



MECH CONNECT

DEPARTMENT OF MECHANICAL ENGINEERING

FACULTY OF
ENGINEERING AND TECHNOLOGY



JAMIA MILLIA ISLAMIA



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NEWSLETTER



MESSAGE FROM THE HEAD

DR. J.A USMANI

Welcome to the Department of Mechanical Engineering of Jamia Millia Islamia, where experienced faculties and highly motivated students - supported by a dedicated staff - experience a unique engineering education.

The Department offers three levels academic programmes leading to Bachelor of Technology (B.Tech.), Master of Technology (M.Tech.) and Doctor of Philosophy (Ph.D.) degrees. An extremely dynamic and large faculty and a well-experienced support staff give the department a breadth of research focus and a wide range of technical expertise.

Our faculty members have a passion for teaching and an avowed commitment to research and development.

We are continually striving to improve the quality of our programs by finding new ways of structuring our curriculum and exploring new delivery methods. We provide our students with opportunities to engage in experiments, design work, project work, industrial training, seminars and teamwork to enhance the learning process that is so vital for a holistic engineering education.

They develop skills of inquiring and exploring new ideas on their own. In essence, they are well prepared for the life-long learning that is vital for an enriching career in engineering. Our students develop an ability to think, are able to innovate, and acquire a strong foundation in technical knowledge.

I congratulate the “**MECH CONNECT**” team for bringing its first newsletter & wish them success in life.

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“THE GOAL OF EDUCATION IS NOT TO INCREASE THE AMOUNT OF KNOWLEDGE BUT TO CREATE THE POSSIBILITIES FOR A CHILD TO INVENT AND DISCOVER, TO CREATE MEN WHO ARE CAPABLE OF DOING NEW THINGS.”

- JEAN PIAGET

CONFERENCES

NSOSR-2015

COORDINATOR – PROF. MOHD. SUHAIB
CO-COORDINATOR – PROF. AHMED FAIZAN SHERWANI

**National Seminar
On
Solar Robotics**

National Seminar on Solar Robotics (NSOSR 2015) was organized between 9th-10th Oct 2015 by the Department of Mechanical Engineering, Jamia Millia Islamia, under the guidance of Prof. Mohd. Suhaib and Prof. Ahmed Faizan Sherwani. Its objective was to explore the challenges and opportunities for the development of solar energy as a competitive energy source. Scientific studies and applications related to Solar Robotics have shown rapid progress and become increasingly important for the nation. The 2-day technical seminar included sessions on Paper presentation, Prof. Abdul Mubeen Memorial Lecture, Alumni Meet, Invited talk by GM-NSIC and Valedictory.

ICEBU-2016

COORDINATOR – PROF. M.N KARIMI



International Conference & Exhibition on Building Utilities (I.C.E.B.U 2016) was organized by the Department of Mechanical Engineering, Jamia Millia Islamia, between 1st December 2016 and 3rd December 2016, under the leadership of Prof. M.N Karimi. The conference was organized to discuss the multidisciplinary engineering & technological capabilities for the effective design and development of buildings.

The discussion & elaboration yielded extensive inputs on design and improvement in present services. The theme of ICEBU-2016, being somewhat different than other conferences, made it appealing to the audience & challenging to the authors, keynote speakers & exhibitors.

The following topics were thoroughly discussed in the conference:

- 1) Building architecture
- 2) Plumbing & Drainage
- 3) Instrumentation & control (Building Automation)
- 4) HVAC Buildings
- 5) Green Buildings & Related Engineering and Social Science Areas.



BIOMECHANICS THE FUTURE OF MOTION

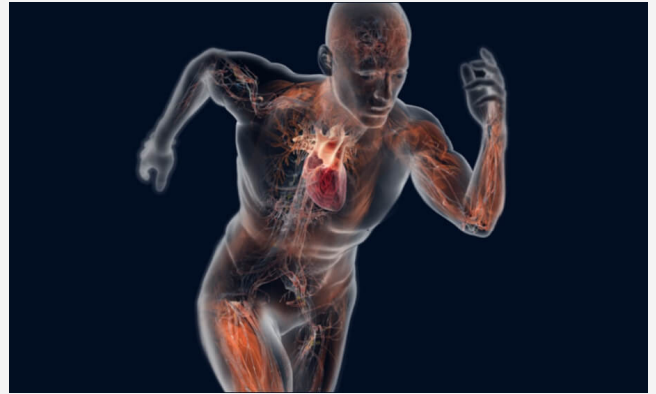
GITESH AGGARWAL B.TECH 3RD YEAR
MECH ENGG.

HISTORICAL PERSPECTIVE

Biomechanics is a relatively new branch in the discipline of kinesiology in that it has been recognized as an individual field of study for approximately 30 years. However, the building blocks forming the entire foundation from which the discipline has emerged can be traced back to the time of Aristotle (084-322 BC.). Aristotle introduced the world to the art of observation for developing an understanding of human movement. Archimedes (287-212 B.C.) developed principles which provided a basis for today's sport of swimming. Leonardo da Vinci (1452-1519) has been deemed an originator of biomechanical thought regarding anatomy and mechanics because of his talents as an artist, biologist, and engineer. Throughout the fifteenth, sixteenth, and seventeenth centuries, Galileo (1564-1642), Newton (1642-1726), and Borelli (1608-1679) were instrumental in providing key elements for understanding today's biomechanical concepts due to their experimentations with and explanations of natural laws and mechanics (Adrian and Cooper, 1989).

TECHNOLOGICAL PERSPECTIVE

In biomechanics, basic methodologies have been improved due to the incorporation of engineering, physics, computer, and mathematical concepts applied to human movement patterns. Keeping up with the computer age has become a major focus in the world of biomechanics. However, it should be noted that biomechanists may have become more involved with the technological aspect of their field than the theoretical and philosophical aspect. Should biomechanists use the current technology to answer research questions or should they answer research questions by building more equipment?



PHILOSOPHICAL PERSPECTIVE

Biomechanics has often been criticized for not being a strong stand-alone discipline. This implies that the study of biomechanics is simply a tool for other disciplines and cannot offer useful information on its own. It should not be forgotten that this field is still relatively young. Currently, the design of kinesiology lists biomechanics as a sub-discipline along with other areas such as sports psychology, sports sociology, exercise physiology, motor learning and development, and adapted physical education.

FUTURE PERSPECTIVES

There are several issues concerning biomechanics that are inevitable. These include the continuation of descriptive types of biomechanical analyses, continued modification and improvement of equipment, continued invasion of the discipline by other professions, and hopefully a realization of the need for biomechanics to become multidisciplinary, incorporating other movement sciences such as exercise physiology, motor development, motor learning, and human factors engineering. These issues are too obvious to any biomechanists concerning the future of their profession. Therefore, the futuristic outlook of biomechanics should be characterized by a set of goals describing the needs of the profession, not just accepting those issues most likely to occur

WHAT THE FUTURE UPHOLDS FOR US

PRIYA AGARWAL B.TECH 1ST YEAR MECH ENGG.

Mechanical Engineering is considered to be one of the oldest and broadest engineering branches. The branch applies the principles of engineering physics and material science for the design analysis, manufacturing and maintenance of mechanical systems. The application of this branch is not just related to the above-mentioned points only.



Mechanical Engineering has been around for centuries and will be, for a long time to come, unless there is a miracle in science that allows humans to deny all laws of mechanics and still allow them to build stuff that can be used. Thanks to mechanical engineering, they have increased the efficiency of the machines that we use and also made it easier to make them. The future of mechanical engineering is spread across various emerging streams that hold many promises to make the future a better place to live in.

Some of the promising streams that the future upholds of mechanical engineering are:

- 1) Nano-technology
- 2) Biomechanics - A promising stream of the future
- 3) Buildings of the future and urban designing
- 4) Robotics ... and the list continues, but these are the major areas where the future of mechanical engineering will logically be applied.

Nano engineering for example is the latest technology where we are "Going small for big advances." It is used to create materials that are not affected by normal factors like weather and corrosion, etc.

Materials designed by Nano-engineering are lighter and stronger than other materials. The mechanical structure of the materials is changed thereby giving enhanced properties to the materials.

A concept using carbon Nano tubes by NASA is said to be able to link the surface of the earth and the satellite thereby making a direct connection to a satellite. This is the potential of nano-engineering. Similarly Mechanical Engineering has helped in creating the fastest cars and in the making of the most comfortable vehicles on the planet that are used by millions.

Advancements in mechanical engineering are applied to automobiles to decrease their carbon footprint and make them more Eco-friendly and economical while simultaneously giving more efficiency.

Huge structures like the Burj-Khalifa, Taipei 101, and many other tall buildings use mechanical engineering for the structure of the building. Taipei 101 uses mass dampers for stability so that there is a uniform weight distribution so that the buildings don't get unstable easily.

Therefore, we can easily see that there is much that waits for the bright future of mechanical engineering. The great efforts of the engineers would definitely prove out to be masterstroke for the coming years.

ELECTRIC VEHICLES: THE FUTURE IS HERE

**SADIYA HUSSAIN B.TECH 3RD YEAR
MECHANICAL ENGG.**

In this fast pacing world, there's no time to stand and have a look at the havoc which we have created. The polluting environment! The filthy air! All these seem to be unbearable.

Passenger vehicles are a major pollution contributor, producing significant amounts of nitrogen oxides, carbon monoxide, and other pollution. Clean vehicle and fuel technologies provide us with an affordable, available means of reducing transportation-related air pollution and climate change emissions. These include fuel-efficient vehicles that use less oil; cleaner fuels that produce fewer emissions; and electric cars and trucks that can entirely remove tailpipe emissions.

Electric Vehicles though date back to the mid -19th century has now gained much momentum. An Electric vehicle is basically a vehicle using electric or traction motor for its propulsion instead of the conventional internal combustion engine. The main advantage served by them is that they do not cater to environmental pollution as they are emission less.



Recently, ISRO has launched its first solar electric vehicle by modifying the existing Maruti Omni 800 by using solar panels to charge the lithium-ion batteries that in-turn power the electric motor.

Even the city of Nagpur has got its first fleet of electric cars driven by OLA. Also the automobile giant Mahindra has tied up with Tesla to make India fully sufficed with electric vehicles by 2030.

To promote the engineering behind electric vehicles the automotive giant Mahindra & Mahindra organizes an event for engineering students known as E-BAJA with the motive "GO GREENER". Thus, these electric vehicles are a demand of the future and have a lot of Imagineering involved in it for a sustainable future.

STUDENT COMPETITIONS



HPVC 2015

Team PRODIGY from Jamia Millia Islamia participated in the Human Powered Vehicle Challenge in 2015 at the Delhi Technological University and secured 3rd place in the Endurance event and an overall 5th rank in the competition.



EFFICYCLE 2016

Team MEKRANGERS from Jamia Millia Islamia participated in Effi-Cycle 2016, convened by S.A.E Northern Section and supported by Maruti Suzuki (Pvt Ltd.) and ICAT Ltd. This 4 Days event was hosted by Lovely Professional University (LPU) Phagwara, Punjab about 104 teams from all over India participated in this season.



HPVC 2016

Team Flair from Jamia Millia Islamia secured third position in the Endurance event in HPVC India 2016 competition, which took place from 17 to 19 March 2016 at VIT's sprawling campus. It consisted of design and innovation evaluations, a drag race speed competition, and an endurance event.



GKDC 2016

Team Alpha from Jamia Millia Islamia participated in Go Kart Design Challenge organized by Indian Society of New Era Engineers (ISNEE). The team participated in the competition organized at KARI Motors, Coimbatore.



SEMA 2016

Team SuperMileage from Jamia Millia Islamia participated in the Shell Eco Marathon Asia, in Manila, Phillipines, 2016. Shell Eco-marathon challenges student teams around the world to design, build, test and drive ultra-energy-efficient vehicles



ROBOCON 2017

Team JMI Discobolus, under the guidance of Professor Mohd. Suhaib, represented the University at ROBOCON 2017, held in MIT Pune, Maharashtra. The team successfully achieved a rank of 39 out of 116 teams that participated in the event.

EXTRA-CURRICULAR



NCC

NCC -The National Cadet Corps plays a significant part in molding a person's character. Gitesh Aggarwal, Mohsina, Narayan Jha, Sadiya Husain and Zeba Khan have been a part of NCC since 2015 and also attended the NCC CATC Camp 2015.



CRICKET

From mechanical department, Ashraf Khan, Kamran, Ajay Sharma and Shubham Tomar represented the faculty in the Inter Faculty Cricket Tournament

FACULTY ACHIEVEMENTS



Prof. J. A. Usmani

Gave an expert lecture on Scope of Refrigeration and Air-Conditioning in India and benefits for students and faculty to become ASHRAE members.



Dr. S. M. Muzakkir

Has filed for patents on Sweeping Brush with Pressurized Air Nozzles for Street Sweeping Machines and Agitator Assembly for a Top Load Washing Machine. Gave an expert Lecture on Lubricant Additives and Effect of Cylindricity on the Tribological Performance of Journal Bearing on "Fundamentals of Engineering Tribology with Applications" held at IIT Delhi. Was awarded the Best Research Paper Awards in International Conference on Industrial Tribology RDCIS, SAIL Ranchi and International Conference and Exhibition on Building Utilities (ICEBU-16), JMI.

Was awarded the Best Research Paper in International Conference on Recent Advances in Nano Science and Technology (RAINSAT- 2015), Sathyabama University & CLRI (CSIR), Chennai where he presented on

1. Experimental Investigations on Effectiveness of Molybdenum Disulphide and Zinc Nano Particles as Lubricant Additive in Mixed Lubrication Conditions (Advanced Functional Materials)
2. Influence of Surfactant on Usage of Functionalized Multi Walled Carbon Nano Tubes (MWCNT) as Lubricant Additive (Applications of Nanotechnology)
3. Is Nano Size the Best Choice?
4. Tribological Performance Evaluation of Nano-Lubricant (Advanced Functional Nanomaterials)
5. Synthesis of a Magnetorheological Fluid and its Tribological Performance Evaluation



Dr. Islam Nawaz

Presented paper in National conference on Renewable Energy Sources for Sustainable Climate. Also gave expert lectures on various aspects of Solar Energy in short term course organized by Centre for Energy Studies held at IIT Delhi.



Prof. A. N. Siddiquee

Carrying out research/project sponsored by UGC in Friction Stir Welding and USM (2012-2017). Visited King Saud University for research co- operation avenues. Expert member for teaching position in NIT Delhi and for course & study committee at NSIT, New Delhi. Helped students for carrying out micro hardness testing (DTU), surface roughness testing (IIT Delhi) and Friction Stir Welding (BITS Pilani). Also gave expert talk on Innovation and Research Trends in Mechanical and Production Engineering in one week national workshop and an expert lecture on Developments and Challenges in Materials and Manufacturing Processes conducted by ITS Engineering College.



Mr. Mohd Javaid

Presented paper in International Conference and Exhibition on Building Utilities held at Department of Mechanical Engineering, JMI. Published a research paper in International Conference on Advance production and Industrial Engineering held at DTU, New Delhi. Participated in AICTE recognized short term course on Recent Trends in Automobile Engineering held at SM VDU Katra Jammu & Kashmir



Prof. Mohd Suhaib

Delivered an invited talk on "Solar operated Autonomous Vehicle" in National Seminar on Solar Robotics (NSOSR 2015) and on "Robotic Grasping & Jamia Hand", Faculty Development Program on Mechatronics & Robotics Manufacturing Industries, JMI. Organized Faculty Development Program on Mechatronics & Robotics for Manufacturing Industries organized in collaboration with AICTE New Delhi at JMI. Reviewer of books at Oxford and Cambridge University Press and various International Journals. Was General Chair and Session Talk/Chair at International Conference and Exhibition on Building Utilities (ICEBU-2016) held at JMI. Member of Organizing and Advisory Committee at various International and National conferences.



Prof Z. A. Khan

Carrying out research/projects sponsored by UGC on SAP-DRS UGC in Friction Stir Welding and USM and UGC-Infrastructure (DRS) (2012-2017). Was the Chair Technical Session at International Conference, 12th IEEE INDICON 2015 at JMI. Also gave expert lectures in FDP on Innovation and Research Trends in Mechanical and Production, Developments and Challenges in Materials and Manufacturing Processes and A Naval Approach to Tool Insert Design for Sustainable Manufacturing in FDP on Trends in Advance and Sustainable Manufacturing Technology in AMU.



Prof. Abid Haleem

Carrying out sponsored research/projects on UGC-Infrastructure (DRS) (2012-2017) and FIST (2012-2017), Department of Science Technology.



Prof. Mohd Islam

Expert member of Academic Audit Inspection in GGSIPU affiliated colleges Mahavir Swami Institute of Technology (Sonepat), JIMS (Gr. Noida) and Delhi Technical Campus.



Dr. A. F. Sherwani

Gave an expert lecture in the one week Faculty Development program on Thermal Engineering Applications and on Solar Energy Assessment and Application at ITS College.

Faculty Development Program on Mechatronics & Robotics in Manufacturing Industries

(27th Feb - 12th Mar, 2015)

Sponsored by All India Council for Technical Education (AICTE)

Coordinator: Prof. Mohd. Suhaib

Co-Coordinator: Dr. S. M. Muzakir

Faculty development program provides an opportunity to teachers, researchers, scientists, engineers and scholars to exchange and share their experience, new ideas and research results about different aspects of recent advances in the field of Mechatronics and robotics in Industries and discuss the practical challenges encountered and the solutions adopted.

The course was intended for teachers from Mechanical, Electrical, Electronics and Instrumentation departments and industry oriented researchers for up-gradation of knowledge and skill in the areas of Mechatronics & Robotics. Nowadays, with the drastic changes in the industrial scenario and industrial competitiveness, the excellence in manufacturing industries is being recognized as a major force and it has made Mechatronics and robotics an emerging field for students, teachers, and researchers. In the present era of globalization, it has also become an important tool for standardization and quality improvement in every sphere of manufacturing activities in industries. The AICTE Faculty development program was organized to present the state-of-the-art in the areas of mechatronics and robotics and its major application in manufacturing industries.

Eminent professors and senior faculty members of the IIT Delhi, IIT Kanpur, IIT Roorkee and JMI University, as well as experts from industries and research centres handled the various sessions of the programme.

FACULTY ARTICLES

Friction Stir Processing

Prof. Arshad Noor Siddique

FSP is an adaption of Friction Stir Welding (FSW), which was invented at The Welding Institute (TWI) of the United Kingdom in 1991 as a solid state joining technique. The following unique features of FSW can be used as a generic process (FSP) to modify the microstructure and change the composition, at selective locations:

- Low amount of heat generated
- Extensive plastic flow of material
- Very fine grain size in the stirred region
- Healing of flaws and casting porosity
- Random misorientation of grain boundaries in the stirred region
- Mechanical mixing of surface and subsurface layers

FSP is a solid-state, thermo-mechanical, metal processing technique where welding/joining does not occur, instead its sole purpose is to cause severe plastic deformation in metallic alloys to achieve microstructure modification by homogenization and refinement. In FSP, a rotating metal tool with a shoulder and a probe/pin is first plunged into a metallic plate and then translated along the surface of the workpiece as shown in Fig. 1. The heat generated by frictional rubbing of tool shoulder softens the material and creates severe plastic deformation at extremely high strain rates.

Application of FSP:-

FSP has led to several applications for microstructural modification in metallic materials, including superplasticity, surface composite, homogenization of nanophase aluminum alloys and metal matrix composites, and microstructural refinement of cast aluminum alloys.

Superplasticity: FSP is able for superplastic forming of commercial aluminium alloys in fabricating complex parts for automotive and aerospace industries

Surface Composites: FSP is able to make the surface layer of components reinforced by ceramic phases while the bulk of components retain the original composition and structure with higher toughness.

Microstructural Modification: FSP eliminates porosities and can be used as a tool to locally modify the microstructure in regions experiencing high fatigue loading in aluminium casting.

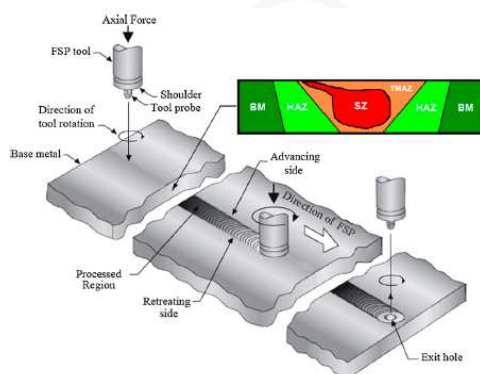


Figure 1: A schematic illustration of FSW/P process

Friction Stir Welding (FSW)

Prof. Zahid A. Khan

FSW is produced by rotating and plunging a non-consumable rotating tool with a specially designed pin and shoulder into the abutting edges of sheets/plates to be joined and the tool is traversed along the line of joint (Fig. 1). The tool serves two primary functions: (a) heating of the workpiece and (b) movement of the material to produce the joint. The heating is accomplished by friction between the tool and the workpiece and plastic deformation takes place. The localized heating softens the material around the pin and combination of tool rotation and translation leads to movement of material from the front of the pin to its back and results in solid state joining. The main factors or variables which affect FSW output response are tool shape and size, tool rotational velocity, welding speed, tool tilt and plunge

Microscopic weld zones in FSW:

FSW joint consists of four micro-structurally distinct regions across the weld as shown in Fig. 2 and are defined below:

1. Heat affected zone (HAZ): In this region, the material experiences a thermal cycle that modifies the microstructure and/or mechanical properties without any plastic deformation.
2. Thermo mechanically affected zone (TMAZ): Here the tool plastically deforms the material.
3. Dynamically recrystallized zone/ weld nugget (WN): This is a central zone of the weld, approximately equal to the size of the rotating pin and possesses greatest heat and deformation.
4. Unaffected material/ base metal (BM): Here the thermal cycle does not create deformation and change in microstructure or mechanical properties.

Application of FSW:-

- Shipping and marine industries: Manufacturing of hulls, offshore accommodations, aluminum extrusions, etc.
- Aerospace industries: Welding of Al alloy fuel tanks for space vehicles, manufacturing of wings, etc.
- Railway industries: Building of container bodies, railway tankers, etc.
- Land transport: Automotive engine chassis, body frames, wheel rims, truck bodies, etc.

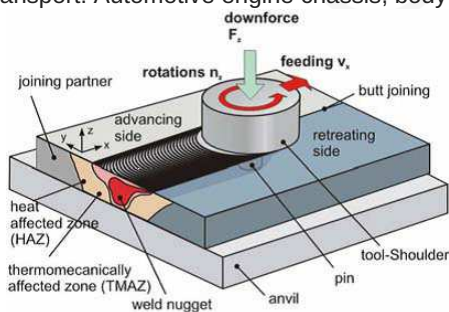


Figure 1: Schematic of FSW process



Figure 2: Different micro-structurally distinct regions in FSW

Types of solar cells and applications

Dr. A. F. Sherwani

Introduction

A solar cell, or photovoltaic cell, is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon. It is a form of photoelectric cell whose electrical characteristics, such as current, voltage, or resistance, vary when exposed to light. Solar cells are the building blocks of photovoltaic modules, known as solar panels.

Types of Solar Cells

Solar cells are typically named after their parent semiconducting material. These materials must have certain characteristics in order to absorb sunlight. Solar cells can be made of one single layer of light absorbing material (single-junction) or multiple physical configurations (multi-junctions) to take advantage of various absorption and charge separation mechanisms. Solar cells can be classified into first, second and third generation cells. Some examples of different types of solar cells that are commercially used or under development phase:

1. Amorphous Silicon Solar Cell (A-Si)
2. Biohybrid Solar Cell
3. Buried Contact Solar Cell

Some Applications of Solar Energy

1. Power plants: In conventional power plants, nonrenewable energy sources are used to boil water and form steam to produce electricity. To convert sunlight into electricity solar panels, photoelectric technologies and thermoelectric technologies etc are used.
2. Homes: Residential appliances can easily use electricity generated through solar power. Besides this solar energy is running solar heater to supply hot water in homes. Through photovoltaic cell installed on the roof of the house energy is captured and stored on batteries to use at night.



PLACEMENTS

The placement scenario at Jamia Millia Islamia for the year 2016-17 has so far been extremely good. Many companies registered with placement cell for mechanical engineering field and recruited many students. Prominent recruiting companies that visited our campus were: - **L&T Engg. Ltd, Siemens Limited, TCS, SuperGas, Trident Group.**

THIS YEAR

The first phase of campus placement saw almost 30 students being placed in various reputed companies such as **Siemens, Larsen and Tubro, Denso, Supergas, Cummins** etc.

A number of students from the department qualified GATE, GRE and CAT with a good score.

Shadab Anwara and **Karan Mittal** have got a call letter from the reputed universities of USA while **Hammad Khalid** got a call from Germany.

Wasim Rehman got selected in the **AFCAT**.

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