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

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Department of Electronics and Communication Engineering

"LEMON NEWSLETTER"

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Message from Head of the Department

I wish students to work hard for the University Exams and aim for the University ranks.

I congratulate the students for their hard work to achieve this height and I appreciate them for making our department and college feel proud.

I look forward from the faculties of ECE department to involve and participate themselves in conducting sponsored Faculty development programme and workshops.

Dr.CHITRAVALAVAN

HOD/ECE

Quotes for Positive Life

"It's actually cool to be positive and optimistic and idealistic.

It's cool to see yourself doing beautiful, great things."

—Tom DeLonge

"Optimism is the faith that leads to achievement;
nothing can be done without hope."

—Helen Keller

Faculty Corner:

Top 3 Satellite Trends & Technologies

- Mrs.C.Jayasri, AP/ECE

1. *Small Satellites*

Equipped with smarter and compact subsystems, small satellites are replacing the need for large satellites and related infrastructure. Commercial satellite operators for connectivity services deploy constellations of smallsats in LEO to provide global coverage with low latency. For similar reasons, small satellites are increasingly positioned in LEO constellations for Earth observation (EO) and remote sensing to generate superior insights. Satellite startups advance this trend through mass production, rocket ride-sharing with other missions, modular commercial-off-the-shelf (COTS) hardware, and standardized satellite buses. Satellite operators and owners also minimize costs through vertical integration in satellite manufacturing. These advances are leading satellite manufacturers to experiment with new space technologies using smallsats as well as build smallsats for GEO orbits.

Galaxy Space provides Communication Services via Smallsats

Galaxy Space, a scaleup from China, mass produces small satellites with modular components and small structures. The startup has already sent 1000 small satellites, equipped with innovative communication payloads, like constellations in the 500-1000Km low earth orbit. These constellations provide 5G network coverage and broadband services to users across the globe. This also serves industries such as aviation, marine, automobile, and manufacturing and is used for emergency response and ecological protection.

Mission Space predicts Space Weather using LEO Constellations

Latvian startup **Mission Space** deploys its own network of nanosatellite constellations, installed with custom sensors, to provide predictive space weather monitoring. The startup's forecasting system measures near-earth magnetic and solar storms, in addition to charged-particle streams of up to 600km. This real-time satellite data is used across industries such as aviation, energy, and financial trading to prevent disruptions caused by space weather radiation risks.

2. *Satellite IoT*

The demand for Satellite-enabled Internet of Things is growing steadily owing to the extensive coverage provided by satellites compared to the existing terrestrial infrastructure. Governments and private sector investment in satellite technology for connected systems and solutions are driving the technological advancements in satellite IoT. Commercial solutions involve deploying IoT sensors and devices for satellite-based, precise, and real-time asset tracking, monitoring, and remote surveillance in any part of the world. Advanced devices and sensor technologies in satellites also empower a new range of cloud and edge computing capabilities. Some of the biggest advances in satellite IoT come from its application in the military and defense. For example, terrestrial communication networks suffer coverage limitations at extreme locations and often depend on land and sea cables. Startups provide hybrid services using satellite IoT as backhaul to existing terrestrial networks, improving the overall infrastructure.

FOSSA Systems offers Low-Cost Satellite IoT Solutions

FOSSA Systems, a Spanish startup, brings secure and optimized satellite IoT communications at a low cost. The startup uses dedicated picosatellite constellations to connect with IoT-enabled devices and facilitates strategic monitoring even at remote locations. The solution enables high capacity vertically-integrated industrial and commercial IoT services through its autonomous IoT sensors and platform. It is already improving productivity in agriculture, logistics, and industrial environments through its digitized solutions.

Fleet Space enables NanoSat-based IoT Solutions

Australian startup **Fleet Space** uses the LoRaWAN protocol of the low-power wide-area network (LPWAN) and LEO satellite constellations to provide bi-directional industrial IoT solutions. Its 6U NanoSatellites with 3D printed antenna and digital beamforming for LPWAN improve satellite-to-ground station connectivity, thereby providing more throughput for remote industrial monitoring. Their integrated satellite and LoRaWAN gateway, The Portal, connects up to 1000 IoT sensors within a 15km range. The solution finds applications in the defense, utility, and mining sectors.

3. *In-Orbit Services*

Satellite technology companies are solving two major challenges impacting satellite performance in space: servicing an orbiting satellite and decluttering the space in low earth orbit. The exponential rise in satellites launched has led satellite operators to employ space situational awareness (SSA) for detecting and cleaning space debris. Self-destruction and other deorbiting technologies introduced by startups for decommissioning satellites are proving sustainable for the future of space. Another satellite technology trend to declutter space is by increasing the lifespan of existing satellites. Startups and scaleups are advancing in these services by using mission extension vehicles, also known as space tugs, to service or upgrade orbiting satellites by stacking with them. Other orbital services include orbital transfer vehicles, as well as payload and cargo delivery vehicles. Autonomous robotic technology further improves satellite maintenance efficiency by performing in-space satellite servicing and repairs.

Obruta provides Satellite In-Orbit Servicing

Canadian startup **Obruta** uses its proprietary service pods and systems to perform satellite servicing while in orbit. Satellites are either equipped with the *Puck*, Obruta's 4-in-1 service interface or receive repairs through its service delivery pods. These technologies revive the satellite through refueling, repairing, recharging, relocating, deorbiting, data-transfer, or life extension. This empowers satellite operators to increase mission duration and mitigate critical mission failures.

Atomos develops Orbital Transfer Vehicles

US-based startup **Atomos** uses its *Orbital Transfer Vehicle (OTV)* or space tugs for custom last-mile orbit insertion of satellites. Space tugs carrying satellites orbit the earth for precise satellite orbit insertion, orbit raising, phasing, and satellite plane changes. It does so by rapidly utilizing high-power electric propulsion and Atomos' proprietary ubiquitous rendezvous operations. This allows satellite launchers to manage orbital transfers and satellite servicing at low costs.

Student Corner:

Li –Fi Technology

- ***A.Ayisha Begum ,IV ECE***

What is Li-Fi technology and how it works?

Li-Fi (Light Fidelity) facilitates the wireless method of data transmission through Visible Light Communication (VLC) technology and can be up to 100 times faster than Wi-Fi.

Li-Fi (Light Fidelity) is similar to Wi-Fi (Wireless Fidelity) but uses light for data transmission instead of radio waves. It facilitates the wireless method of data transmission through Visible Light Communication (VLC) technology and can be up to 100 times faster than Wi-Fi. It uses solid-state lighting (SSL) such as LED bulbs.

Advantages of Li-Fi:

1- It has less interference.
2- Li-Fi can pass through salty seawater as light can travel through water.
3- It can work in the dense region.

Applications of Li-Fi:

1- It is used in airlines as it will not interfere with the equipment on the aircraft that relies on radio waves such as its radar.
2- Li-Fi is used in undersea explorations as light can travel through water.
3- It is used in operation theatres in the hospitals as light waves have little effect on medical instruments.
4- It is also used in offices and homes for data transmission and internet browsing.

Pros of Li-Fi:

1- Speed: Light spectrum is nearly 10,000 times larger than the spectrum occupied by radio waves thereby carrying more information 100 times faster than Wi-Fi. It can transmit data at a rate of 224 GB per second.
2- Efficient and Cheaper: Li-Fi is more efficient and cheaper than Wi-Fi due to the nature of LED bulbs. It will save costs in homes and workplaces as it can work without electronic devices such as routers, modems, and so forth.
3- Security: Radio waves can be intercepted by people outside your network as they can pass through walls, compromising the security of your data. However, light can be stopped by opaque objects, making Li-Fi more secure than Wi-Fi. Additionally, some rooms can be designated as high-security areas with their own Li-Fi networks.
4- Availability: With Li-Fi, every light source can facilitate you with the internet. Once the technology is available to the general public, it can be accessed via street lights, building lights, and so forth.

Cons of Li-Fi:

1- Limited Range: As light cannot penetrate through walls, it is good with the security point of view but it provides a limited range. Thus, Li-Fi can be effectively used in closed spaces. In open spaces, Wi-Fi's coverage can go up to 32 meters as compared to Li-Fi.
2- Limited Compatibility: As technology is new, not many devices are compatible with it.
Importance of Li-Fi:

1- Year-over-Year, consumption of wireless data is increasing by 60%. This means that the radio-frequency space is becoming saturated and may lead to spectrum crunch-- *lack of sufficient wireless frequency to support increasing consumers*-- negatively impacting the speed of internet usage.

2- Li-Fi can be applied in traffic control systems using a car's headlights or in chemical manufacturing plants where radio frequency is too dangerous.

3- With Li-Fi, the spectrum can be utilized more than 1000 times greater than the entire spectrum used for radio frequencies.

4- It provides more access points in comparison to Wi-Fi.

Thus, there's a need for Li-Fi as Wi-Fi won't be able to keep up with the increased demand for data and can be used in places where radio waves cannot reach.

Questions on Optical Communication

- ***Rohith . R , IV ECE***

1. Which equations are best suited for the study of electromagnetic wave propagation?
   a) Maxwell's equations
   b) Allen-Cahn equations
   c) Avrami equations
   d) Boltzmann's equations
2. When λ is the optical wavelength in vacuum, k is given by $k=2\Pi/\lambda$. What does k stand for in the above equation?
   a) Phase propagation constant
   b) Dielectric constant
   c) Boltzmann's constant
   d) Free-space constant
3. Constructive interference occur when total phase change after two successive reflections at upper and lower interfaces is equal to? (Where m is integer)
   a) $2\Pi m$
   b) Πm
   c) $\Pi m/4$
   d) $\Pi m/6$
4. When light is described as an electromagnetic wave, it consists of a periodically varying electric E and magnetic field H which are oriented at an angle?
   a) 90 degree to each other
   b) Less than 90 degree
   c) Greater than 90 degree
   d) 180 degree apart
5. A monochromatic wave propagates along a waveguide in z direction. These points of constant phase travel in constant phase travel at a phase velocity V_p is given by?
   a) $V_p=\omega/\beta$
   b) $V_p=\omega/c$
   c) $V_p=C/N$
   d) V_p=mass/acceleration
6. Which is the most important velocity in the study of transmission characteristics of optical fiber?
   a) Phase velocity
   b) Group velocity
   c) Normalized velocity
   d) Average velocity
7. What is refraction?
   a) Bending of light waves

b) Reflection of light waves
c) Diffusion of light waves
d) Refraction of light waves

8. The phenomenon which occurs when an incident wave strikes an interface at an angle greater than the critical angle with respect to the normal to the surface is called as _____
   a) Refraction
   b) Partial internal reflection
   c) Total internal reflection
   d) Limiting case of refraction
9. An optical fiber has a core radius 2μm and a numerical aperture of 0.1. Will this fiber operate at single mode at 600 nm?
   a)Yes
   b) No
10. What is needed to predict the performance characteristics of single mode fibers?
    a) The intermodal delay effect
    b) Geometric distribution of light in a propagating mode
    c) Fractional power flow in the cladding of fiber
    d) Normalized frequency

Answers:

1. a) Maxwell's equations
2. a) Phase propagation constant
3. a) 2Πm
4. a) 90 degree to each other
5. a) $V_p=\omega/\beta$
6. b) Group velocity
7. a) Bending of light waves
8. c) Total internal reflection
9. a) Yes
10. b) Geometric distribution of light in a propagating mode

LOGIC PUZZLES

- ***Nivethika.R, IV ECE***

1. On taking delivery of a consignment of eggs the market stall owner was furious to find that several were cracked. In fact, on counting them up in order to assess the damage he found that 72 were cracked, which was 12 per cent of the total consignment. How many eggs in total were in the consignment?
   Answer: 600.
2. At college, 70% of the students studied Maths, 75% studied English, 85% studied French and 80% studied German. What percentage at least must have studied all 4?
   Answer:10
3. A card player holds 13 cards of four suits, of which seven are black and six are red. There are twice as many hearts as clubs and twice as many diamonds as hearts. How many spades does he hold?
   Answer:6

4. A B C D E F G H
   What letter comes two to the right of the letter which is immediately to the left of the letter that comes three to the right of the letter that comes midway between the letter two to the left of the letter C and the letter immediately to the right of the letter F?
   Answer:H
5. A train moving at 49 mph meets and is passed by a train moving at 63 mph. A passenger in the first train noted that the second train took AS seconds to pass him. How long is the second train?
   Answer: 740.46ft.

Send your suggestions to:

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Editors Desk

Benefits of meditation

- *Gaining a new perspective on stressful situations.*
- *Building skills to manage your stress.*
- *Increasing self-awareness.*
- *Focusing on the present.*
- *Reducing negative emotions.*
- *Increasing imagination and creativity.*
- *Increasing patience and tolerance.*

Vision of the Institute

To blossom into a cynosure of technological innovations

Mission of the Institute

To participate in the noble cause of nation building by offering professional education, research and training in engineering and technology especially to the rural based poor Students

Department Vision

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

Department Mission

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

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To enable graduates to pursue research, or have a successful career in academia or industries associated with Electronics and Communication Engineering, or as entrepreneurs.

PEO2: To provide students with strong foundational concepts and also advanced techniques and tools in order to enable them to build solutions or systems of varying complexity.

PEO3: To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

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)

1. To analyze, design and develop solutions by applying foundational concepts of electronics and communication engineering.
2. To apply design principles and best practices for developing quality products for scientific and business applications.
3. To adapt to emerging information and communication technologies (ICT) to innovate ideas and solutions to existing/novel problems.