A.V.C COLLEGE OF ENGINEERING, MANNAMPANDAL, MAYILADUTHURAI

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Department of Electronics and Communication Engineering

(Accredited by NBA)

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Message from Head of the Department

I appreciatethe students who have taken efforts in participating in the paper presentations and competitions.

I congratulate the students who have been selected for the Internship.Iwish them all success in their endeavors.

I expect from the faculties of ECE department for their active participation in bringing funding projects to our department.

Dr.CHITRAVALAVAN

HOD/ECE

RESILIENCE

"Life doesn't get easier or more forgiving, we get stronger and more resilient."

"Resilience is accepting your new reality, even if it's less good than the one you had before. You can fight it, you can do nothing but scream about what you've lost, or you can accept that and try to put together something that's good."

"The human capacity for burden is like bamboo-far more flexible than you'd ever believe at first glance."

Faculty Corner:

Applications of 6G Technology in Satellite Communications

- ***Mrs.R.Ramya, AP /ECE***

6G technology is expected to revolutionize satellite communications by offering ultra-fast speeds, ultra-low latency, and AI-driven network optimization. With advancements in terahertz (THz) frequency bands, AI-powered connectivity, and satellite-terrestrial integration, 6G will enhance global communication infrastructure.

Key Applications of 6G in Satellite Communications

1. Global 6G Coverage with Satellite Networks

- 6G will use low Earth orbit (LEO), medium Earth orbit (MEO), and geostationary orbit (GEO) satellites to provide global connectivity, including remote and rural areas.
- Integration of Non-Terrestrial Networks (NTN) will create seamless communication between satellites, ground stations, and mobile users.
- Ideal for maritime, aviation, and disaster recovery scenarios where terrestrial networks are unavailable.

2. Ultra-High-Speed Internet for Space and Earth

- 6G will leverage THz and optical wireless communication (OWC) to enable terabit-per-second (Tbps) data rates.
- High-speed satellite internet will enhance telemedicine, remote education, and IoT applications in hard-to-reach locations.

3. AI-Driven Smart Satellite Networks

- AI and machine learning will optimize satellite communications by:
  - Predicting network congestion and adjusting bandwidth dynamically.
  - Enhancing self-healing networks for real-time error detection and correction.
  - Reducing latency for high-speed, real-time applications like autonomous vehicles and real-time military operations.

4. Satellite-Based IoT& Smart Cities

- 6G satellites will support massive IoT connectivity, enabling:
  - Smart agriculture (real-time soil, weather, and crop monitoring).
  - Environmental monitoring (tracking climate change, pollution, and natural disasters).
  - Intelligent transportation systems (satellite-based navigation and traffic management).

5. Enhanced Military & Defense Communications

- 6G-enabled secure satellite networks will provide:
  - Quantum encryption for ultra-secure communication.
  - Real-time battlefield monitoring with AI-driven satellite imagery.
  - Hypersonic vehicle tracking for defense and aerospace applications.

6. Space Exploration & Deep Space Communication

- Interplanetary internet: 6G satellites will enable fast and reliable communication between Earth, the Moon, Mars, and beyond.
- AI-powered space telescopes: Faster data transmission for space exploration missions.

- Human settlement on Mars: 6G will provide critical communication infrastructure for future space colonies.

Challenges & Future Prospects

Challenges:

- High energy consumption of 6G satellites.
- THz signal attenuation due to atmospheric conditions.
- Cybersecurity risks in quantum communications.

Future Prospects:

- Integration with quantum communications for unhackable networks.
- Development of AI-powered autonomous satellites.
- Expansion of 6G-based deep space networks for interplanetary travel.

Conclusion

6G will redefine satellite communications by providing ultra-fast, AI-driven, and quantum-secure connectivity across Earth and beyond. It will enable global IoT, space exploration, smart cities, and next-gen military applications. As research progresses, 6G satellites will play a crucial role in the future of space-age communication

Student Corner :

Embedded Systems and Real-Time Operating Systems (RTOS)

- ***Abiramasundari.S,III ECE***

Embedded Systems

Definition:

An **embedded system** is a specialized computing system designed to perform dedicated functions or tasks within a larger system. It consists of hardware and software optimized for specific applications.

Characteristics:

- Task-specific and optimized for particular applications
- Low power consumption
- Real-time performance requirements
- Often resource-constrained (limited memory and processing power)
- Highly reliable and stable
- Usually designed for continuous operation
-

Components of Embedded Systems:

1. **Microcontroller (MCU) / Microprocessor (MPU)** – The processing unit
2. **Memory** – RAM, ROM, Flash for storing code and data
3. **Input Devices** – Sensors, buttons, touchscreens
4. **Output Devices** – LEDs, displays, motors, actuators
5. **Communication Interfaces** – UART, SPI, I2C, CAN, Ethernet, etc.
6. **Power Supply** – Battery or external power source
7. **Software/Firmware** – Code that controls the hardware

Applications of Embedded Systems:

- Consumer electronics (smartphones, smartwatches, cameras)
- Automotive (engine control units, ABS, infotainment systems)
- Medical devices (pacemakers, infusion pumps, diagnostic systems)
- Industrial automation (PLC, robotics, CNC machines)
- Aerospace and defense (drones, navigation systems)
-

AI in Smart Irrigation Systems

- ***Sivakumar G,III ECE***

Introduction

Smart irrigation systems utilize **Artificial Intelligence (AI)** to optimize water usage, enhance crop yields, and reduce environmental impact. AI-driven irrigation leverages real-time data and predictive analytics to make automated and efficient watering decisions.

Components of AI-based Smart Irrigation

1. **Sensors** – Soil moisture, temperature, humidity, rain, and nutrient sensors collect real-time data.
2. **Weather Forecasting** – AI integrates weather data to predict rainfall and adjust irrigation schedules accordingly.
3. **Machine Learning Algorithms** – AI analyzes historical and real-time data to optimize water usage.
4. **IoT Connectivity** – Smart irrigation systems use IoT to communicate between sensors, controllers, and cloud-based platforms.
5. **Automated Actuators** – AI-based controllers regulate water flow based on analyzed data.
6. **Remote Monitoring & Control** – Mobile applications and cloud platforms allow farmers to monitor and control irrigation remotely.

Working of AI-driven Smart Irrigation

1. **Data Collection:** Sensors and satellite imagery collect environmental data.
2. **Data Processing:** AI algorithms analyze soil moisture, weather forecasts, and crop requirements.
3. **Decision Making:** AI determines the optimal water levels and schedules irrigation accordingly.
4. **Automated Execution:** Watering is adjusted automatically based on AI recommendations.
5. **Continuous Learning:** The system refines its predictions over time for better accuracy and efficiency.

Benefits of AI in Smart Irrigation

- **Water Conservation:** Reduces water wastage by ensuring optimal usage.
- **Energy Efficiency:** Lowers energy consumption by preventing over-irrigation.
- **Cost Savings:** Reduces labor and resource expenses.
- **Improved Crop Yield:** Ensures plants receive precise water levels for healthy growth.
- **Sustainability:** Promotes eco-friendly farming practices.
- **Early Issue Detection:** Identifies water stress and soil issues before they affect crops.

AI Technologies Used in Smart Irrigation

- **Machine Learning (ML):** Predicts irrigation needs based on historical and real-time data.
- **Computer Vision:** Analyzes crop health using satellite and drone imagery.

- **Deep Learning:** Enhances decision-making accuracy by processing complex datasets.
- **Edge Computing:** Enables real-time data processing at the sensor level.

Applications of AI-based Smart Irrigation

- **Precision Agriculture** – AI optimizes irrigation for maximum crop yield.
- **Greenhouse Farming** – Automated watering in controlled environments.
- **Urban Landscaping** – Smart irrigation for parks, gardens, and golf courses.
- **Drip Irrigation Systems** – AI enhances water delivery efficiency.
- **Large-Scale Farming** – AI-driven irrigation for vast agricultural lands.

Challenges & Future Trends

Challenges:

- High initial investment
- Need for skilled personnel to manage AI systems
- Dependence on internet connectivity and cloud services
- Integration with existing irrigation infrastructure

Future Trends:

- AI-powered **robotic irrigation systems**
- **Blockchain** for secure water usage data management
- **5G and IoT advancements** for enhanced real-time control
- **AI-powered drones** for precision monitoring and irrigation

Critical Thinking

- Karpagasri M, IV ECE

1. The Poisoned Drink

Puzzle:

A man goes to a restaurant and orders a drink with ice. He slowly drinks it and leaves unharmed. Another man orders the same drink but drinks it quickly and dies. The drink was poisoned. Why did the second man die while the first survived?

Answer:

The **poison was in the ice**!

- The first man drank slowly, allowing the ice to melt and dilute the poison.
- The second man drank quickly, consuming the ice before it melted—thus, he ingested the poison.

2. The Double Vision Mystery

Puzzle:

A woman walks into a room and sees a man who is identical to her. She screams and faints. Why?

Answer:

She saw **herself in a mirror**, but she wasn't expecting it!

3. The Unbreakable Egg

Puzzle:

You are given **two identical eggs** and a **100-floor building**. The eggs might break if dropped from a certain floor, and your task is to find the highest floor from which an egg can be dropped without breaking. You can drop the eggs **as few times as possible**. How do you do it?

Answer:

Use the **10-floor interval strategy**:

1. Drop the first egg from the **10th, 20th, 30th** floor, and so on.
2. If the egg **breaks** at, say, the 40th floor, then you know the breaking point is between **30-40**.
3. Now, drop the second egg from floors **31, 32, 33...**until it breaks.
4. The last safe floor is the answer!

This method ensures the **fewest drops** to find the answer.

4. The Stuck Car Puzzle

Puzzle:

A man pushes his car to a hotel and suddenly realizes he's bankrupt. What happened?

Answer:

He was **playing Monopoly**!

- The "car" is his **game piece**.
- He landed on a hotel and **owed too much money**.

5. The Lighthouse Mystery

Puzzle:

A ship is sailing in **pitch darkness** but suddenly **stops immediately** without crashing or being damaged. Why?

Answer:

It reached a **lighthouse beam**!

- The captain saw the light in time and **stopped the ship** before hitting rocks.

6. The Elevator Button Puzzle

Puzzle:

A man lives in a building with 20 floors. Every day, he takes the elevator down to the ground floor, but when he returns, he only takes the elevator to the **10th floor** and walks the rest of the way up. Why?

Answer:

The man is **too short** to reach the higher buttons!

- On rainy days, he uses his **umbrella** to press the 20th-floor button.

Interview Puzzles

- ***Harine.K , IV ECE***

1. Consider a chessboard with a single Rook. A Rook can move any number of squares sideways/forward, but not diagonally. What is the minimum number of moves the Rook needs to make, in order to pass over all the squares on the chessboard and return to the original position?
2. Three friends divided some bullets equally. After all of them shot 4 bullets the total number of bullets remaining is equal to the bullets each had after division. Find the original number divided.
3. Major Jasbir is forming five-person Special Task Group. The group must contain one leader, two bomb-experts and two soldiers. P, Q and R are possible bomb-experts. R, S and T are possible leaders. U, V and W are possible soldiers. Also, P and R prefers to work with each other in the same team. T prefers to work only if V works. How many different possible Groups, Major Jasbir can make?
4. The secret agent X emailed some code to his head office. They are "RADAR, LEVEL, ROTOR, REDIVIDER, MOTOR". But four of these five words have something in common and one is fake. Can you tell which one is fake? Ignore the fact that four of the code-words are of the same length.
5. Hence, total 300 viewers watch all three channels. A man was looking at a portrait. Someone asked him, "Whose picture are you looking at?" He replied,

pointing at the portrait: "Brothers and sisters have I none, but this man's son is my father's son." Now whose picture is the man looking at?

6. Given following facts:

1. Dinesh is younger than Farukh and older than Gurmit.
2. Jatin is younger than Chandu and older than Eshrat.
3. Amit is younger than Irfan and older than Chandu.
4. Farukh is younger than Bhavin and older than Hemant.
5. Irfan is younger than Gurmit and older than Jatin.
6. Hemant is older than Gurmit.

Who is the Youngest?

7. A frog starts climbing 15 feet wall. Each hour he climbs 3 feet and rests for 30 minutes. During rest, he slips back 2 feet. How many hours does the frog take to reach the top?
8. If a bear eats 65 pounds in fish every day EXCEPT every 6th day which it only eats 45 pounds of fish. If the bear continues this, how many pounds of fish will it eat in 200 days?
9. Pinto says, "The horse is not Black." Sandy says, "The horse is either Brown or Grey." Andy says, "The horse is Brown." At least one is telling truth and at least one is lying. Can you tell the color of the horse?
10. Five horses ran in the race.
    - There were no ties.
    - Sikandar did not come first.
    - Star was neither first nor last.
    - Mughal Glory came in one place after Sikandar.
    - Zozo was not second.
    - Rangila was two place below Zozo.

    In what order did the horses finish?

Answers for the Puzzles

1. 16 moves.
2. 18.
3. Major Jasbir can make 8 different possible groups.
4. The fake code-word is MOTOR..All the code-words except MOTOR are Palindromes.
5. The man is looking at his FATHER's portrait.
6. Eshrat is the youngest.
7. 19 hours.
8. The bear will eat 12,340 pounds of fish in 200 days.
9. The color of the horse can be any color other than Black and Brown.
10. Zozo, Star, Rangila, Sikandar, Mughal Glory

Brain Teasers

-Aishwarya S,IV ECE

1. The Man in the Elevator

Puzzle: A man lives on the 10th floor of a building. Every day, he takes the elevator down to the ground floor to go to work. When he returns, he takes the elevator to the 7th floor and then walks the rest of the way up. Why?

Answer:

The man is **short** and can only reach the 7th-floor button. On rainy days, he uses his umbrella to reach the 10th-floor button!

2. The Riddle of the Sphinx

Puzzle: What walks on four legs in the morning, two legs in the afternoon, and three legs in the evening?

Answer:
A **human**!

- As a baby ("morning"), they crawl on **four** legs.
- As an adult ("afternoon"), they walk on **two** legs.
- As an elderly person ("evening"), they use a cane, making it **three** legs.

3. The Missing Coin
Puzzle: You have **10 coins**, but one is fake and weighs **slightly less** than the others. You have a **balance scale**, but you can only use it **three times**. How do you find the fake coin?
Answer:

1. Divide the 10 coins into **three groups**: 3, 3, and 4.
2. Weigh the first **two groups (3 vs. 3)**.
    - If they balance, the fake coin is in the group of 4.
    - If they don't, the lighter side has the fake coin.
3. Take the **3 coins** from the lighter side and weigh **two of them**.
    - If they balance, the fake coin is the one not weighed.
    - If one is lighter, that's the fake coin!

4. The Liar and the Truth-Teller
Puzzle: You are in a town where one group of people always tells the **truth**, and another group always **lies**. You meet two people: one is a truth-teller and the other is a liar. You can ask **one question** to one person to find the correct road to the city. What do you ask?
Answer:
Ask: **"If I asked the other person which road leads to the city, what would they say?"**

- The truth-teller will truthfully tell you the wrong road.
- The liar will lie about what the truth-teller would say (which is still the wrong road).
- Either way, take the **opposite** road!

5. The Three Switches and One Light Bulb
Puzzle: You are outside a room with **three light switches**. Inside the room, there is **one** light bulb. You can turn the switches on and off as many times as you like, but you can **only enter the room once**. How do you determine which switch controls the bulb?
Answer:

1. Turn on switch **1** and leave it on for a few minutes.
2. Turn off switch **1** and turn on switch **2**.
3. Enter the room:
    - If the bulb is **on**, it's controlled by switch **2**.
    - If the bulb is **off but warm**, it's controlled by switch **1**.
    - If the bulb is **off and cold**, it's controlled by switch **3**.

Editors Desk

10 ways Green Tea keeps you healthy and fit!

Green tea has many ingredients in it such as caffeine, theobromine, saponins, theophylline, vitamins and epigallocatechin. The compound Epigallocatechin (EGCG) boosts your metabolic rate and reduces your appetite. All these compounds lead to thermogenesis which creates heat in the body in turn increasing your metabolic rate.

Drinking tea has been around for ages, but it is only in recent times that the real health benefits of drinking green tea

have been explored. The main health benefits come from the antioxidants that it contains.

1. These antioxidants are said to be active contributors in fighting all types of cancers.
2. Cholesterol is another disease that green tea combats. Green tea helps keep our arteries healthy and unblocked, which will help prevent heart attacks.
3. Green tea also regulates blood sugar. It keeps our body hydrated, and it does wonders for our skin.
4. Immunity levels are boosted, since green tea has active antibacterial compounds that help our body fight disease more naturally.
5. Drinking green tea thrice a day will increase our metabolism, which will encourage our body to lose weight and burn calories faster.
6. The hunger instinct is also reduced when we drink two to four cups of green tea and our body does not crave unhealthy snacks.
7. Two to four cups of green tea burns 70 to 80 calories per day, as it increases metabolism and helps to exercise longer with more endurance.
8. Green tea stimulates the nervous system, making the fat burning process faster. It also makes our brain more active.
9. Four to five cups of green tea, teamed with a high fibre diet and a vigorous cardio workout will ensure that our body works up to being toned and healthy.
10. Green tea encourages good sleep, ensuring that we are well rested and ready for our workout, whether it is cardio, strength training or yoga.

Send your suggestions to:

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Department Vision

To create globally competent engineers in Electronics and Communication Engineering to meet the industrial progress for betterment of the society

Department Mission

- To create an academic ambience for quality education in the field of Electronics and Communication Engineering
- To make the best use of modern tools and software for teaching and research activities
- To promote industry-institution interaction for skill-based learning of students from rural society
- To inculcate moral and ethical values with a sense of professionalism.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's):

1. To provide the students with a strong foundation in the required sciences in ordertopursue studiesinElectronicsand CommunicationEngineering.
2. Togainadequateknowledgetobecomegoodprofessionalinelectronicandcommunicationengineeringassociatedindustries,highereducationandresearch.
3. To develop attitude in lifelong learning, applying and adapting new ideas andtechnologiesastheirfield evolve
4. Topreparestudentstocriticallyanalyzeexistingliteratureinanareaofspecializationandethicallydevelopinnovativeandresearchorientedmethodologiesto solve the problemsidentified.
5. To inculcate in the students a professional and ethical attitude and anability tovisualizethe engineering issues in abroadersocialcontext.

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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.
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.
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.
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.
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.
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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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

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.

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.

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.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

- PSO1: Design, develop and analyze electronic systems through application of relevantelectronics,mathematicsand engineering principles
- PSO2:Design,developandanalyzecommunicationsystemsthroughapplicationoffundamentals from communication principles, signal processing, and RF System Design &Electromagnetics.
- PSO3:Adapttoemergingelectronicsandcommunicationtechnologiesanddevelopinnovativesolutionsforexistingand newer problems