mechanical, Electronics & Communication, Computer Science & Engineering departments and Management school are submitted to

1. Department of Science & Technology (SERB (IRRD), NCSTC, NSTMIS, Intel, Equity, EMR, ECR, AMT, TPF-Nano)
2. Ministry of Defence (DRDO-DESIDOC, NRB, GTRE-CARS)
3. Global Initiative on Technology Alliance (GITA)
4. Indo-Spanish Joint Programme
5. Ministry of Mines
6. Ministry of Environment, Forest & Climate Change
7. Biotechnology Industry Research Assistance Council- Academic Innovation Research
8. Indian Council of Social Science Research
9. National Council for Science & Technology Communication

Investigation on Developing Zirconia/Alumina Composite Structure using Direct Ink Writing Technique

This project is submitted by Dr. Praveen A. S., Assistant Professor from the Department of Mechanical Engineering to the Department of Science & Technology under the scheme of Early Career Research Award during 2017.

Summary:

The zirconia/alumina composite has got significant attention in recent times due to their excellent mechanical properties. This composition is widely used as a structural material for biomedical and aerospace applications. Thus, this proposal focus on the development of zirconia/alumina composite 3D structure using direct ink writing technology. Also, aims to investigate the effect of printing parameters and sintering temperature on the microstructural and mechanical properties of the zirconia/alumina composite structure. The stakeholders of Biomedical, Dental, Aerospace industries and Foundries will have immense interest in the application of direct ink writing technology for the development of zirconia/alumina parts. With substantial rise in population and consequential medical issues as well as rapid growth in the aerospace sector, the uptake of project outcomes is going to be significant.

Technology for Fabrication of Indigenous System on Chip for Marine Pollution Monitoring

This project is submitted by Dr. U. Saravanakumar, Assistant Professor as Principal Investigator along with Dr. P. Suresh, Assistant Professor as Co-Principal Investigator from the Department of Electronics & Communication Engineering to Science and Engineering Research Board, Department of Science and Technology during 2017.

Summary:

The objective of this project is to design, develop, fabricate and validate an Indigenous System on Chip (SoC) with the facilities available in India. The SoC module contains the discrete blocks such as 32-bit Processor, Memory units, ADC / DAC, DMA, Amplifiers, Filters and other peripherals needed for the marine pollution monitoring system. The prototype model for the proposed application will be developed by using Indigenous SoC which meets the theme of Make in India and will be validated at marine environment.

Development of Hydroxyapatite/Zirconia (Hap/ZrO2) based bio-printing

This project is submitted by Dr. A.S. Praveen, Assistant Professor as Principal Investigator along with Mr. M. Shriharish, Assistant Professor as Co-Principal Investigator from the Department of Mechanical Engineering to BIRAC under the scheme of AIR during 2017.

Summary:

The novelty of this proposal is to develop 3D direct ink writing system with indigenously made Hydroxyapatite/Zirconia ceramic ink for fabrication of complex bio structures. Innovation in the project is possibility of fabricating intricate bio structures without any customized tools directly from CAD data with significant cost and time gains. Also in this project, development of Hydroxyapatite and Zirconia composition ensures strength of the structure while assuring bio compatibility thus confirming to engineering and medical functions. The proposed ceramic ink will have favourableviscosity ~5-20 Pa.s and yield stress greater than 40 Pa. The research also includes the development of a dispersion system for producing a wall thickness of 150 µm and a cartesian manipulator with an accuracy of +/- 100 µm. The above configuration is to create porous ceramic structure with pore size in range of 150-500 µm. Usage of ceramic ink that are indigenously developed opens up several avenues for serving the needs of bio and medical fields in India.

Impact of International Collaborations in Scientific and Technological Research on Unmanned Aerial Vehicles, Robotics and 3D Printing

This project is submitted by Dr. E Balasubramanian, Associate Professor as Principal Investigator from the Department of Mechanical Engineering to National Science and Technology Management Information System Division (NSTMIS),Department of Science and Technology during 2017.

Summary:

The report will capture theimpact of international collaboration with reference to policymaking, IP generation and establishment of R & D facilities on the following themes:3D Printing in automotive, aerospace, manufacturing, medical and architecture; UAV in environmental, agriculture, military and civil; Robotic technology in medical, aerospace and other industrial applications.

It provide a valuable data base for policy makers, funding agencies such as DRDO andDST, industrialists, business start-upson these technologies; The data will provide information on trained manpower, researchers, scientists and professors pursuing international collaboration; To assess the impact of international collaborations on policy making, IP generation,establishment of research facilities and entrepreneurship development with a focus onUAV, 3D Printing and Robotics domains

Near Net Shape Processing of Ceramic Parts through Layered Manufacturing

This project is submitted by Dr. U. Chandrasekhar, Professor as Principal Investigator from the Department of Aeronautical Engineering along with Dr. A.S. Praveen, Assistant Professor and Mr. M. Shriharish, Assistant Professor from the Department of Mechanical Engineering to Additive Manufacturing Technology Division,Department of Science and Technology during 2017.

Summary:

Near net shape generation of a few parts of smal armaments without the usage of part-specific tooling or fixtures, binders or high power lasers and thereby provide rapid manufacturing solutions within a build envelop of 400 x 400 x 250 mm3. Through precise delivery of inhibitor solutions on polymer layers and custom developed vector printing with micro nozzle, we aim to outline the part profile with 100 -200 micron lines. Experimental evaluation of the influence of various SISP parameters (heat source-to-build platform distance, traverse speed, hatching patterns, nozzle diameter etc.) over features of the near net shape parts such as surface quality, shrinkage, strength, geometrical accuracy and residual stress.

Silver Nanoparticle - Polystyrene Composites for 3D Printing of Parts with Enhance Strength, Conductivity and Antibacterial Characteristics

This project is submitted by Dr. S. Gowthaman, Associate Professor from the Department of Mechanical Engineering to TPF-Nano,Department of Science and Technology during 2017.

Summary:

A process for developing encapsulated as well as surface coated AgNPs/PS composite particles; New paradigm in 3D printing with novel nanosilver/polystyrene composites through SIS process and thus enlarge the spectrum of industrial applications wherein mechanical strength, conductivity and antibacterial properties are vital for basic functionalities.

Additive Manufacturing Technologies – Applications in Aeronautical and Marine Sectors

This project issubmitted by Dr. U. Chandrasekhar, Professor as Principal Investigator from the Department of Aeronautical Engineeringalong with Dr. S. Gowthaman, Associate Professor from the Department of Mechanical Engineering to DESIDOC, DRDO during 2017.

Summary:

The monograph on AM will be oriented towards practical aspects and application feasibilities so that scientists, researchers and project leaders would find it as a reference resource. Case studies corresponding to design houses, defence, aeronautical and naval establishments would be covered with both national and international perspectives. Design for Additive Manufacturing (DFAM), rapid tooling, light-weighting through AM and certification of AM materials are among the salient features of the proposed monograph.

City Information System

This project is submitted by Dr. U. Chandrasekhar, Professor as Principal Investigator from the Department of Aeronautical Engineering along with Dr. E. Balasubramanian, Associate Professor from the Department of Mechanical Engineering to Indo-Spanish Joint Programme, during 2017.

Summary:

Development of a comprehensive 3D visualisation tool for urban areas, which will enable decision makers to view and manage an area by utilizing real-time data and predictive analytics. The solution will see the integration of 3D maps, GIS software, Urban Data (Building & Energy Sustainability Data, Traffic & Mobility Data, Environmental Data and Infrastructure Health Data) and Predictive Intelligence.

Impact of International Collaborations in Scientific and Technological Research on Unmanned Aerial Vehicles, Robotics and 3D Printing

Dr E Balasubramanian and Dr M. Arulprakasajothi submitted a proposal to the programme of National Science and Technology Management Information System Division (NSTMIS), Department of Science and Technology.

Summary:

This project aims to capture the impact of international collaboration with reference to policy making, IP generation and establishment of R & D facilities on the following themes:

a. 3D Printing in automotive, aerospace, manufacturing, medical and architecture

b. UAV in environmental, agriculture, military and civil

c. Robotic technology in medical, aerospace and other industrial applications

It provide a valuable data base for policy makers, funding agencies such as DRDO and DST, industrialists, business start-upson these technologies. The data will provide information on trained manpower, researchers, scientists andprofessors pursuing international collaboration

Investigations on the Effect of ZnO Nanowire Interface on the Mechanical Performance of Marine Composites

This project is submitted by Dr. S. Gowthaman, Associate Professor from the Department of Mechanical Engineering toDRDO-NRB, during 2017.

Summary:

The main objective of the proposal is to experimentally investigate the effect of using ZnO nanowires as the interface coating on the mechanical performance of marine composites, i.e., glass/epoxy, glass/vinyl ester, carbon/epoxy and carbon/vinyl ester composites.Polymer composites research has progressed significantly and this material has outperformed metal with greater strength-to-weight properties in various naval applications including ship superstructures, ship hulls, propellers etc. However, designing of these composites with ultimate durability is a challenge as they are susceptible to harsh marine environments.

Secured Unique ID Development through Multi-modal Biometric System with Enhanced Recognition Rate and Time Compression

This project is submitted by Dr. K. Meena, Associate Professor from the Department of Computer Science & Engineering as Principal Investigator toDST under the scheme of Early Career Research Award, during 2017.

Summary:

Human authentication plays a vital role in real time environment. Commercial applications such as computer network login, electronic data security; Government applications such as national identity card, driver's license, voters' id, PAN card, passport; Online applications include forensic applications such as corpse identification, criminal investigation, terrorist identification and missing children need human authentication. In recent years, biometric has revolutionized the human authentication technology. The base and reach of human recognition system has been expanded by the innovative uses of biometric devices. Existing techniques do not provide maximum time compression and recognition rate. This proposal addresses these issues by using of multi-resolution domain for reduction of computation time and texture based feature extraction techniques for increasing the recognition rate. Also, in our country, current user data identification and authentication trails are protected only from manual inspection, thus potentially creating unauthorized surveillance. This proposal aims to address this gap by providing technology for storing Unique ID in cloud environment for online verification. The proposed systems will become ubiquitous and inevitable in the coming future.

Recovery of Value Added Products (Heavy Metals) from Mine Waste Using Novel Organic Backbone (PBI)-Inorganic Polymeric Composites

This project is submitted by Dr. C. Ramesh Kumar, Associate Professor as Principal Investigator along with Prof. Dr. A. Kanni raj, Professor as Co-Principal Investigator from the Department of Chemistry to Ministry of Mines during 2017.

Summary:

Extraction of heavy metals from mine waste water as well as from tailing process waste will accomplished using ion-exchange process using Organic Backbone (PBI)-Inorganic Polymeric Composites. Salient feature of this project is demonstration of the developed process on sample waste streams generated by ore mines in India. Outcome of the project would facilitate waste recovery processes of several Indian ore mining enterprises that produce million tonnes of waste annually.

Mentoring

As part of internal support for R&D, Vel Tech invites experts from various reputed institutes and industries to interact with faculties and students. The experts deliver a talk on state-of-the-art research, review research proposals, and discuss with students and faculties on opportunities for joint proposal, internships, research facilities etc. Recently, the Institution hosted experts from institutes like IITs (Kanpur, Mandi, Madras, Hyderabad, Bombay etc), NIT-Trichy, CEG, RRCAT-Indore, Hexolabs etc with specializations in various fields like Materials, Manufacturing, Wireless Sensors, High Performance Computing etc.

Dr. Ing. Duraiselvam, NIT Trichy
Research area - Surface Engineering
Target outcome - Student internship, Joint proposal

Dr. Sparsh Mittal, IIT Hyderabad
Research area - High Performance Computing
Target outcome - Student internship, Joint workshops

Dr. Viswanath Balakrishnan
Research area - Materials, Nanodevices
Target outcome - Student internship, Joint proposal

Dr. Venkitanarayanan, IIT Kanpur
Research area - High strain rate testing
Target outcome -Facilities

Dr. S.G Singh, IIT Hyderabad
Research area - Electronics / VLSI
Target outcome -Facilities, Mentoring

Dr. K.N. Gopal, IIT Madras
Research area - Composite Materials
Target outcome -Facilities, Mentoring

Dr Karunakaran, IIT Bombay
Research area - Hybrid Manufacturing
Target outcome -Facilities, Joint Proposal

Dr. Rajalakshmi, IIT Hyderabad
Research area - WSN, Sensors
Target outcome - Student internship

Dr. Venkiah, IIT Tirupathi
Research area - Metrology
Target outcome -Facilities

Dr. Balaji, IIT Madras
Research area - Joy of Research
Target outcome -Facilities

Dr. S. Harish, Kyukshu University,
Research area - Thermal Engineering
Target outcome -Joint Proposal

Dr. PVM. Rao, IIT Delhi
Research area- Design Thinking
Target outcome- Mentoring

Dr. K.S. Reddy, IIT Madras
Research area - Thermal Engineering
Target outcome -Facilities

Dr. C . Paul, RRCAT, Indore
Research are - Additive Manufacturing
Target outcome -Joint Proposal

National Level Seminar on Advances in Cryogenic and Cryo-Materials

Dr. A. Manimaran
Professor, Department of Mechanical Engineering

Dr. A. Manimaran, Professor and Dr. M. Arulprakasajothi, Associate Professor from the Department of Mechanical Engineering, School of Mechanical and Construction, organized a Two Day National Level Seminar on ADVANCES IN CRYOGENIC AND CRYO-MATERIALS during 10th-11th November, 2017, which was sponsored by Science and Engineering Research Board, Department of Science and Technology. A total of 42 participants from various parts of our country attended the seminar.

The technical sessions are covered with the fundamentals of Cryogenics to its applications to technical challenges in some of the applications. The speakers are from various reputed organizations such as IISc, IGCAR, Inter University Accelerator Centre, and Institute for Plasma Research, TIFR, and University of Hyderabad.

Prof. S. Kashthurirengan from Centre for Cryogenic Technology, Indian Institute of Science, Bangalore talked about Cryogenics fundamental and its applications.

Participants along with Keynote Speakers

Mr. K. Gireesan from SQUIDs andApplications Section-Materials Science Group, Indira Gandhi Centre for atomic Research, Kalpakkam gave a talk on 'SQUID sensors and its Applications.

Dr. M. Arulprakasajothi
Associate Professor, Department of Mechanical Engineering

Dr. Soumen Kar from Cryogenics & Applied Superconductivity Lab Inter University Accelerator Centre, New Delhi presented delivered a talk on 'Technical Challenges in Cryogenics in a whole Body Superconducting MRI Scanner'.

Mr. S. Srinath from School of Physics, University of Hyderabad presented on 'Low temperature properties of magnetic materials'. Dr. Ing. Vipul L. Tanna from IPR SST-1 Cryogenics Team Institute for Plasma Research, Bhat, Gandhinagar spoke about 'Lessons Learnt from Complex and Large Cryogenics System at IPR'. Mr. K V Srinivasan, The Engineer Incharge of Low Temperature Facility, Tata Institute of Fundamental Research, Mumbai presented on 'Thermal analysis and Indigenous Development of Porous Regenerator for Stirling Cryocooler'. Mr.S. Subramanian, Assistant Professor, Aeronautical, Vel Tech presented on 'The fascinating world of cryogenics - History, applications and thermodynamics'.

Presentation by Prof. S. Kashthurirengan

Additive Manufacturing / 3D Printing as a tool for product development – Research in the Institutions Thrust Area

3D Printing or additive manufacturing, a direct result of digitization, has become so widespread in recent years that many refer to it as 3rdindustrial revolution. It allows users to print things that would be almost impossible to make in a traditional machining environment. 3DP as a technology has already started to revolutionize sectors like medicine, education, automation and even aerospace industry. Vel Tech has been integrating 3DP into UG/PG programs for past few years and the results of this effort are seen in many ways. 3DP machines work directly from a computer model or CAD data, so students can makeparts with exciting design features and shapes, without entering workshop.

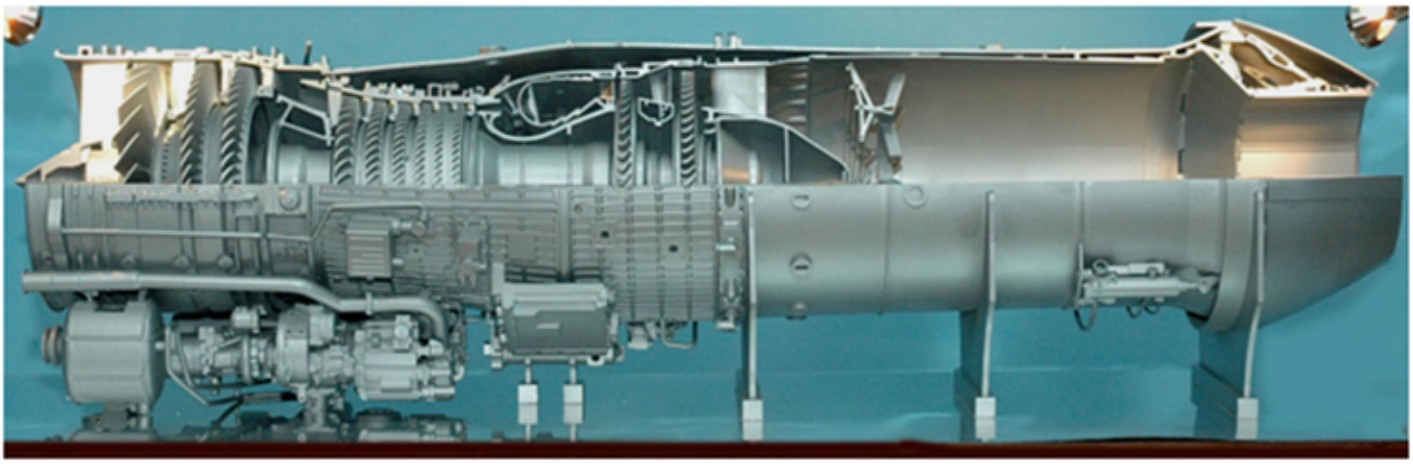
There are many ways to print something in three dimensions, but all have one thing in common: instead of cutting, drilling and milling objects, as a conventional factory does, to remove material and arrive at the required shape, a 3D printer starts with nothing and adds stuff to it. There are many ways of doing – by squeezing the molten plastic through a small hole and depositing on a plate; exposing liquid araldite like material to laser in a precise way and solidifying it or fusing the metal particles together using a binder. Based on the process it may be called as Fused Deposition Modeling or Stereolithography or Powder Jet Binding. In Vel Tech, multiple number of 3D printers that are used to help students to make parts for aeronautical, mechanical, automotive, electronics and bio engineering projects.

In case of fused deposition modeling, a semi-liquefied thermoplastic such as BS, PC or PLA is extruded out an orifice and deposited on a build platform. The filament making has tremendous scope for research in terms exploring several additives or filler through the composite filaments can be developed with superior strength and thermal conductivity. Vel Tech is working development of an extrusion unit that can convert HDFE into filament. The core focus of the study being carried out by Dr.Varadarajan will evaluate the rheology of the thermoplastic fluid at various temperatures. The study will further explore the influence of raster style, aircraft and layer thickness on tensile and flexural strengths of the FDM part. It is expected that the students from auto, aero and mechanical engineering departments can explore the use of FDM parts for rapid tooling, assembly integration studies and mass customization. With AM as one of the thrust areas of research at Vel Tech, AM related R&D is being carried out in multiple modes –

(i) Stereo lithography based combustor modeling (aeronautics department)

(ii) Selective inhibition sintering of high strength plastics (mechanical department) and

(iii) Droplet deposition of ceramic inks for realization of near net shape patterns (interdisciplinary)



A global case study in AM - Gas turbine engine assembly integration by Dr. U. Chandrasekhar
(http://www.stratasys.com/resources/case-studies/aerospace/gas-turbine-research-establishment)

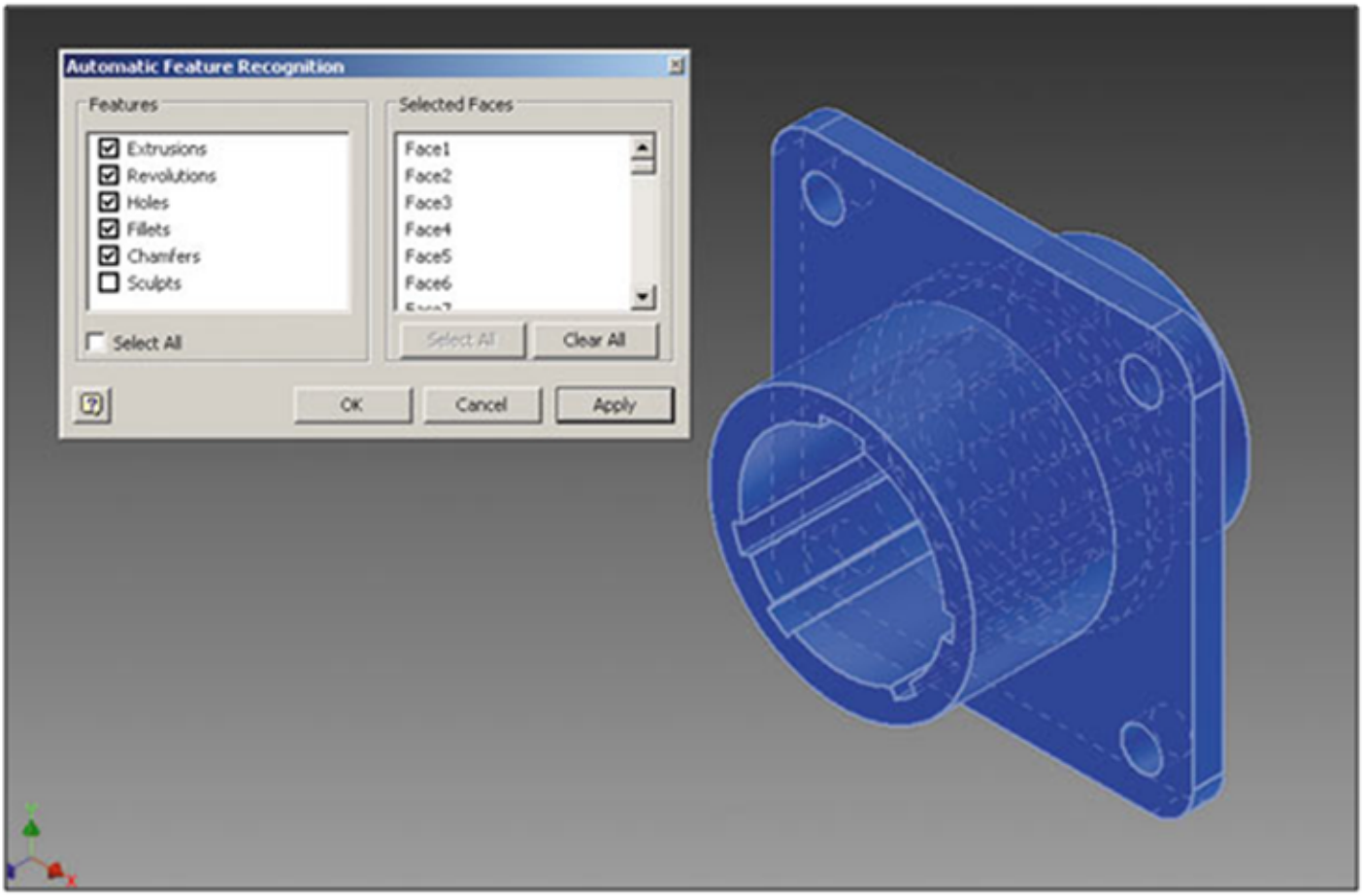
Smart System for Automatic Feature Recognition of Sheet Metal Parts

Dr. Sachin Salunkhe,
Associate Professor,
Department of
Mechanical Engineering

Production of high quality products of the lowest possible cost is the main objective of manufacturing industries. Increased competition has forced industries to search for other possibilities to the modern approaches to design, manufacturing and management. Smart feature recognition play an important role in manufacturing (automobile, aeronautical etc.) sectors especially in sheet metal industries.

Feature recognition means identifying the design geometry that represents holes, slots, pockets, bosses, fillets, chamfers and other design elements that can be machined. Automating or streamlining this process is a big help to the programmer.With computerized feature recognition, programmers can be more productive, relieving pressure on shops that can't find enough qualified programmers. Part programs can be prepared in less time, easing the burden on overworked programming departments and eliminating a major bottleneck in work flow.

Feature recognition also plays a key role in efforts to create a digital product model that can be used directly as part program input, bypassing the CAM programming process altogether.



Many developers are working on ways to automate these interpretive steps. Feature recognition technology is an emerging tool for this purpose.

The product model itself will function as a universal part program, serving as machine input for any machine capable of producing the part.

An insight into Visible Light Communication

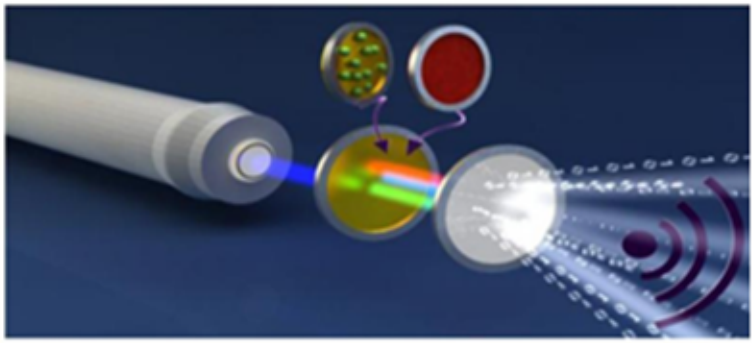
Dr.S.Natarajan,
Professor
Department of Electronics and Communication Engineering

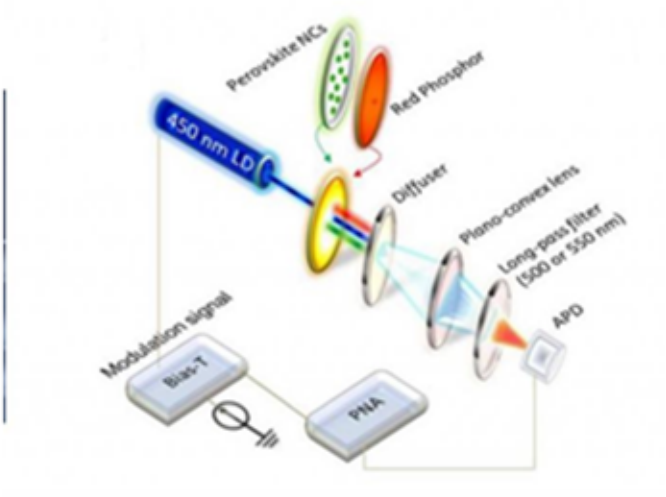
Visible Light Communication (VLC) is a free-space optical wireless communication technology that uses visible light to transmit data across distances.

The concept is varying the intensity of a beam of light be used to encode information. Light travels 186,000 miles per second, so communication across long distances is virtually instantaneous.

This ambitious concept is still being developed. Meanwhile, manufacturers have moved to develop VLC for specific building applications, and these solutions, now being demonstrated, will be commercially available soon.

These manufacturers are focusing on two extraordinary capabilities of luminaires that both illuminate and communicate with light.





In the modern era, technological advances allowed us to modulate the light at higher frequencies, allowing richer information. Light can be transmitted across a free space (e.g., lasers communicating between two buildings) or across a medium (e.g., fiber optics).

With the advent of LED, a new idea in VLC is to use general lighting to communicate with users in a space as a replacement or supplement to Wi-Fi. While traditional light sources present practical limitations, LED lighting can be modulated at very high frequencies, with a cycle as short as nanoseconds. This concept, called Li-Fi, could be a solution to RF bandwidth limitations as the visible light spectrum is 10,000 larger than the radio spectrum. As a bonus, VLC doesn't cause electromagnetic interference. The light can transmit information either directly or reflected from a surface. It can do so while dimmed. However, light cannot penetrate obstacles such as walls.

The first is using LED lighting as a network for indoor positioning. The second is targeted communication with mobile devices. While there are numerous potential applications, the initial focus is retail stores. Currently, a project has been initiated as Indo-Italy collaboration research project and the proposal is ready for submission. The theme of research is Technologies for Cultural heritage. Light Communication is used toenable the visually impaired visitors to experience the visual artefacts in cultural heritage structures byauditory sensing. The head phone receives light datacomposed of descriptive audio, describing the visual artefact currently visited by the visually impaired visitor inpreselected language. The light transmitter, which is kept ata suitable height in the vicinity of the artefact, streams audio and navigation information in the form of light apartfrom providing illumination.

Research Interactions with Japanese Universities

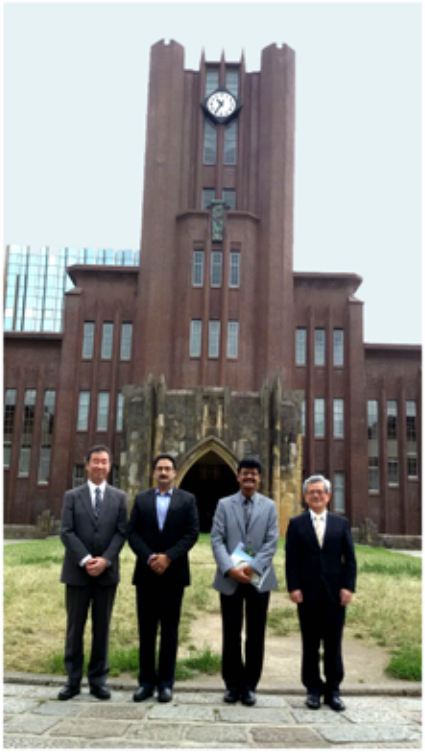
Vice President Mr. K. V. D. Kishore Kumar and Pro Vice Chancellor Dr. U. Chandrasekhar visited some of the most reputed Japanese Universities for joint research activities in the following domains

- Think film sensor
- Additive Manufacturing
- Data Analytics
- Nano Engineering

The high–level administrators and decision makers from the following Universities expressed their keenness for association with Vel Tech.

- Tokyo Metropolitan University
- Nagoya Institute of Technology
- Toyota Technological Institute
- University of Tokyo
- University of Tsukuba

Subsequently communication was continued with Mr. Satoma Suzuki and Dr. Hidenori Watanabe for joint projects in image data analytics along with the faculty of Computer Science department with reference to forthcoming Indo-Japan Science and Technology calls.



Vice President and Pro VC with Dr.Takaaki Kajita, Nobel Price laureate-Physics at University of Tokyo

Meeting with Toyota Technological Institute (Automotive Design)

Meeting with Tokyo Metropolitan University - Research Centre (Image Analytics)

Meeting with University of Tsukuba (Super Computing)

Meeting with University of Tokyo - Invitation to visit Vel Tech

3rd International Conference on Design, Analysis and Development Practices in Aerospace and Automobile Engineering (I-DAD 2018)

Vel Tech is organizing a three-day International Conference on Innovative Design, Analysis and Development Practices in Aerospace and Automotive Engineering (I-DAD 2018)

from February 22nd to 24th 2018. This conference is held once in two years, and I-DAD 2018 will be the third edition of the I-DAD conference series.

IDAD conference provides a concerted platform for global and national researchers and academicians to disseminate the information on the latest aspects of design, analysis, manufacturing, integration and system development of various engineering sectors including aerospace, automobile, energy and manufacturing sectors. The conference will have other events like project competitions, workshops and festivities organized by Vel Tech. The proceedings of the I-DAD 2018 conference will be published in Scopus Indexed "Lecture Notes in Mechanical Engineering" by Springer.

The topics of the conference are:

- Additive Manufacturing / 3D Printing
- Aerodynamics
- CAD, FEM, CFD
- Design Engineering
- Advanced Materials & Composites
- Nanoengineering
- DFM & Design Optimization
- Propulsion / Thermal Engineering
- Quality & Reliability
- Sensors & Health Monitoring
- UAVs and Autonomous Systems
- IC Engines
- Applications (Auto, Aero, Bio-fuels, Energy, Space, Robotics, Environment, Manufacturing, AR/VR & Tooling)

Eminent speakers are invited from all over the world to deliver talks on various themes comprising of multidisciplinary topics. The previous IDAD conferences attracted renowned speakers from France, Germany, Taiwan, USA, Canada, Singapore etc., and also from premier national institutions like DRDO, IGCAR, ISRO, IITs, NITs etc, and the sample experts list for I-DAD 2018 is mentioned below.

Keynote Speakers

Dr. V. Natarajan, RIC-Chennai, DRDO
Dr. S. Akella Sarma, Mahindra & Mahindra
Dr. Dheepa Srinivasan, GE India Ltd.
Prof. S. Harish, Kyushu University, Japan
Prof. H.M.A. Hussein, Helwan University, Egypt
Dr. K.S. Raghavan, Discipline Chief, Cyient Ltd.
Dr. S. Suryakumar, IIT-Hyderabad
Dr. Godfrey Onwobulu, Sheridan Inst. of Tech., Canada

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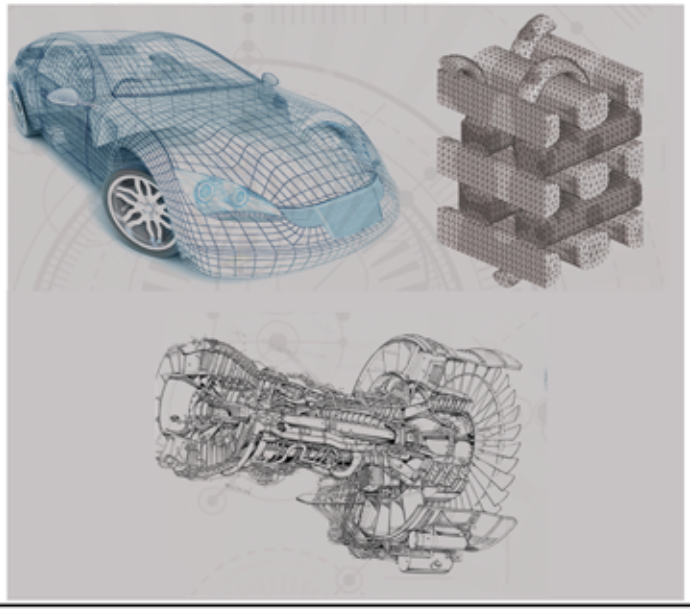
Prof. A. M. Kuthe, VNIT-Nagpur
Dr. Shailendra Kumar, SV NIT-Surat
Dr. Ian Gibson, Deakin University, Australia



Vel Tech is conferred with an Award in an Education Summit

During the CL Education Summit held at Hyderabad on 14-15 November, 2017, Vel Tech received an award for exemplary work carried in creation of research and innovation system in the Institution. The summit was attended by many CEOs from national and multinational organisations, several IITs, IIMs, Vice Chancellors, Deans and thought leaders from corporate world. The award selection was done by a panel of eminent academicians and scientists consisting of -

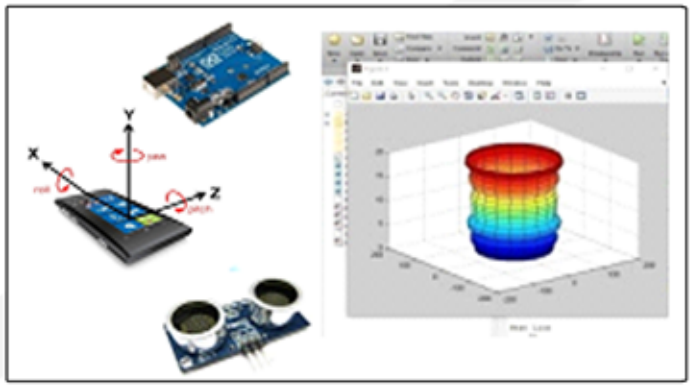
Prof. S. Sadgapoan, Director – IIIT
Prof. AnindyaChatterjee, IIT Kanpur
Prof. Rishikesh Krishnan, Director – IIM
Dr. R. A. Mashelkar, Fellow Royal Society & Former DG-CSIR

The primary aim of the Education Summit was to provide a concerted platform enabling collaboration, networking and knowledge share between the various stakeholders in the innovation eco-system and to catalyze the transformation of the region into a global innovation hub.Dr. U. Chandrasekhar, Pro Vice Chancellor was requested by the organisers to share the experiences in accelerating the research and innovation practices in a University. He addressed the audience on integrating the disruptive contemporary technologies into research pursuits while taking the faculty, students' and institutional needs into cognizance. The other speakers in this session were from IIT Kanpur and IIT Bombay. During the keynote of the summit, Dr. B.V.R. Mohan Reddy founder and executive Chairman of Cyient (Infotech) emphasised the need of innovative practices and also the important role of Universities in growing economy like that of India.

Dr.U. Chandrasekhar receiving the award during the education summit

Vel Tech Faculty wins an Award of Excellence for developing a Biomedical 3D Scanning Device

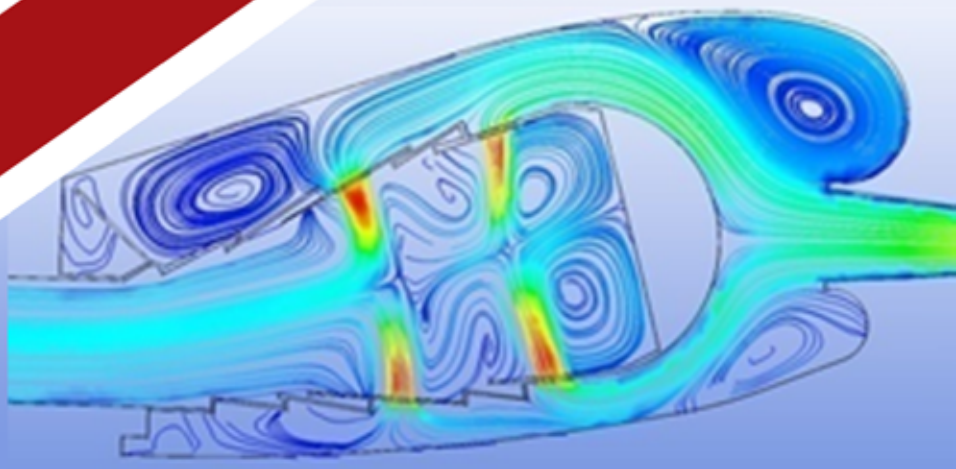
Vel Tech faculty member Shri Harish won an award of excellence for developing an ingenious solution that can be used for 3D profiling of below-knee stumps. He was selected for this award by a jury of medical doctors and professors from IIT Bombay, COE-Pune and NIT-Nagpur in medical device innovation camp conducted in September 2017.



Schematic of low cost 3D scanner

The developed device obtains the positional information using low-cost gyroscope, accelerometer and ultrasonic sensor available from discarded mobile phones; and an efficient MATLAB program leads to defining 3D point cloud data leading to patient-specific solution. Mr Harish worked in tandem with a small group of clinicians and designer to develop the prototype. Dr. U. Chandraekhar, Pro Vice Chancellor who mentored his efforts mentioned that Mr Harish has open invitation from IIT-Bombay to refine his efforts leading to further research, IP generation and commercialisation.

Along with a team of clinician and doctors, Vel Tech faculty member Mr.Shri Harish designed a 3D Scanning system with an ultrasonic sensor, a micro controller and a smart phone.



Computational Fluid Dynamics analysis of an Aero Gas Turbine Combustor