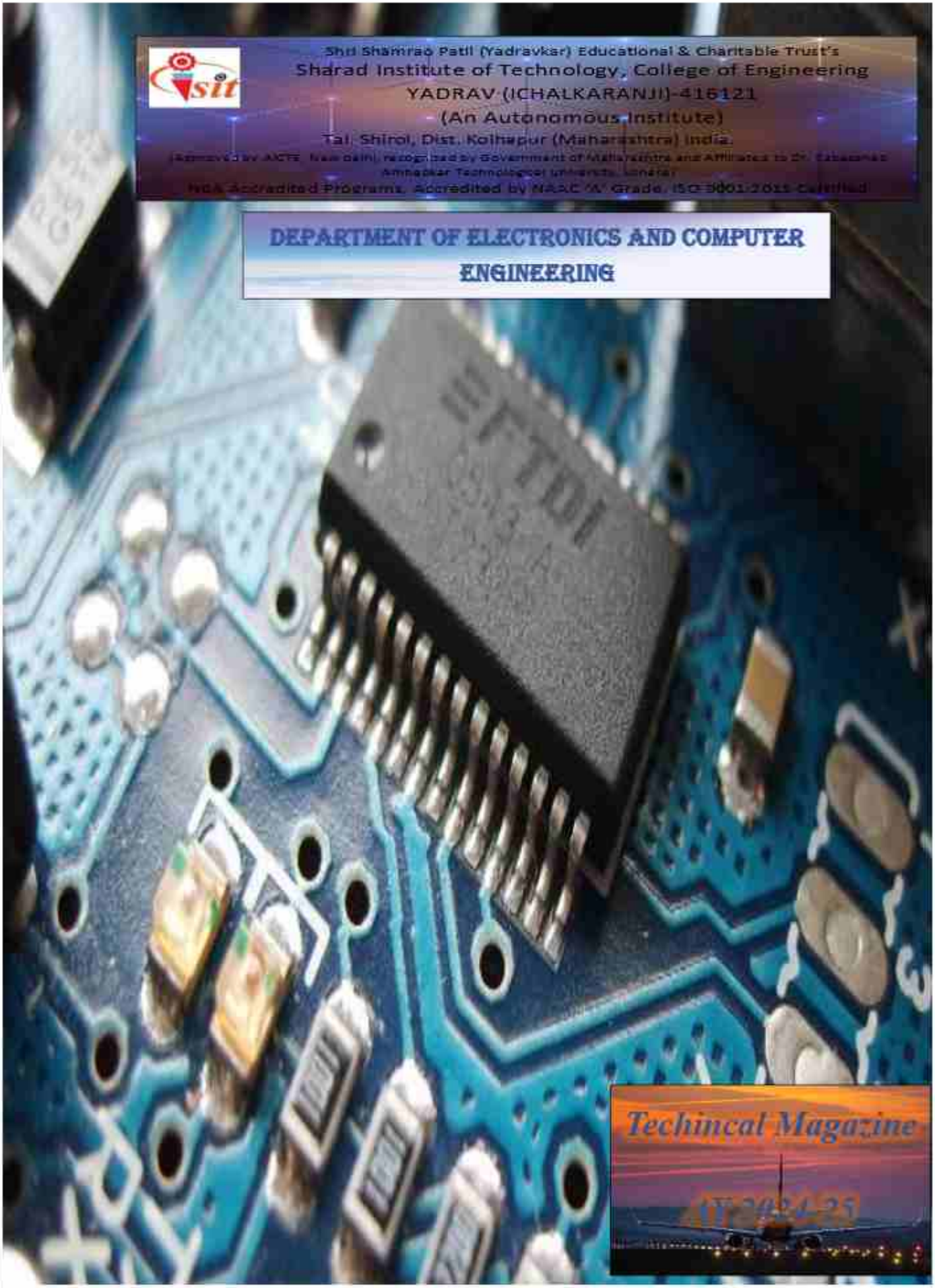

Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's
Sharad Institute of Technology, College of Engineering
YADRAV-(ICHALKARANJI)-416121
(An Autonomous Institute)
Tal. Shirol, Dist. Kolhapur (Maharashtra) India.
(Approved by AICTE, New Delhi, recognized by Government of Maharashtra and Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere)
NBA Accredited Programs, Accredited by NAAC 'A' Grade, ISO 9001:2015 Certified
DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING
Techincal Magazine

Department of Electronics and Computer Engineering

Welcome to the Department of Electronics and Computer Engineering, as we stand at the intersection of rapid technological advancement and unprecedented connectivity, the field of Electronics and Computer Engineering (ECE) continues to be a driving force in shaping our world. From the development of sophisticated artificial intelligence algorithms to the creation of cutting-edge semiconductor devices, ECE professionals are at the forefront of innovation, pushing the boundaries of what is possible.

In this issue, we explore the latest breakthroughs and trends that are redefining the landscape of electronics and computer engineering. Our featured articles delve into the emerging technologies transforming industries, such as the Internet of Things (IoT), quantum computing, and 5G communications. We highlight how these advancements are not only enhancing our daily lives but also paving the way for new business models and economic opportunities.

We also take a closer look at the ethical considerations and societal impacts of these technologies. As engineers, it is our responsibility to ensure that our innovations contribute to the greater good, promoting sustainability, security, and inclusivity. Through thoughtful design and careful implementation, we can address the challenges posed by issues such as data privacy, cyber threats, and environmental sustainability.

As we navigate this exciting era, collaboration and continuous learning remain key. We encourage our readers to engage with the diverse perspectives and ideas presented in this magazine, and to participate in the vibrant discussions that will shape the future of ECE. Together, we can harness the power of technology to build a smarter, more connected, and more resilient world.

Thank you for joining us on this journey. We hope this issue ignites your passion for innovation and inspires you to push the boundaries of what is possible in Electronics and Computer Engineering.

Happy reading!

MESSAGE FROM HON. EXECUTIVE DIRECTOR

I am very happy to know that Sharad Institute of Technology is bringing out the of technical Magazine for the year 2023- 2024. Sharad Institute of Technology has made all efforts towards the core areas of excellence in latest multidisciplinary technology with aiding efforts. I am sure that this technical magazine play important role to update students with latest technologies in the globe. Wish you all the best.

Shri. Anil Bagane
Executive Director
SITCoE, Yadrav

MESSAGE FROM PRINCIPAL

I am extremely pleasant to know that Electronics and Computer Engineering department publish technical magazine. I congratulate HoD, faculty and students of Electronics and Computer Engineering department to publish of technical magazine. I appreciate all of you for working together as a team.

I wish a very best of luck to the team of Technical Magazine.

Dr. S. A. Khot
Principal
SITCoE, Yadrav

MESSAGE FROM HOD

Greetings to all readers,

As the Head of the Department of Electronics and Computer Engineering, I am delighted to welcome you to this latest edition of our technical magazine. Our field stands as a cornerstone of modern technology, influencing every aspect of contemporary life, from healthcare and transportation to communication and entertainment. It is within these pages that we celebrate the remarkable strides our students, faculty, and industry partners are making in advancing this dynamic discipline.

As you peruse this magazine, I hope you find inspiration in the stories of innovation, dedication, and collaboration. I encourage you to engage with the content, participate in the ongoing discussions, and share your thoughts and ideas. Together, we can continue to drive progress and make a meaningful impact through the field of Electronics and Computer Engineering.

Thank you for your continued support and interest in our department.

Warm regards,

Dr. P. S. Patil
Head of E & C Dept.
SITCoE, Yadrav

MESSAGE FROM EDITOR

It is my pleasure and great privilege to publish technical magazine. Technical magazine be a snapshot of the various multidisciplinary technologies associated with Electronics and Computer Engineering. We would like to place on record our gratitude and heartfelt thanks to all student and faculties from Electronics and Computer department, those who have contributed to make this effort in a successful one.

We profusely thank our Hon. Executive Director Shri. Anil Bagane, Principal Dr. S. A. Khot and head of Electronics and Computer engineering department Dr.P.S.Patil for giving support and encouragement and a free hand in this Endeavour.

Ms. P.D Ghate
Assistant Professor
E & C Engineering Department

Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's
Sharad Institute of Technology, College of Engineering
YADRAV (ICHALKARANJI)-416121
(An Autonomous Institute)
Tal. Shirol, Dist. Kolhapur (Maharashtra) India.
(Approved by AICTE, New delhi, recognized by Government of Maharashtra and Affilliated to Dr. Babasaheb Ambedkar Technological university, Lonere)
NBA Accredited Programs, Accredited by NAAC 'A' Grade, ISO 9001:2015 Certified

VISION

"To be a centre of excellence in Electronics & Computer engineering education to prepare professionally competent engineers with lifelong learning attitude for the accomplishment of ever-growing needs of society."

MISSION

To prepare technically and professionally competent engineers by imparting quality education through effective teaching learning methodologies and providing stimulating environment for research and innovation.

To develop professional skills and right attitude in students that will help them to succeed and progress in their personal and professional carrier.

To imbibe moral and ethical values in students with concern to society and environment.

PROGRAM EDUCATIONAL OBJECTIVES

Graduates will

1. Acquire fundamental knowledge of Electronics and Computer Engineering to design and develop new ideas to solve real time problems.
2. Excel in professional carrier by applying recent technologies & skills in Electronics and Computer Engineering field.
3. Exhibit leadership qualities, effective communication skills & lifelong learning attitude to work efficiently with industry by promoting appropriate practices and sense of social responsibility.

PROGRAM SPECIFIC OUTCOMES

Students will be able to

1. Demonstrate proficiency in use of software and hardware required to develop solution in the field of Electronics and Computer Engineering.
2. Ability to design and develop analog, digital, embedded systems and computer algorithms using various learning platforms.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.(WK1 to WK4)

3. Design/development of solutions: Design creative solutions for complex engineering problems and design/develop system/components/processes to meet the identified needs with consideration for the public health and safety,whole-life cost, net zero carbon, culture, society and environmental as required.(WK5)

4. Conduct investigations of complex problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling,analysis and interpretation of data to provide valid conclusions.(WK8).

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling recognizing their limitations to solve complex engineering problems.(WK2 and WK6).

6. The Engineer and The world: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health,safety,legal framework,culture and environment.(WK1,WK5 and WK7)

7. Ethics: Apply ethical principles and commit to professional ethics, human values,diversity and inclusion;adhere to national and international laws.

8. Individual and collaborative team work: Function effectively as an individual, and as a member or leader in diverse teams/ multidisciplinary teams.

9. Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

10. Project management and finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. Life-long learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptibility to new and emerging technologies and iii) critical thinking in the broadest context of technological change.(WK8)

INDEX

1. Sunita Williams' Historic Return

After nearly nine months in space, astronauts Sunita Williams and Butch Wilmore are set to return on March 18, 2025, aboard SpaceX's Crew Dragon. Initially launched on Boeing's Starliner, technical failures extended their stay. NASA's live coverage will document this historic return, highlighting resilience in space exploration and mission adaptability.

Following almost nine months in space, astronauts Butch Wilmore and Sunita Williams are due back on Earth on Tuesday, March 18, 2025, after an extraordinary odyssey that has enthralled the world. Their return, originally scheduled for June 2024 aboard Boeing's Starliner spacecraft, was postponed as a result of unexpected technical issues. Instead, they will now be coming home aboard SpaceX's trusted Crew Dragon capsule, a demonstration of NASA's flexibility and dedication to safety.

The Journey So Far: Challenges and Triumphs

Williams and Wilmore launched on June 5, 2024, aboard Boeing's Starliner Crew Flight Test (CFT). The original intention was to conduct a week-long test flight to showcase the spacecraft's capabilities for subsequent crewed missions to the International Space Station (ISS). But within minutes of launch, the Starliner suffered severe propulsion system failures, such as helium leaks and thruster malfunctions. These problems required a serious technical assessment to guarantee the safety of astronauts, resulting in an extended duration at the ISS.

- The Starliner's failures are not an exception; the program has experienced several delays and technical problems since its start.
- In 2019, the capsule strayed off course due to a software error on its maiden uncrewed test flight, missing the ISS. Later, in 2021, a launch attempt was also deferred because of blocked valves.
- Still, despite all the issues, a successful unmanned docking with the ISS took place in May 2022, but subsequent issues related to parachutes and combustible cabin tape pushed the crewed test flight even further back.

The Rescue Mission: SpaceX to the Forefront

With the technical problems of the Starliner, NASA sought the help of SpaceX. The Crew Dragon capsule, with its reputation for dependability and versatility, was called upon to bring Williams and Wilmore back from the ISS. This flight underscores the importance of redundancy in space travel and the cooperative nature of NASA and its business partners.

On March 16, 2025, the Crew Dragon successfully docked at the ISS, paving the way for the astronauts' return. This rescue operation underscores the importance of having multiple capable spacecraft systems to ensure crew safety and mission continuity.

Live Coverage by NASA

NASA will provide live coverage of the return journey, allowing viewers worldwide to witness this historic moment. The countdown will start at 10:45 PM EST on March 17 (8:15 AM IST on March 18) with hatch closure preparations. Meanwhile, as the Crew Dragon docks away from the ISS and sets off towards the Earth, live updates will still be streamed by NASA, concluding with the March 18 splashdown off Florida's coast at 5:57 PM EST (3:27 AM IST on March 19).

Historical Context and Logistical Challenges

Williams and Wilmore's prolonged time in space has been characterized by logistical issues. Packed originally for an eight-day mission, they needed extra supplies, such as clothes and personal items, to keep them going through their extended time. Though their time in space is remarkable, it does not match the U.S. record of 371 days and the world record of 437 days.

Future Implications

Williams' and Wilmore's safe return will yield significant lessons for all future crewed missions. It underscores the necessity of close coordination between NASA and its commercial collaborators to make sure that space exploration is healthy and resilient despite unforeseen obstacles.

As the space community awaits this historic return, it also eagerly awaits the next SpaceX Crew-9 mission, set for August 2024. The ISS will continue to remain a central point in global space research, with NASA and its collaborators working around the clock to make all missions safe and successful.

Sunita Williams and Butch Wilmore's odyssey is a testament to the human spirit of perseverance and the pioneering principle of space travel. As they head back towards Earth, their tale reminds us of the challenges and successes that characterize our quest for the universe. Join NASA's live broadcast to experience this incredible moment and honor the feats of these incredible astronauts

By

Rohit Santiur

BTech ECE

2. ISRO'S Upcoming Plans: Gaganyaan (2026), Samudrayaan (2026), and Chandrayaan-4 (2027) to be launch said Union Minister Jitendra Singh

India's space and deep-sea exploration reach new heights with Gaganyaan (2026), Samudrayaan (2026), and Chandrayaan-4 (2027) missions. Gaganyaan will launch India's first manned mission into Low Earth Orbit (LEO). Samudrayaan explores marine biodiversity and mineral resources, while Chandrayaan-4 aims to return lunar samples to Earth, enhancing India's scientific standing globally.

India is gearing up for a groundbreaking era in space and deep-sea exploration with three major missions: Gaganyaan (2026), Samudrayaan (2026), and Chandrayaan-4 (2027). In an interview with PTI Videos, Union Minister Jitendra Singh said "The objective of the Chandrayaan-4 mission is to gather samples from the Moon's surface and return them to Earth."

By

Ruturaj Patil

BTech ECE

3.Mission Breakdown

Recently ISRO has announced Gaganyan Mission, Samudrayaan, and Chandrayaan 4 missions to launch in 2026 and 2027. Let us see its objectives, its launch year and key features of the mission

Mission	Objective	Launch Year	Key Features
Gaganyaan Mission 2026	Send the first batch of Indian astronauts to space	**2026**	Manned mission to Low Earth Orbit (LEO)
Samudrayaan Mission 2026	Explore deep-sea resources & marine biodiversity	**2026**	Manned submersible mission to 6,000m depth
Chandrayaan-4 Mission 2026	Collect & return lunar surface samples to Earth	**2027**	Dual-launch mission using LVM-3 rocket

Details of Missions which has to be launch

1. Gaganyaan Mission (2026)

ISRO is going to launch the Gaganyaan Mission in 2026 to carry humans first time. This First human spaceflight program of India with astronauts aboard an indigenous spacecraft.Will be launched into Low Earth Orbit (LEO) using ISRO's GSLV Mk III (LVM-3) rocket. Includes a precursor uncrewed mission carrying 'Vyommitra', a humanoid robot, in 2025 to test systems before the manned flight. Designed to establish India's independent capability for human spaceflight, reducing dependence on foreign agencies.

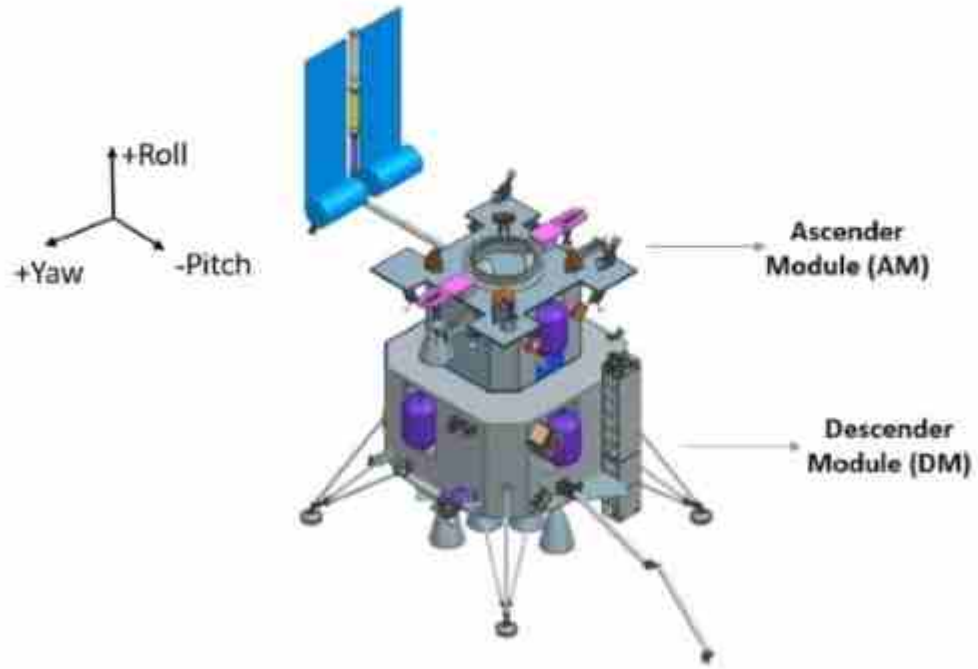
Gaganyaan: Names of Astronauts For India's First Human Space Flight Mission

2. Samudrayaan Mission (2026)

Samundrayaan Mission 2026 is an ISRO deep-sea exploration mission in which ISRO will study about study marine biodiversity, mineral resources, and the seabed. The mission will send a three-member crew in a submersible vehicle to a depth of 6,000 meters. Developed by the National Institute of Ocean Technology (NIOT) in Chennai.

3. Chandrayaan-4 Mission (2027)

ISRO's Chandrayaan-4 Mission is India's first lunar sample return mission, aiming to collect and bring back Moon soil and rock samples. Requires two separate launches using the heavy-lift LVM-3 rocket. The mission components will be assembled in lunar orbit before execution. Could involve international collaboration with partners like Russia or NASA.



Source: ISRO

Scientific & Strategic Importance:

ISRO's scientists will play a very significant and strategic role in upcoming missions in which they will be using advanced planetary research by analyzing the composition and history of the Moon.

To strengthen India's position in lunar exploration, there will be placing it among elite nations.It lays the foundation for future human missions to the Moon and Mars.

Potentially aids in lunar resource utilization, such as Helium-3 mining.

India's Expanding Space Infrastructure

ISRO is now expanding its infrastructure developments by launching its New Third Launch Pad which is being built to support heavier rockets for advanced missions. ISRO is now making expansion Beyond Sriharikota which is a new launch site in Tamil Nadu's Tuticorin district that will facilitate small satellite launches. To boost in Space Economy, there has been a currently valued at $8 billion, projected to reach $44 billion by 2035.

Private Sector Participation:

With Musk's involvement in Space technology, India also has Increased investment & international collaborations can be seen in collaborations with other countries. Now there will be an entry of private space companies under India's new space reforms. There will be many promotions for start-ups and innovation in the sector.

Conclusion

With Gaganyaan, Samudrayaan, and Chandrayaan-4, India is set to achieve historic milestones in space and deep-sea exploration. These missions mark a transformational phase in India's scientific journey, enhancing its global leadership in space technology, marine research, and planetary exploration.

India's future missions promise not just technological advancements but also economic and strategic benefits, paving the way for a new era of discovery and innovation.

By
Ms. Sanika Upadhye
TY ECE

4. Edge: Excellence in Engineering

"Dream. Build. Achieve. With mentor lighting the way.: Inter University Research Convention State Level Project Competition has won 2 prizes in *ENGINEERING AND TECHNOLOGY CATEGORY

Name of Students :

1. Suyash Vinay Pande
2. Mahesh C Avalakki
3. Ruturaj R Patil
4. Mohak P Sidgonda

Name of Guide: Dr Sachin S Gurav

Name of Project: "Mobility-Minds: Unleashing Potential With AI emowered Mobility Standers for Cerebral Palsy, Amyotrophic Lateral Sclerosis and paralysis patients."

"Words of Gratitude to Our Guide"

We are immensely honored to share that our project has received **two prestigious prizes** at the *Inter University Research Convention – State Level* in the **Engineering and Technology category**.

This achievement would not have been possible without the unwavering support, guidance, and encouragement of our respected guide.

Your insightful mentorship, constant motivation, and belief in our capabilities shaped our journey from ideation to innovation. You not only guided us technically but also instilled in us the confidence to face challenges and aim higher.

We dedicate this success to you with heartfelt gratitude. Thank you for being our pillar of strength and inspiration.

— With sincere thanks,
Your proud students

5. NextGen Achievers

"Teamwork, talent, and timeless guidance: Students have achieved success at the CMR HACKFEST 2.0 36 hours national level Hackthon held at CMR College of Engineering and Technology, Hyderabad

"Gratitude to Our Teachers"

We are thrilled to share that we achieved remarkable success at **CMR HACKFEST 2.0** — the 36-hour *National Level Hackathon* hosted by **CMR College of Engineering and Technology, Hyderabad**.

This accomplishment is not just ours, but a reflection of the constant encouragement, knowledge, and values instilled in us by our dedicated teachers.

Your mentorship shaped our problem-solving approach, honed our technical skills, and empowered us to think innovatively under pressure.

Thank you for believing in us, guiding us through every challenge, and inspiring us to turn ideas into impactful solutions.
Your role in our journey is invaluable, and we owe this milestone to your unwavering support.

— With heartfelt gratitude,
Your students

6. Visionary Vibes

AICTE IDE BOOTCAMP
MGM UNIVERSITY 2024

"From ideas to impact — a winning journey with our guiding stars.": Team Spandan Secured 2nd rank Organized By Entrepreneurship & Business mind Ministry Of Education Innovation Cell Govt.India 2024 .

"Heartfelt Thanks to Our Mentor"

We are proud to share that **Team Spandan** has secured the **2nd Rank** in the prestigious competition organized by the **Entrepreneurship & Business Mind – Ministry of Education Innovation Cell, Government of India, 2024**.

Behind this achievement stands the constant support, guidance, and inspiration of our mentor.

Your mentorship helped us turn our vision into a well-structured plan, sharpened our entrepreneurial thinking, and gave us the confidence to present our ideas on a national platform.

Thank you for always pushing us beyond limits, believing in our potential, and shaping our journey with wisdom and care.

This success is as much yours as it is ours.

— With deep respect and gratitude,
Team Spandan

7. Pulse of Progress

"Guided by brilliance, powered by innovation — 7 projects, one proud team!": Avishkar Zonal Project Competition! Total 07 projects selected for University Level Competition.

"Thank You, Respected Guides"

We are delighted to share that **a total of 07 projects** from our institution have been selected for the **University Level Competition** in the **Avishkar Zonal Project Competition**.

This remarkable milestone has been made possible due to the dedicated mentorship and tireless support of our guides.

Your expert guidance, encouragement, and constant motivation have played a crucial role in shaping our ideas into impactful projects. You believed in our potential, challenged us to think critically, and stood by us through every phase of our research journey.

We are truly grateful for your valuable time, knowledge, and mentorship. This achievement is a reflection of your efforts as much as ours.

— With sincere thanks and respect,
All participating students

8. Warfare Reimagined: Technologies That Shaped the Bharat-Pak War 2025

Introduction

In the wake of rising geopolitical tensions, the hypothetical Bharat-Pak War 2025 redefined the contours of modern conflict. Unlike traditional warfare, this confrontation showcased a battlefield dominated not just by soldiers, but by intelligent machines, data-driven strategies, and high-tech weaponry. The 2025 war between India (Bharat) and Pakistan marked a technological turning point in South Asian defense operations.

1. Unmanned Aerial Vehicles (UAVs) and Combat Drones

Both nations deployed fleets of AI-powered drones for surveillance, reconnaissance, and tactical strikes.

- India's *Rustom-II* and *SWiFT stealth drones* monitored enemy movements in real time.
- Pakistan countered with *Shahpar-II* and *Burraq drones* for autonomous missions. Drones carried smart payloads, reducing human casualties and increasing mission efficiency.

2. Cyber Warfare and Digital Combat

The cyber domain emerged as the fifth battlefield.

- Attacks on military communication networks, transport control systems, and financial institutions created chaos without physical engagement.
- India's *CERT-IN* and Pakistan's *ISPR cyber units* engaged in aggressive digital counterintelligence and offensive hacking.
  Zero-day exploits and malware crippled logistics and communication temporarily.

3. Space-Based Surveillance and Navigation

ISRO's RISAT and CartoSat satellites offered Bharat high-resolution imaging and GPS precision targeting.

- India deployed **real-time data relays** from space for missile tracking and border defense.
- Both nations used satellite jammers to blind enemy systems temporarily.

4. Artificial Intelligence in Decision Making

AI-driven systems performed threat prediction, resource allocation, and troop movement simulation.

- Algorithms processed terabytes of battlefield data to assist generals in making split-second decisions.
- Automated command centers enabled multi-domain coordination — air, land, sea, and cyber.

5. Hypersonic and Precision Strike Missiles

Bharat's test deployment of hypersonic cruise missiles such as *Shaurya-II* marked a strategic edge.

- These weapons travelled at speeds exceeding Mach 5, making them nearly impossible to intercept.
- Guided by AI, missiles hit high-value targets with pinpoint accuracy.

6. Electronic Warfare (EW) Systems

India deployed DRDO's electronic jamming systems to disable enemy radar, disrupt radio waves, and paralyze communication grids.

- **EMP-based drones** were used to shut down command posts.

- Pakistan relied on mobile EW platforms to blind missile guidance systems.

7. Robotic Ground Units and Battlefield Automation

Autonomous ground robots were deployed for tasks such as:

- Mine detection and neutralization
- Border patrol and night surveillance
- Casualty evacuation under heavy fire.

Conclusion

The Bharat-Pak War of 2025 was not a test of manpower alone, but a demonstration of technological superiority and innovation. It served as a reminder that the future of warfare lies at the intersection of engineering, data science, AI, and space technology.

As engineers of tomorrow, we must understand the responsibility that comes with innovation—building tools that secure peace, not just win wars.

By
Namrata Todkar
TY ECE

9.Engineering Response to the Pahalgam Attack – A Call for Technological Vigilance

Introduction

The tragic **Pahalgam attack** shook the nation, once again highlighting the pressing need for enhanced surveillance, quick response systems, and national security preparedness. While such incidents evoke pain and outrage, they also raise a critical question: **How can engineers contribute to national safety?**

As technology continues to shape every aspect of modern life, the role of engineers in **preventing, monitoring, and responding** to such attacks has never been more vital.

1. Smart Surveillance and Real-Time Monitoring

- AI-powered CCTV cameras with facial recognition can detect suspicious behavior in high-risk zones.
- Drone surveillance in mountainous and border regions like Pahalgam can offer real-time threat detection even in inaccessible terrain.

2. Communication and Emergency Response Systems

- Development of secure communication apps for military and rescue teams to coordinate during crises.
- IoT-based alert systems in buses or public vehicles to immediately notify control centers in case of threats.

3. Border Security and Intrusion Detection

- Engineers can develop infrared sensors and radar-based systems for tracking movements along sensitive areas.
- Geofencing and GPS-based tracking for sensitive convoys or tourist vehicles in volatile regions.

4. Data Analytics and Threat Prediction

- Use of predictive analytics to track online chatter, unusual movement patterns, or activity spikes in certain regions.

- Machine learning models can be trained to detect emerging threats before they occur using historical data.

5. Disaster Management and Evacuation Tech

- Engineers can design automated evacuation plans, smart alarms, and AI-based crowd control systems for use in tourist and military zones.
- Use of robotics for bomb detection and neutralization, especially in high-risk zones.

6. Cybersecurity and Counterterrorism

- Engineers play a vital role in building secure communication platforms, safeguarding surveillance infrastructure, and preventing data breaches.
- Support for intelligence agencies with ethical hacking tools and cyberforensic solutions.

Conclusion

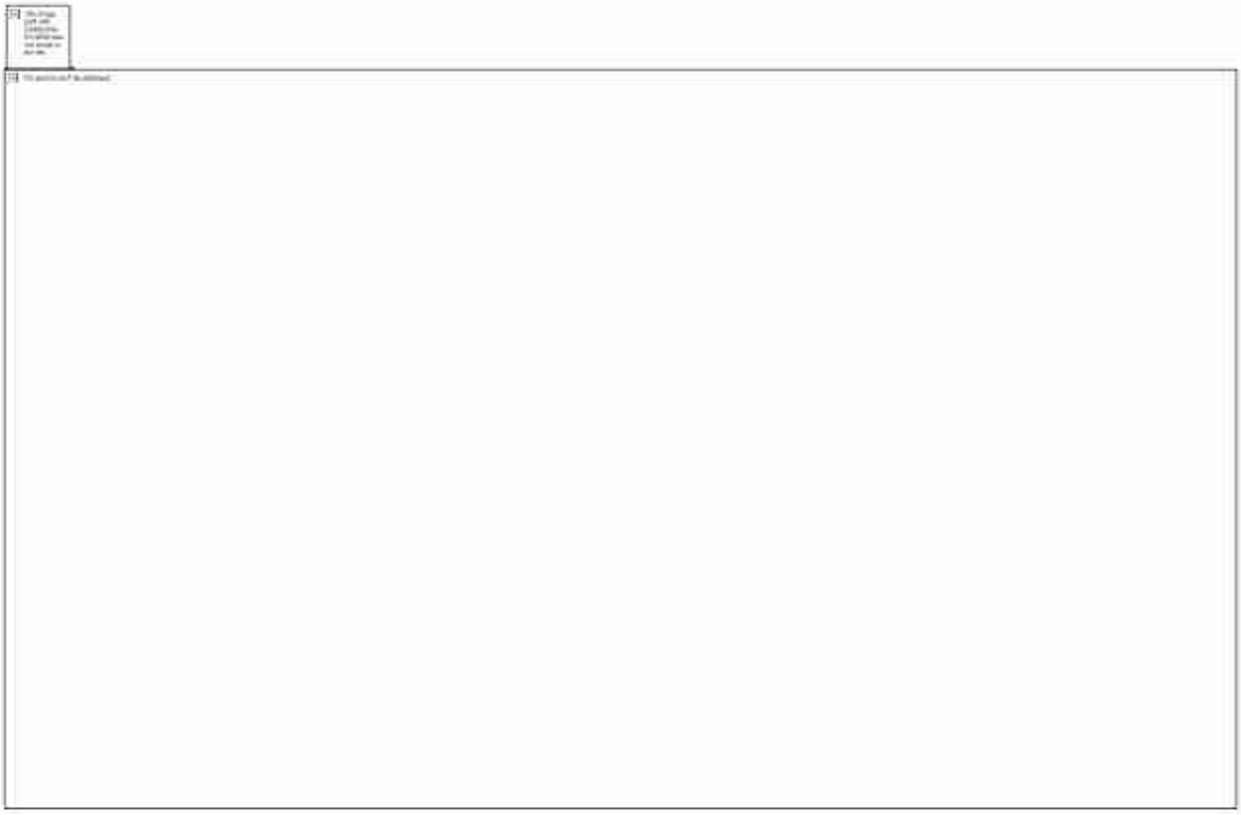
The Pahalgam attack is a harsh reminder of the threats that still persist in our society. But it is also a call to action for India's young engineers — to innovate not only for convenience and speed, but also for safety, resilience, and national defense.

As budding technocrats, let us aim to engineer solutions that save lives, ensure peace, and stand as silent sentinels against the shadows of terror.

By
Shreyash Bhujbal
TY ECE

10. Engineering Lessons from a Plane Crash – Innovation for Safer Skies

"Boys, Books, and a Burning Sky": Air India plane crashes into intern doctors' hostel; robbery reported at rescue site



"Seconds Before Silence": Heartbreakinging Selfie before Tragedy:Udaipur Doctor couple, 3 kids killed in plane crash

Introduction

Every time a plane crash occurs, it shakes the world's confidence in modern aviation — a marvel of engineering. Behind every tragedy lies a lesson that engineers must study, understand, and act upon. From structural failures to software glitches, engineering decisions impact lives at 35,000 feet. As engineers, we must see these incidents not just as accidents, but as critical points of learning and innovation.

1. Mechanical and Structural Engineering Failures

- Crashes can occur due to material fatigue, turbine failure, or wing structure weaknesses.
- Use of composite materials, smart alloys, and real-time stress monitoring sensors can drastically improve aircraft durability.

2. Electrical and Avionics Systems Malfunction

- Malfunction in flight control systems, autopilot errors, or faulty sensors can misguide pilots.

- Engineers must design redundant and fail-safe systems with multiple backups and error detection.

3. Human-Machine Interface Issues

- Complex cockpit designs or poor UI/UX can lead to misinterpretation of signals by pilots.
- Engineering must focus on ergonomics, clarity in displays, and intuitive warning systems.

4. Software and Automation Challenges

- Over-reliance on automated systems (e.g., MCAS in the Boeing 737 MAX) has led to fatal crashes.
- Software engineers must ensure rigorous testing, AI transparency, and ethical programming.

5. Communication and Tracking Gaps

- In some crashes, lack of real-time aircraft location tracking delays rescue and recovery.
- Engineers can improve this with satellite-based ADS-B systems, black box streaming, and IoT connectivity.

6. Role of Data and Predictive Maintenance

- With AI and big data, engineers can now predict which components may fail before they do.
- Implementing predictive maintenance reduces risk and improves reliability in aviation systems.

7. Emergency Response Technologies

- Faster emergency locator beacons, crash-proof data storage, and automatic distress alerts can save lives.
- Engineers can design autonomous drones to aid in search and rescue operations.

Conclusion

Every plane crash is a sobering moment for the world — but especially for engineers. It reminds us of the immense responsibility we carry when we design, test, and approve systems

that carry human lives.As future engineers, our mission is to ensure that the sky remains the safest place to be, through innovation, integrity, and a commitment to life-first engineering.

By

Shantanu Joshi,BTech ECE.

11. Kumbh Mela: Engineering the World's Largest Human Gathering

Introduction

The Kumbh Mela is not just a spiritual event — it is a colossal exercise in engineering, logistics, infrastructure, and smart management. As millions of pilgrims converge on sacred riverbanks across India, the event becomes a live case study for engineers in multiple domains. It is a test of coordination, resource optimization, safety protocols, and innovative technology — all under time-bound and high-pressure conditions.

1. Civil and Structural Engineering Marvel

- Temporary cities built in weeks include shelters, roads, sanitation systems, water pipelines, and pontoon bridges.
- Engineers must plan to withstand heavy human traffic, weather changes, and flood risks near riverbanks.
- Use of modular construction, prefabricated structures, and geotextiles for quick deployment.

2. Smart City and IoT Integration

In recent years, Kumbh Mela has adopted smart technologies such as:

- AI-based crowd monitoring
- Facial recognition CCTV
- IoT-enabled public utilities (e.g., water level sensors, bio-toilets)
- Engineers design and implement command and control centers for real-time surveillance and crowd safety.

3. Transportation and Traffic Management

Managing the inflow/outflow of 30–50 million people requires:

- Dynamic traffic routing systems
- Use of GIS mapping, drone surveillance, and digital signage
- Coordinated transport between buses, trains, and local vehicles with smart mobility planning

4. Water, Waste, and Sanitation Solutions

- Ensuring clean water supply and effective waste disposal is crucial to avoid public health crises.

- Engineers plan portable water filtration units, eco-friendly toilets, and mobile sewage treatment plants.
- Implementation of biodegradable waste management and real-time waste collection tracking.

5. Electrical and Power Supply Systems

- Establishing temporary but stable power grids for lighting, cooking, communication, and health camps.
- Use of solar energy, portable generators, and smart metering to ensure energy sustainability.

6. Health and Emergency Response Planning

- Design of telemedicine centers, first-aid booths, and mobile hospitals.
- Engineers collaborate with health departments to develop GPS-tracked ambulances, emergency drone delivery, and heat maps of illness spread.

7. Digital Experience and Public Communication

Mobile apps and websites provide:

- Maps, schedules, weather updates, and safety alerts
- Lost-and-found services
- AI-powered chatbots for help and instructions
- Use of public address systems, digital display boards, and multi-lingual interfaces designed by communication engineers.

Conclusion

The Kumbh Mela is a shining example of how engineering meets culture, faith, and humanity. Behind the spiritual grandeur lies a silent but powerful contribution of civil, electrical, mechanical, computer, and environmental engineers working in unison.

As future engineers, events like Kumbh Mela challenge us to innovate, adapt, and think on a massive scale — to not just build systems, but to build safe, inclusive, and resilient communities.

"Where faith gathers in millions, engineering ensures it flows smoothly."

By

Shweta Sangale

BTech ECE

12. Digital technologies to achieve the UN SDGs

WSIS Forum Photo Contest, Promoting access to information to our key stakeholders in the Pacific, Vanuatu and Fiji

OVERVIEW

- Information and communication technologies (ICTs) can help accelerate progress towards every single one of the 17 United Nations Sustainable Development Goals (SDGs).
- ITU contributes to all SDGs (see below) but especially to SDG 9, helping to build resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. Efficient and affordable ICT infrastructure and services help countries to engage in the digital economy and boost their economic competitiveness and well-being. Most of the

world's 42 least developed countries (LDCs) are making impressive progress towards SDG 9, with significant impact in financial inclusion, poverty reduction and improved health.

- ICTs provide the means to deliver high-quality goods and services in health care, education, finance, commerce, governance, agriculture, and other vital areas. They can help to reduce poverty and hunger, boost health, create new jobs, help mitigate climate change, improve energy efficiency, and make cities and communities more sustainable.
- Under half the world's people still do not use the Internet, according to ITU's latest statistics. Disenfranchised populations, particularly women and girls, older people, persons with disabilities, indigenous populations, and the economically disadvantaged, as well as people living in LDCs, landlocked developing countries, and small island developing states, need to be included in the emerging digital society to meet all 17 SDGs. Much of ITU's work aims to extend ICT networks, promote an enabling environment, encourage investment in telecommunication/ICT networks and foster digital inclusion.
- The COVID-19 pandemic has boosted connectivity, as more people have moved online to continue working, studying and to stay in touch with friends and family during lockdowns and confinement. However, the challenges of the pandemic and economic slowdown have created additional problems for achieving the SDGs. The international community has pledged to learn from the global challenge of the pandemic and 'build back better'. Increased connectivity and ICTs can form a major part of building back better, countries can use increased connectivity to engage with their citizens better to achieve the SDGs.

How tech can help achieve each SDG:

Digital technologies can contribute significantly to the fulfilment of every SDG:

- **SDG 1: No poverty**. More than 2 billion people in the world don't have bank accounts, while access to digital financial services has been proven to help lift people out of poverty. The Financial Inclusion Global Initiative (FIGI), begun in 2017 by ITU, the World Bank and the Committee on Payments and Market Infrastructures (CPMI), with support from the Bill & Melinda Gates Foundation, expands digital financial inclusion in developing countries.
- **SDG 2: Zero hunger**. By making agricultural practices more data-driven and efficient, ICT-enabled solutions can help farmers increase crop yields while reducing their use of energy. The UN Food and Agriculture Organization (FAO) has worked closely with ITU since 2017 to bolster ICT innovation in agriculture.
- **SDG 3: Good health and well-being**. Direct patient interaction, health informatics and telemedicine can be improved through better connectivity. The "Digital Health for

Africa" partnership launched by ITU and the World Health Organization in 2017, has delivered digital health leadership capacity development for more than 15 countries in Africa. Be He@lthy, Be Mobile, another ITU-WHO collaboration, is carrying out projects in several countries on mHealth, in addition to maintaining the mHealth Knowledge and Innovation Hub in Europe (mhealth-hub.org). Current and forthcoming ITU standards for multimedia systems, developed in collaboration with other organizations, will support the widespread deployment of digital health applications, including telemedicine and remote medical imaging.

- **SDG 4: Quality education**. ITU and the International Labour Organization (ILO) are leading the Digital Skills for Decent Jobs Campaign, which aims to equip 5 million young men and women with job-ready digital skills by 2030 in support of the first-ever, comprehensive UN system-wide effort for the promotion of youth employment worldwide. The Giga Initiative led founded by ITU and UNICEF monitors and promotes connectivity in schools.
- **SDG 5: Gender equality**. According to ITU statistics, 250 million fewer women were online than men in 2017. Globally, 62% of men use the Internet compared with 57% of women. Although the digital gender divide has been narrowing in all world regions and virtually eliminated in the developed world, wide gaps persist in LDCs (where 31% of men are online, compared to just 19% of women) and in Landlocked Developing Countries (where 38% of men compared to 27% of women). To close the digital gender gap, ITU members organize the annual International Girls in ICT Day to encourage more women and girls to pursue science, technology, engineering, and mathematics (STEM) careers. Gender equality initiatives where ITU is directly engaged include EQUALS, a ground-breaking global network to build an evidence base and improve women's access to technology, build relevant digital and other skills, and promote female leadership in the tech sector.
- **SDG 6: Clean water and sanitation**. New and emerging digital technologies facilitate smart water and sanitation management. The ITU Focus Group on Smart Sustainable Cities follows key trends in urban smart water management, including ICTs for wastewater management.
- **SDG 7: Affordable and clean energy**. Rising tech use contributes to emissions of carbon dioxide and other greenhouse gases. But the industry is exploring ways to use greener energy, make devices more energy efficient, and incorporate solar, wind and other renewable sources into the value chain. At the same time, cutting-edge tech will be essential to cut global emissions, build smart grids and cities, electrify transport, and build sustainable economies and societies. ITU has helped set more stringent energy efficiency and emission control standards

for ICTs and has outlined how smart grids can help to build more controllable and efficient energy systems and reduce carbon emissions.

- **SDG 8: Decent work and economic growth**. Technology creates new jobs, enables resilient work and commerce, and stimulates wider social and economic development. ITU's Digital Innovation Framework helps countries, cities and other communities and systems accelerate their digital transformation, stimulate ICT-centric innovative entrepreneurship, and foster vibrant small and medium enterprises (SMEs).
- **SDG 9: Improved Infrastructure**: Much of ITU's work directly aims to improve the extent and quality of ICT infrastructure of radiocommunication and backbone networks and to extend networks into underserved remote and rural areas. ITU's standards are improving the energy efficiency and performance of ICT networks, in backhaul, wireline and radiocommunication networks.
- **SDG 10: Reduced inequalities.** ITU works to reduce inequality within and between countries, communities, and populations by extending access to technologies and knowledge to disadvantaged segments of society.
- **SDG 11: Sustainable cities and communities**. "United for Smart Sustainable Cities" (U4SSC), begun by ITU and the United Nations Economic Commission for Europe (UNECE) in 2016, helps cities take key steps to become smart and sustainable. Fifty cities from a number of countries worldwide have now joined this project.
- **SDG 12: Responsible consumption and production**. E-Waste, including waste created by ICTs, is increasing all over the world. ITU has launched a coalition to produce the Global E-waste Monitor and strengthen collaboration to address the global challenge of waste from electrical and electronic equipment. ITU is also developing global strategies, standards and policies that offer guidelines for the sustainable management of e-waste.
- **SDG 13: Climate change action**. Digital tools allow increasingly sophisticated climate modelling. ITU facilities international cooperation on policies and standards to help reduce energy consumption for ICT products and services. Key ITU standards promote green data centres and green power feeding systems. ITU is carrying out a joint project to model cities using digital twin modelling.
- **SDG 14: Life below water.** ICTs are being extensively used to monitor the changing marine environment (e.g. the movement of ice flows and glacial movements). Buoys can be equipped with remote monitoring to monitor changing conditions at sea (e.g. salinity levels of water via buoys). Sensor networks and RFID chips can be used to protect endangered animals (e.g. whales and dolphins) to learn about their migratory patterns and needs.

- **SDG 15: Life on Land.** ICTs can be used to identify, monitor, photograph and track wildlife populations. Sensor networks and RFID chips can be used to protect endangered animals (e.g. lions, elephants and tigers) to learn more about their migratory patterns and needs for protection.
- **SDG 16: Peace, justice and strong institutions**. E-government services are helping improve the relationship of citizens and state and improving the efficiency of delivery of government services. ITU helps to drive citizen empowerment through its work on smart sustainable cities and key performance indicators (KPIs) that measure social inclusion, such as voter participation or the number of government services delivered through electronic means.
- **SDG 17: The power of partnerships**. Public-private partnerships are key to bringing ICTs to all nations, peoples, and communities. Partnerships are particularly needed to build the physical infrastructure required to deliver Internet services in hard-to-reach areas and to currently disadvantaged populations, as well as to facilitate the investment, inclusion and innovation required to for SDG fulfilment across the board.

  ITU has formed strategic partnerships with UN agencies and other organizations and companies to drive sustainable development and address specific challenges in relation to all 17 SDGs.

By

Mahesh Chandrakant Avalakki

Btech ECE