Department of

Electrical and Electronics Engineering

THUNDER TRENDS

Technical Magazine

July 2022 – Dec 2022 Volume : XI

Chief Advisor

Dr. G.Venkateswarlu

Chief Editor

N. Shanthi Kumari

Student Editors

Mohammad Yunus, IV EEE

P. Sri Vidhya, III EEE

Raghu Maniswar, II EEE

NARAYANA ENGINEERING COLLEGE :: NELLORE

(AUTONOMOUS)

Vision of the Institute

To be one of the nation's premier Institutions for Technical and Management Education and a key contributor for Technological and Socio-economic Development of the Nation.

Mission of the Institute

- To produce technically competent Engineers and Managers by maintaining high academic standards, world class infrastructure and core instructions.
- To enhance innovative skills and multi disciplinary approach of students through well experienced faculty and industry interactions.
- To inculcate global perspective and attitude of students to face real world challenges by developing leadership qualities, lifelong learning abilities and ethical values.

Vision of the Department

To impart knowledge in the field of Electrical and Electronics Engineering to meet the technical challenges of industry and society with strong innovative skills, leadership qualities and ethics.

Mission of the Department

- To provide standard training and effective teaching learning process to the students by using the state-of-the-art laboratories, core instruction and efficient faculty.
- To enhance competent, innovative and technical skills amongst the students through training programs by industry and external participation.
- To inculcate leadership qualities, ethical values and lifelong learning skills in learners to serve the society and nation for overall development through value based education.

Program Educational Objectives (PEOs)

Programme Educational Objectives (PEOs) of B.Tech (Electrical and Electronics Engineering) program are: Within few years of graduation, the graduates will

PEO-1: To solve composite problems using mathematics, basic sciences and engineering principles in the domains of testing, design and manufacturing.

PEO-2: To achieve higher positions in their profession by demonstrating leadership qualities, research and innovative abilities.

PEO-3: To contribute in the field of Electrical and Electronics Engineering to finding solutions for societal problems through their lifelong learning skills and ethical values.

Program Outcomes (POs)

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

PO-2: Problem analysis: 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/development of solutions: 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: Conduct investigations of complex problems: 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: Modern tool usage: 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: The engineer and society: 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: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

PO-10: Communication: 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: Project management and finance: 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: Life-long learning: 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)

On completion of the B.Tech. (Electrical and Electronics Engineering) degree, the graduates will be able to

PSO-1: Provide alternate solutions to address the problems with specific requirements in the field of Electrical and Electronics Engineering.

PSO-2: be ready to work professionally in relevant industries like power systems, control systems and software industries.

The Drone Acharya

IN the first week of January 2020, two MQ-9 Reaper drones took off from an airbase in Kuwait and travelled 600 km to hover over Baghdad international airport. Seconds after

the green signal, the drones fired missiles to knock out two cars that were leaving the airport. The attack killed Maj. Gen. Qasem Soleimani, head of Iran's Quds Force, and Abu Mahdi al-Muhandis, deputy chairman of Hashd al-Shaabi (Popular Mobilisation Forces), an Iran-backed militia in Iraq. The Reapers' precision stunned the world.

An unmanned combat aerial vehicle (UCAV), also known as a combat drone, colloquially shortened as drone or battlefield UAV, is an unmanned aerial vehicle (UAV) that is used for intelligence, surveillance, target acquisition, and reconnaissance and carries aircraft ordnance such as missiles, ATGMs, and/or bombs in hardpoints for drone strikes.

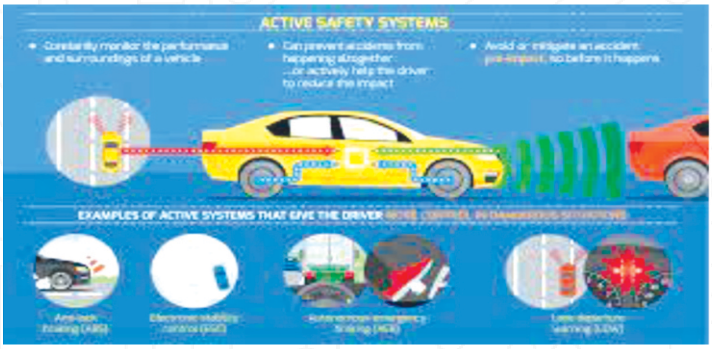
These drones are usually under real-time human control, with varying levels of autonomy. (4) Unlike unmanned surveillance and reconnaissance aerial vehicles, UCAVs are used for both drone strikes and battlefield intelligence. Aircraft of this type have no onboard human pilot. (5) As the operator runs the vehicle from a remote terminal, equipment necessary for a human pilot is not needed, resulting in a lower weight and a smaller size than a manned aircraft. Many countries have operational domestic UCAVs, and many more have imported armed drones or are in the process of developing them.

PUVVALA DEEKSHITHA
Roll No. 20711A0236, III EEE

Automotive safety

I get hundreds of queries every month across India about all types of cars that people want to buy—from those who ask about budget entry level cars to those who don't consider the price at all. Over the years, I have seen various trends emerge.

Whether it is a shift towards a certain body style or the desirability of certain features, I know what people are interested in and what they finally buy. Over the past six months or so, there has been a big increase in queries about, firstly, electric cars and, secondly, how safe the cars in question are. While safety features have been on customers' minds for many years now, there used to be a big disconnect between the actual purchase decision and concerns about safety. This is beginning to change. The final purchase decision for more people is increasingly being influenced by safety features and ratings. But many are still confused about what constitutes a safe car and how to



Automotive safety is the study and practice of design, construction, equipment and regulation to minimize the occurrence and consequences of traffic collisions involving motor vehicles. Road traffic safety more broadly includes roadway design. One of the first formal academic studies into improving motor vehicle safety was by Cornell Aeronautical Laboratory of Buffalo, New York. The main conclusion of their extensive report is the crucial importance of seat belts and padded dashboards. However, the primary vector of traffic-related deaths and injuries is the disproportionate mass and velocity of an automobile compared to that of the predominant victim, the pedestrian.

According to the World Health Organization (WHO), 80% of cars sold in the world are not compliant with main safety standards. Only 40 countries have adopted the full set of the seven most important regulations for car safety. In the United States, a pedestrian is injured by a motor vehicle every 8 minutes, and are 1.5 times more likely than a vehicle's occupants to be killed in a motor vehicle crash per outing.

Improvements in roadway and motor vehicle designs have steadily reduced injury and death rates in all first world countries. Nevertheless, auto collisions are the leading cause of injury-related deaths, an estimated total of 1.2 million in 2004, or 25% of the total from all causes. Of those killed by autos, nearly two-thirds are pedestrians. Risk compensation theory has been used in arguments against safety devices, regulations and modifications of vehicles despite the efficacy of saving lives.

SHAIK MOHASINA
Roll No.20711A0244, III EEE

Hunt for a jet engine

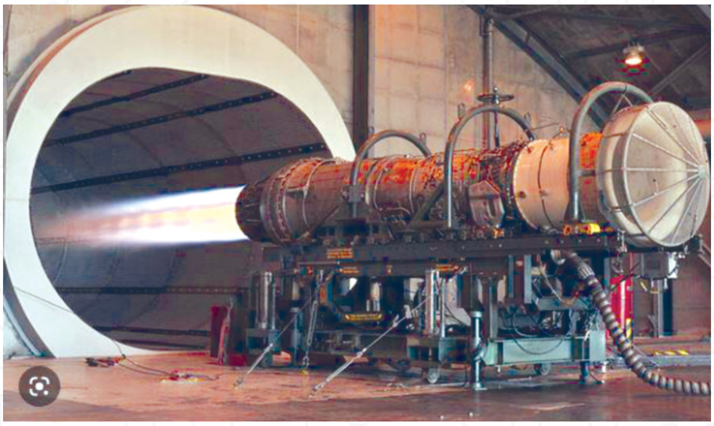
Can India find partners to develop indigenous engines for its fighter jets? Global jet engine manufacturers are circling Delhi, drawn by the prospect of massive purchases There's a sudden roar of jet engines in the air. What is fuelling it is India's airpower expansion plan and a pressing need for engines of required power for its homemade fighters.

THERE'S A SUDDEN ROAR of jet engines in the air. What is fuelling it is India's airpower expansion plan and a pressing need for engines of required power for its homemade fighters. Last week, US defence aircraft major Boeing announced in New Delhi that the company anticipates business worth $3.6 billion, benefitting the Indian aerospace and defence industry over the next 10 years, with the F/ A-18 Super Hornet as India's next naval carrier-based fighter. French major Dassault Aviation has pitched its Rafale-M jets against the US's Super Hornet. In the first week of July, Olivier Andries, CEO of France's Safran Group, met defence minister Rajnath Singh in New Delhi and apprised him of his company's long-term goal for the joint development and production of advanced jet engines.

Safran—one of the major original equipment manufacturers (OEM) of military and commercial jet engines in the world—makes engines for the Rafale jets. Its Snecma M88 engine, used in Indian Rafales, has a maximum thrust of about 75kN (kilonewtons).

The Indian Air Force (IAF) has opened its hunt for 114 multi-role fighters while the Navy needs approximately 30 carrier-based fighter jets. Their combined value? Some $20 billion. The IAF also requires close to 600 India-made fighters for its fleet, all of which would require over 2,300 engines, assuming a spare ratio of 1.5 engines/ installed engine. Moreover, the Sukhoi fleet of 282 jets will also go in for engine retrofit in the years to come.

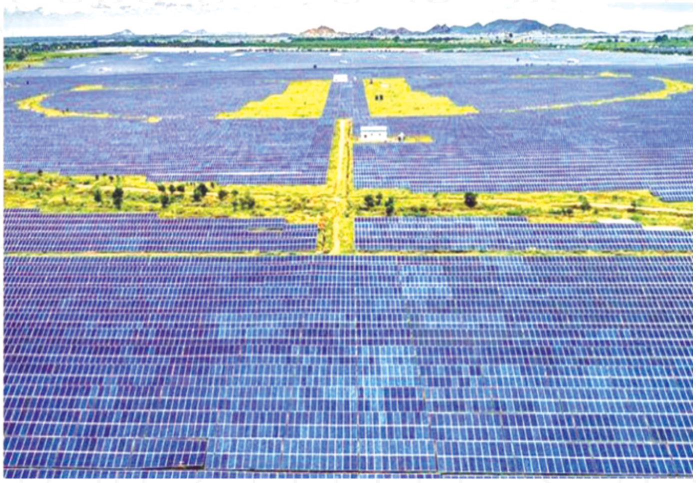
Importing all these engines will involve a significant spend of India's foreign exchange.



VADLA DHARMIKA
Roll No.20711A0257, III EEE

Energy | Power surge

Though our power-generating capacity has made a quantum leap, so has demand, causing a supply lag The Indian power sector has come a long way since Independence when access to electricity was restricted to a few urban areas with almost no supply in rural areas. The country has taken big strides since then—both in the installed electricitygenerating capacity as well as transmission & distribution (T&D). From a meagre 1,362 MW in 1947, the total power-generating capacity has increased to 403,761 MW at the end of June 2022.



Power surges are just as the name suggests: surges of electrical power that arehigher than normal. Typical voltage levels for household appliances andelectronics are between 110 volts and 220 volts in most countries, with the UnitedStates operating on 120 volts on average. When significantly more voltage comesthrough wires into devices, it's known as a power surge. These surges can be smallor large, resulting in reduced performance or possibly damaging plugged-indevices.

SYED GOUSE
Roll No.21715A0206, III EEE

Atomic energy | Fission feats

India's atomic journey has enabled nuclear deterrence but failed to deliver on the promise of an energy revolution

India made an early commitment to nuclear power by enacting the Atomic Energy Act and setting up the Atomic Energy Commission (AEC) in 1948 with Homi J. Bhabha as chairman. Six years later, the Department of Atomic Energy (DAE) was created under the direct charge of Prime Minister Jawaharlal Nehru to work towards ensuring nuclear security as well as generation of electricity from the thorium and uranium available in India.

Atomic energy or energy of atoms is energy carried by atoms. The term originated in 1903 when Ernest Rutherford began to speak of the possibility of atomic energy.(1) H. G. Wells popularized the phrase "splitting the atom",(citation needed) before discovery of the atomic nucleus.

Atomic energy includes:

- Nuclear binding energy, the energy required to split a nucleus of an atom.
- Nuclear potential energy, the potential energy of the particles inside an atomic nucleus.
- Nuclear reaction, a process in which nuclei or nuclear particles interact, resulting in products different from the initial ones; see also nuclear fission and nuclear fusion.
- Radioactive decay, the set of various processes by which unstable atomic nuclei (nuclides) emit subatomic particles.
- The energy of inter-atomic or chemical bonds, which holds atoms together in compounds.

Atomic energy is the source of nuclear power, which uses sustained nuclear fission to generate heat and electricity. It is also the source of the explosive force of an atomic bomb, the set of various processes by which unstable atomic nuclei (nuclides) emit subatomic particles. The energy of inter-atomic or chemical bonds, which holds atoms together in compounds.

Atomic energy is the source of nuclear power, which uses sustained nuclear fission to generate heat and electricity. It is also the source of the explosive force of an atomic bomb.

VADLA DEVENDRACHARI
Roll No. 20711A0256, III EEE

WAY TO EFFICIENT AND SAFE METERING

In a vast country like India, smart metering is absolutely essential to ensure efficient transmission and distribution while monitoring energy usage and efficiency. In this COVID-era, we would have been much benefited, if we could complete 100% installation of smart meters before March 2020. However, as it could not be done, in the coming days we have to accelerate our pace of smart meter installation – so that we remain ready to counter such situations in future... -P.K. Chatterjee (PK).

Energy metering is the most important pillar of the power business, and in the last two decades or so several changes or transformations have been witnessed in this field. In today's situation, when the COVID–19 pandemic protocols are suggesting social distancing and staying at home as far as possible, physically checking energy meters at each and every corner of a country is not only difficult but also apparently impossible. However, because of compulsory stay-at-home situation domestic energy consumption is increasing at most of the individual consumer's residence. With such backdrop, there cannot be any ambiguity but to opt for Smart Metering.

Smart Meters : According to a nice definition from Wikipedia, "A smart meter is an electronic device that records information such as consumption of electric energy, voltage levels, current and power factor. Smart meters communicate the information to the consumer for greater clarity of consumption behaviour, and electricity suppliers for system monitoring and customer billing.

Smart meters typically record energy near real-time, and report regularly, at short intervals throughout the day.

Smart meters enable two-way communication between the meter and the central system. Such an Advanced Metering Infrastructure (AMI) differs from Automatic Meter Reading (AMR) in that it enables two-way communication between the meter and the supplier.

Communications from the meter to the network may be wireless, or via fixed wired connections such as Power Line Carrier (PLC). Wireless communication options in common use include cellular communications, Wi-Fi (readily available), wireless ad hoc networks over Wi-Fi, wireless mesh networks, Low Power Long-Range wireless (LoRa), Wize (high radio penetration rate, open, using the frequency 169 MHz) Zigbee (low power, low data rate wireless) and Wi-SUN (Smart Utility Networks)."

Development of Smart Meters: Wikipedia also presents, "In 1972, Theodore Paraskevakos, while working with Boeing in Huntsville, Alabama, developed a sensor monitoring system that used digital transmission for security, fire and medical alarm systems as well as meter reading capabilities. This technology was a spin-off from the automatic telephone line identification system, now known as Caller ID.

Market Growth of Smart Meters: Before the world slipped into the dark era of COVID – 19, the usefulness of smart meters was realised by the electrical energy measuring experts in almost all countries. Thus, its commercial production also was gaining momentum. However, the COVID-era has accelerated the pace of its growing demand.

As per the latest finding of Research And Markets, "Among the many benefits of smart meters are monitoring of electric system in real time & provision of responsive data for balancing electric loads; reduction of waste by forecasting energy demand more efficiently.

The advanced metering infrastructure holds several merits over conventional metering and supports bi-directional communication. Smart meters are increasingly replacing traditional electric meters, mainly in developed countries, and enabling power system to undergo notable transformation in terms of efficiency and reliability.

These devices provide utilities with the opportunity to exploit data to ensure efficient use of energy, reduce wastage, and minimize human intervention. Smart meteringdevices in homes deliver accurate readings and eliminate incorrect billing.

GUVVALA PRASANTHI
Roll No. 19711A0214, IV EEE

Energy Storage

A significant and essential trend this year is energy storage. Those who work in energy space believe it's a critical component to improve and evolve the integrity of the grid. Consumers want more control over their energy, but the current system doesn't allow for this type of movement on a mass scale. The Federal Energy Regulatory Commission (FERC) has already implemented a "Pay-for-Performance" pricing structure to incentivize energy storage technologies development. This is one of the main ways that the U.S. energy grid will bring stability, and it has the potential to become a cost-efficient solution on a commercial scale.

In the 20th century grid, electrical power was largely generated by burning fossil fuel. When less power was required, less fuel was burned.(4) Hydropower, a mechanical energy storage method, is the most widely adopted mechanical energy storage, and has been in use for centuries. Large hydropower dams have been energy storage sites for more than one hundred years.

Concerns with air pollution, energy imports, and global warming have spawned the growth of renewable energy such as solar and wind power.(4) Wind power is uncontrolled and may be generating at a time when no additional power is needed. Solar power varies with cloud cover and at best is only available during daylight hours, while demand often peaks after sunset (see duck curve). Interest in storing power from these intermittent sources grows as the renewable energy industry begins to generate a larger fraction of overall energy consumption.

Off grid electrical use was a niche market in the 20th century, but in the 21st century, it has expanded. Portable devices are in use all over the world. Solar panels are now common in the rural settings worldwide. Access to electricity is now a question of economics and financial viability, and not solely on technical aspects. Electric vehicles are gradually replacing combustion-engine vehicles. However, powering long-distance transportation without burning fuel remains in development.

Pumped-storage hydroelectricity is by far the largest storage technology used globally. However, the usage of conventional pumped-hydro storage is limited because it requires terrain with elevation differences and also has a very high land use for relatively small power. In locations without suitable natural geography, underground pumped-hydro storage could also be used.

LEBURU HARI CHARAN
Roll No. 19711A0222, IV EEE