VOLUME 3 ISSUE 1

MILES TO NAUTS

FEB 2024

KUMARAGURU college of technology
character is life

Aeromodeling Club
Kumaraguru College of Technology

INNOVATION
DRONUT X1 BY CLEO ROBOTICS

KNOW ABOUT THE **HISTORY** OF **DASSAULT MIRRAGE**

AEROSPACE START UPS
GalaxEye SPACE

LIFE AND SCIENCE
BERNOULLI'S PRINCIPLE
IN DAY TO DAY LIFE

Mr. JOHN STRINGFELLOW
AERO - INVENTOR
ICON OF THE MONTH

INTERVIEW
TECH ENTREPRENEUR
Mr. AJAY KUMAR

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MILES TO NAUTS

JANUARY 2024

Dear Readers,

We are ecstatic and privileged to have made our magazine, "MILES TO NAUTS" reach your hands. We have worked hard, and we've also had some incredible adventures along the way. Our magazine is the brainchild of students who are passionate about aerospace and dream of carving out a career in this challenging yet fascinating field. The magazine seeks to make a link between what people learn and what they practice in daily lives. We have put together facts, experiences, and information in this issue that will benefit anyone who flips the pages. The magazine aims to quench the intellectual thirst of anyone who is trying to constantly educate themselves and to motivate them to strive towards excellence. We hope and believe that you would be as thrilled and excited as we were while working on this magazine and will constantly render your support through your constructive criticism and continued readership.

Hope to see you soon,
Editorial Team, Miles to Nauts .

BEST AIRPLANES

Dassault Mirage III

The Bell X1

DASSUALT MIRAGE III

The French aircraft company Dassault Aviation developed a family of single/dual-seat, single-engine, fighter aircraft called The Dassault Mirage III. On November 25, 1958, it achieved a speed of Mach 2 in horizontal flight and it was the first Western European combat aircraft to exceed this speed.

In response to its successful flight, The Mirage III was produced in large numbers for both the French Air Force and a wide number of export customers. The Mirage III experienced an elongated service life for some time, when engaged in close-range dogfighting, the type remained a fairly maneuverable aircraft and also an effective opponent. Some operators have undertaken extensive modification for this aircraft and upgraded the programs of their flights, such as Project ROSE of the Pakistan Air Force.

THE BELL X-1

The Bell X-1 (Bell Model 44) is a rocket engine-powered aircraft, it was the one designated originally as the XS-1 and built by Bell Aircraft as a joint National Advisory Committee for Aeronautics–U.S. Army Air Forces–U.S. Air Force supersonic research project. Conceived in 1944 and designed and builtin 1945, it achieved a speed of nearly 1,000 miles per hour (1,600 km/h; 870 km) in 1948. The Bell X-1A was built from the same design which had greater fuel capacity and hence longer rocket burning time. In 1954, it exceeded 1,600 miles per hour (2,600 km/h; 1,400 km).

On 14 October 1947, the first manned supersonic flight occurred which is USAF aircraft #46-062, Captain Charles "Chuck" Yeager was the one who piloted it and nicknamed it as Glamorous Glennis for his wife.

When the airplane was drop launched from the B-29 bomb bay, it reached Mach 1.06 (700 miles per hour). Following the complete burnout of the engine, the plane was glided to land on the dry lakebed. Yeager supersonic flight, on 14 October 1947, exceeded Mach 1 in the X-1. From the X-1 program, the three main participants won the National Aeronautics Association Collier Trophy in 1948 for their efforts. Then they were honored at the White House by President Truman. These three were Larry Bell for Bell Aircraft, Captain Yeager for piloting the flights, and John Stack for the contributions of the NACA.

The Bell X-1

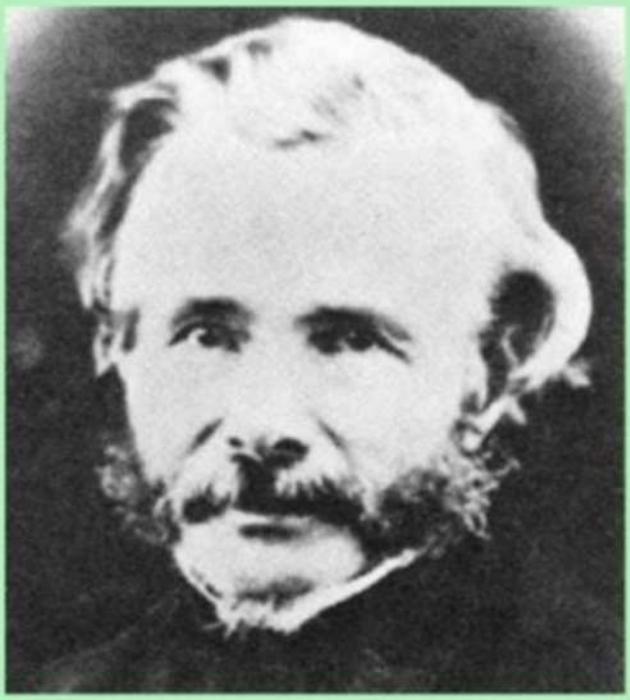
Collier Trophy in 1948

FACTS

An online check-in facility was first introduced by Alaskan Airlines in 1999.

ICON OF THE MONTH

JOHN STRINGFELLOW



John Stringfellow was born in England in the year 1799 and started his life with a flight that paved the way for what was to help others in their reach for the stars. During the Luddite movement in 1829, he moved to Somerset and decided to set up a company.
He continued to make his way up while doing volunteer work as a parish councilor. During those days he spent a lot of time observing the birds and the way they fly. In 1835 John and a friend William Samuel Henson, with a similar interest started working for their passion.

In their first experiments based on the flight of birds, John and William discovered that it took a rook one foot of wingspan to lift half a pound of weight at twenty miles per hour to hold it in the air.

With this knowledge, it was not long before John had constructed a lightweight steam engine to rotate a propeller that could be slung underneath an aero frame made of silk, cane, and string. Stringfellow's engineering skills were so good that he was able to construct a steam engine weighing only twelve ounces, with the paper-thin copper boiler. The first result of String fellow's efforts was the 1848 machine, which was powered by two contra-rotating propellers driven by one of Stringfellow's powerful and lightweight steam engines. The first attempt to fly the 10 feet wingspan machine took place indoors, sadly a lack of proper balance resulted in failure and damage to the machine. The second attempt was a rather wonderful success, for the flying machine, it left a guidewire and flew straight and true for about 30 feet. John Stringfellow and his son Frederick J. Stringfellow collaborated on the experiments and built a few flying machines together and individually. Perhaps, most famous of John Stringfellow's machines were his steam-powered triplane of 1868, which was exhibited at the Crystal Palace in London, England. The superimposition of wing surfaces was an idea which Stringfellow borrowed from Francis Wenham. Except for the lack of a vertical tail surface, it was the very image of an early airplane. It was tested a few times while at the Crystal Palace and did, on occasion, manage to leave the guidewire and fly for a distance.

This very flying machine (the steam engine of which won first prize at the Crystal Palace exhibition) is on display in the Early Flight Gallery of the National Air & Space Museum, Washington, D. C. Frederick J. Stringfellow built his flying machine in 1868 also, steam-powered twin-propeller tandem-winged monoplane, and it was also displayed at the Crystal Palace. John Stringfellow had planned to eventually build a flying machine that would carry him aloft and equipped a building for just that purpose. He died on the 13th of December 1883 unable to complete all his heart desired.

FACTS

The first flight attendants had to weigh less than 115 pounds, be unmarried and be trained nurses.

INTERVIEW

AJAY KUMAR

1. Apart from hobbyists, UAVs and RPAs have been a cup of tea for people in the field of Aviation. Being a software developer, what directed you towards drone technologies?

Our company was founded in 2013. Till 2016, I was much interested in software only, but after visiting one of my clients from Japan, who gifted me a DJI Drone, I started flying it just for a hobby purpose. Then we started R&D on how it works, what kind of software should be there to control it. My first preference was to develop some software for drones, which we are still working on. Later, I thought that why won't we test it in our products, and that's how we entered into the manufacturing of drones.

Ajay Kumar
Founder and Director of CASCA-E-Connect private limited and Institute of Drone Technology.

2. We have water-borne drones, ROV underwater drone fleets, and even drones to test and clean water pollution. How do you see this application of aerial vehicles in the aquatic environment?

Drones can reach those places easily where it will be too much expensive to take other gadgets and manpower to visualize the process. For cinematography itself, people need to drive deep into the sea to film aquatic lives. In those cases, if we use underwater drones, it will be effective and easy. There is a lot of scopes if we integrate the aerial and aquatic drones. The motor used in aerial drones has a different airframe compared to aquatic ones, but with R&D we can find a feasible solution for it because, when we talk about technologies, there is nothing impossible. Amphibious drones have great scope shortly.

3. What is your take on VTOL? Are VTOLs a better solution than multi-copters in the field of logistics?

110% yes. I believe that VTOL is a better solution. We are also working on it and by the end of 2027, we would be able to launch aerial vehicles for both logistic and transport of humans. There are two kinds of logistics. One is where we need a dedicated port, to transport from one place to a designated location. Another one is to deliver products in their doorsteps. Taking VTOL into consideration, delivering in doorsteps can't be implemented because of the different types of residential areas in cities and the lack of enough space for VTOL landing. We have started R&D on that. In multicoptors, we are working on noise cancellation in multirotor, developing landing pads that could be installed in balconies of the buildings, which could take up to a weight of 25kg.

4. Tell us about Eklavya- The survey-grade mapping drone of CASCA-E-Connect.

Eklavya was named after a character Eklavya from the epic Mahabharat where guru Dronacharya denied teaching archery skills to him, yet he worshipped guru Drona's statue and learned it all by himself. Guru Drona asked Eklavya's thumb as guru Dakshina because he wanted Arjun to be the World's best archer. Even after all these shortcomings, Eklavya was one of the best archers of that time. Eklavya was launched for surveillance and security purposes. It has a range of nearly 6 kms and a maximum altitude of 500 m. It is equipped with a camera of 10x zoom and its structure is made as aerodynamically as possible. The same frame could be used for mapping by replacing certain equipment. Eklavya-2 is specially made for mapping. We are conducting accuracy tests and by end of January, we would be the 3rd or 4th company bidding for SoI (Survey Of India). And by December, we will be launching our next start-up, GoDrona.

5. Why is a remote piloting license important? What are the hardships faced by hobbyists in attaining a license?

It is similar to getting a driving car license. If you are not eligible to drive a car, if you don't have that skill, you might end up taking the lives of people. Even if a 1 kg or 2 kg mini drone falls on a running vehicle, it might cause damage to the public. You must be trained enough to bring your drone back, even if any of your control systems fails. That is why it's very important to get a drone pilot license. The hardships are the cost of attaining the license. Initially, we had to renew the license every year, now the duration has been extended for 10 years. After 10 years, you will undergo refreshment training and then you are eligible to fly a drone again.

6. Drone abuse, package stealing, Range, weather impacts are some of the shortcomings in implementing drone deliveries in countries like India. What could be a possible solution for this ?

Because buying the drones and flying them to film something is not the future of drones but logistics and deliveries are. Using facial recognition, QR code-based precise landing can be used to ensure the proper delivery of packages. As far as the weather is concerned, we can deliver the goods from the main hub to a sub-hub and then deliver the goods with the help of conventional methods, which will be somehow effective. Also, we should remember that bad weather conditions impact almost everything like aircraft, helicopters, even in defense. That would remain there because it's nature and we can only avoid it but not overpower it. Making drone deliveries available for all the people in the country won't be an immediate success. Think about the times when mobile phones were launched in India. It was accessible only for premium classes but now it is available to everyone. By effective software solutions and regulations from the government, it could be attained in near future.

7. In borders, terrorist organizations, inter-service intelligence use drones to deploy ammunitions or to attack military bases. Do we have sufficient technologies to counterattack them?

We are having technology and we are upgrading every day. Wherever we have the deployment, they are not having the technology. That's the thing. But it is not like our country is not having the technology. It is not available everywhere. That's the challenge. It may be costly, or it may be too technical to handle, that may be the reason and since drones have been introduced too late in India.

From the last two years, it has gained momentum being active in border areas but still, it can be scanned, and it can be shot down. It is possible to counterattack and also it is effective. We are still working on that to develop the technology. Because if we buy it from other countries, there are many side effects of it. They may retrieve our security loopholes information. So, our government is working on it to get rid of this issue.

8. Where does India stand in drone technology? What are the beneficiaries we will get if we gain supremacy in this field?

As of now, European countries and China are much more effective in drone technology. Also,
we must agree that India is the future for markets because of its population. In the future, if any product is launched and is feasible, our markets are best for it. So, there is a big scope in our country. As of now, India is a booming country if we talk about drones. Once upon a time, we were able to see drones only in cinemas, but now we can see it everywhere. The very first thing is to have our flight controller to gain development. If we use other flight controllers, it is not secure. If we are deploying other stuff like microcomputers along with that, it is secured. But it is best to have our flight controllers. That is where we must develop.

9. There is a huge gap between the business or industry and the educational sector. Your initiative, "Institute of Drone technology" bridges the gap between these two. Tell us about the motto behind IDT.

Institute of Drone technology is just a concept as of now. We are not running it. The main motive behind it is, to impart industrial training. We are working on our software. There are five modules of power software.

We are not disclosing it, but we are making our own complete ecosystem of drones. Where we'll be having our products, services, and maintenance. If we want to deliver our food, we use it to make that work done with apps and software. The delivery system would be ours. So, for anyone who's trying to pursue their career in drone technology, that would be easy for them to get training from this institution and get placed in our company itself. That's the main motive.

10. Nowadays, the application of drones in various fields has been increased and so is the ideas of drone start-ups. What is the success rate of drone start-ups?

If you do not have passion and copying someone's and trying that as a business, not putting proper homework, not having a proper reason where you want to go, definitely in such situation,
any startup will stick at a point of time and it will stop. Any person who is starting a startup must have a proper reason that what actually they are trying to do and also what is their idea. There
must be something unique in what they do. Success depends on the confidence they have in what they do and the proper reason. Also, they must do proper homework for that. If they follow these, definitely they'll succeed.

FACTS

Out of the total number of airports in the world, one-third is located in the U.S.

INNOVATION IN AVIATION

DRONUT X1

Dronut X1 is the future of Unmanned aerial flight. Inspired by the shape of a DONUT.It was designed and manufactured by CLEO ROBOTICS, USA. Dronut uses different flying technology other than conventional drones. It costs $9800.

DRONUT X1

Dronut X1 DESIGN

Dronut X1 DESIGN

Dronut X1 is the world's 1st bi-rotor ducted drone with no exposed propellers in it. Dronut X1 can easily fit in our palm since it is the smallest in class and safest ever. It is made from strong but light carbon fiber material. Weight is under 1 pound and measuring length is 6.5 inches by 4 inches.

Dronut X1 comes with a powerful Qualcomm Snapdragon processor. And It is powered by their patented thrust vectoring technology. Dronut X1 contains 3D LIDAR, 4K resolution camera, for precise positioning they use global shutter camera technology. It is also fitted with several gyroscopes onboard and other sensors and LED lights for low and no light environments.

It Weighs about 440gms and has a maximum speed of 4m/s with a flight time of 12 mins. With a Charge time of 40 mins, it can be operated using an Android phone. It comes with a rechargeable and replaceable battery.

It has a 4k camera along with LIDAR both with higher stream resolution, stream frame rate and field of view. Additionally it has a Hovering accuracy of 0.1m. The internet of things contributes to the easy handling of the drone. Hidden propellers with proximity sensors help in detection of obstacles. The small size and LIDAR allows the drone to access dark, GPS denied and crowded areas. The facile design increases the amount of customers.

FACTS

The North Maeric X-15 is the fastest supersonic airplane. It can fly at a speed of 6.7 Mach (7,200 km/h). In other words, it can fly at 6.7 times the speed of sound.

AEROSPACE STARTUP

FACTS

QANTAS, the name for Australia's national airline, was originally an acronym for Queensland and Northern Territories Air Service.

Avian Aerospace

Avian Aerospace Pvt Ltd - Their work is based on developing advanced autonomous vehicles and providing cutting-edge solutions for challenging industrial problems. They were established in the year 2019.

They started Avian Aerospace with one focus: to develop a company that can compete with large firms while operating with the flexibility and customer focus of a small, family-run business.

They call it small business values with a big business approach. Today, 75 percent of their business comes from a core group of legacy clients: a testament client to their commitment to building strong, long-term working relationships. They are providing the best drone services within their client's budgets and time frames without sacrificing quality and workmanship. They work with you on all of your innovative ideas. They also keep you updated on the latest drone technologies . They design, engineer, consult and make products for the Real Estate and Construction, Wind and Solar Energy, Railways, and Industrial sectors.

GalaxEye Space Solution pvt Ltd

GalaxEye Space Solution pvt Ltd

GalaxEye is a space technological startup initiated in 2020 by a team of 5 alumni cum students of IIT Madras. These 5 had previously worked together in a team Avishkar Hyperloop and participated in a competition that was organized by Elon Musk's aerospace manufacturer and space transportation service company SpaceX and was the only Asian finalists. They were given the work to build the future of satellite Image Acquisition globally. Now they are working on making an efficient satellite constellation. This will give us a new dataset at a high cadence and high resolution. Each satellite will carry a hybrid sensor that they have innovated. They are trying to combine the optical sensor and radar sensors to derive the third type, which will be their 'intellectual property'. They named the hybrid sensor "Drishti". They are aiming to launch their first satellite by early 2023. They have raised one pre-seed round funding, from Speciale Invest, A Venture Capital Firm. GalaxEye is an IIT Madras incubated startup. Their Headquarters is in Chennai, Tamil Nadu.

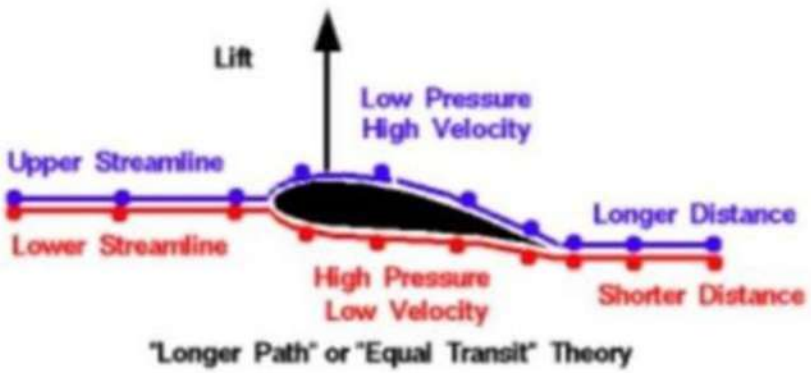
LIFE AND SCIENCE

Bernoulli's Principle

Bernoulli's principle states that in a steady flow, the total energy associated with the fluid flow remains constant. The total energy can be the summation of Pressure energy, Kinetic Energy, and Gravitational Energy. It was derived from the law of conservation of Energy.

$$P+1/2\ \rho v^2+\ \rho gh=\text{Constant}$$

Where P is the pressure energy,
the term $1/2\ \rho v^2+$ is Kinetic energy per unit volume and
the term ρgh is potential energy per unit volume.

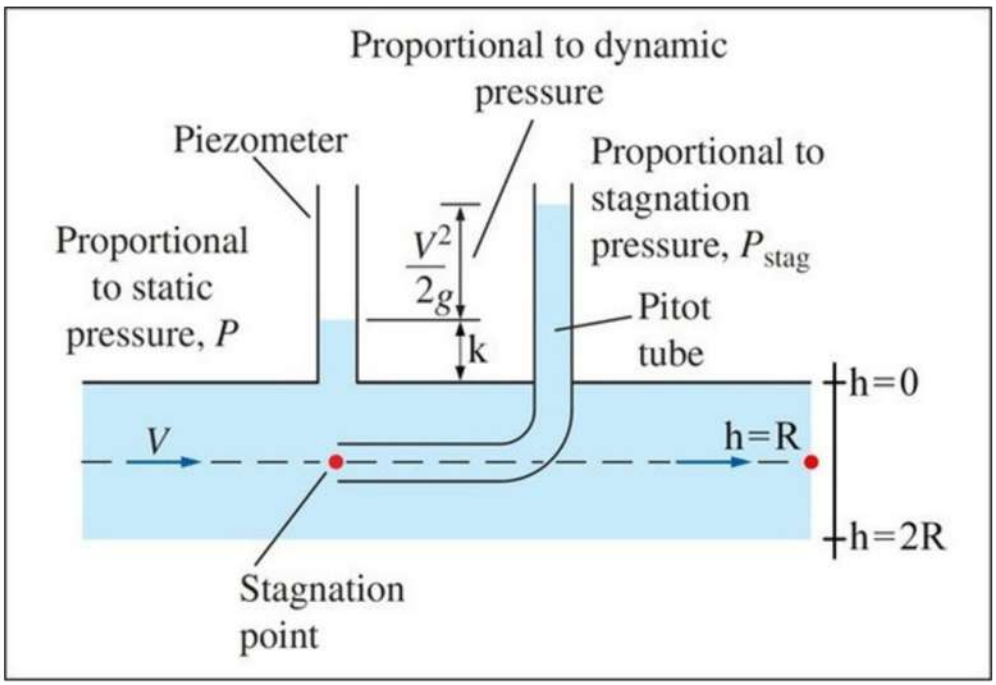


Bernoulli's principle

One of the main applications of Bernoulli's principle is Pitot Tube.
A pitot tube is an instrument used in aircrafts for measuring the pressure on the aircrafts with the help of fluid flow velocity. In aircrafts, it is used to protrude outwards facing the fluid flow. It is a glass tube bent at 90°.

The Bernoulli equation can also be defined in terms of pressure as a combination of static and dynamic pressure. Pitot pressure is equal to the summation of static and dynamic pressure. The pitot tube is connected with an airspeed indicator to indicate the speed of the aircraft to the pilot. The static pressure can be obtained from the static ports present in the pitot tube, whereas the dynamic pressure can be determined with the diaphragm in the setup. The movement of the diaphragm determines the dynamic pressure.

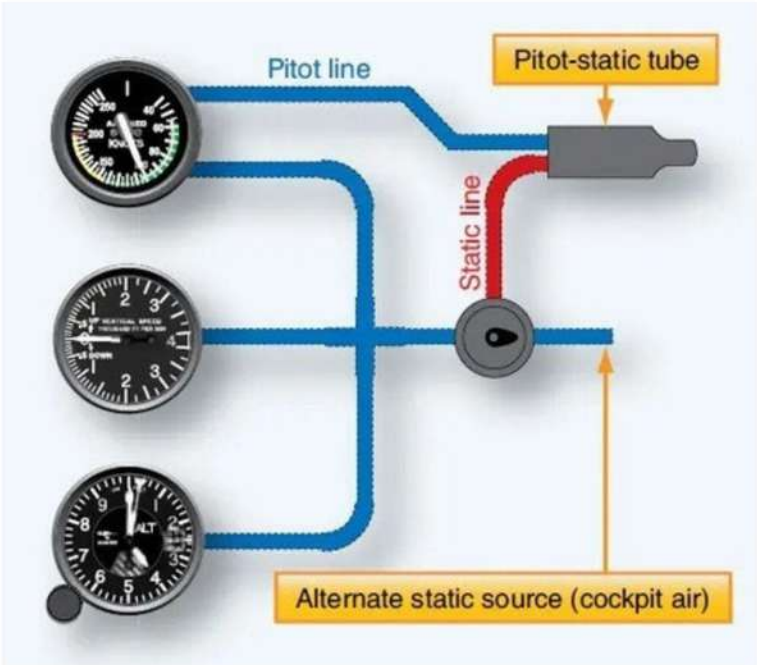
Pitot Pressure = static pressure + Dynamic pressure



Pitot Tube

FACTS

There are many kinds of dirigible, such as blimps, hindenburg, and zeppelins. The Hindenburg is the most famous of dirigible which was landing on May 6, 1937. The others one is the Goodyear Blimp. It was usually used in the sporting events.



Pitot-static pressure instruments

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MILES TO NAUTS

HOD's NOTE :

Dr. M SENTHIL KUMAR

I am delighted to note that the Students Association of Department of Aeronautical Engineering and the Aeromodelling Club have taken initiatives of releasing Department Technical Magazine "Miles to Nauts". The magazine will be platform for the students to present their findings, collection of technical information, current affairs in the field of Aeronautical, Aerospace and Allied Engineering. Releasing of magazine will be helpful in many ways such as dissemination of knowledge to all the students, networking , communication, leadership skills, updates on activities of the department etc. I wish the technical magazine should carry many more useful information beneficial to all the students and provide a new dimension of growth to the department.

STAFF COORDINATOR's NOTE :

Mr.DARSHAN KUMAR.J

Every dreamer is not necessarily a doer and every doer is not always a dreamer. Life gives us numerous chances and opportunities to begin fresh and flourish. These happy thoughts shall brighten up each mind reading the journal. Have fun combining intellect and writing, enjoy every moment of this journey.Best wishes for your new initiative.Let our journal reach from one mile to 1000s of nauts through your mighty words.Let this endeavour touch the sky with glory .

VISION OF THE INSTITUTE

The vision of the college is to become a technical university of International Standards through continuous improvement.

MISSION OF THE INSTITUTE

Kumaraguru College of Technology (KCT) is committed to providing quality Education and Training in Engineering and Technology to prepare students for life and work equipping them to contribute to the technological, economic and social development of India. The College pursues excellence in providing training to develop a sense of professional responsibility, social and cultural awareness and set students on the path to leadership.

VISION OF THE DEPARTMENT

To attain excellence and global reputation in Aeronautical Engineering Education and Research.

MISSION OF THE DEPARTMENT

- The department is committed to provide quality education in Aeronautical Engineering to students to build their career and do quality research and thus contribute to the field of Aviation and Aerospace.
- The department aims to prepare students for their higher studies and research to contribute to the advanced technological needs of Aeronautical engineering.
- Encourage faculty to update their knowledge and teaching-learning process through continuous learning.
- Undertake inter-disciplinary research to contribute and support the industry.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Program Educational Objectives of Aeronautical Engineering Undergraduate Program are to prepare the students:

I. To pursue a successful profession in leading organizations.

II. To pursue postgraduate degrees and conduct research at leading technological universities to contribute to the advancement in the field of Aviation and Aerospace industries.

III. To continue their professional development by utilizing educational and career building opportunities through their employer, educational institutions, or professional bodies.

PROGRAM OUTCOMES (POs)

Graduates of the Aeronautical Engineering Undergraduate Program should have the ability to:

PO 1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates of the Aeronautical Engineering Undergraduate Program will have the ability to:

PSO 1: Apply concepts and principles of Aerodynamics, Aircraft Structures, Aircraft Propulsion, Aerospace Materials, UAV and Avionics to provide solutions to critical industrial problems.

PSO 2: Use the software packages in the design, manufacturing, testing and maintenance of aeronautical and aerospace-based components and systems