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

|Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai|
|Accredited by NBA (CSE, EEE,ECE&Mech), & NAAC with A Grade (3rd Cycle) |
|An ISO 9001:2015 Certified Institution|

Department of Electronics and Communication Engineering

(Accredited by NBA)

"LEMON NEWSLETTER"

Volume: 12 ***Month: August'24*** ***Issue:04***

Message from Head of the Department

I look forward from the faculties of our department to involve themselves in submitting funding proposals.

I expect from the final and third year students to go for the internship so that it would be easier for them to get placed in reputed companies.

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

Dr.CHITRAVALAVAN
HOD/ECE

MINDFULLNESS

"Mindfulness means being awake. It means knowing what you are doing."

"Life gives you plenty of time to do whatever you want to do if you stay in the present moment."

"Mindfulness gives you time. Time gives you choices. Choices, skillfully made, lead to freedom."

"When you're quiet, everything settles on the floor of your mind like sediment in undisturbed still water."

"Nowhere can man find a quieter or more untroubled retreat than in his own soul."

Faculty Corner:

Recent Advancements in Image Processing

- ***Dr.K.R.Vinothini, ASP/ECE***

Recent advancements in image processing are heavily driven by deep learning algorithms, particularly Convolutional Neural Networks (CNNs), which enable highly accurate image analysis, object detection, and image restoration by learning complex features directly from large datasets, leading to significant improvements in tasks like image recognition, segmentation, and enhancement compared to traditional methods; key areas of innovation include Generative Adversarial Networks (GANs) for image synthesis, multi-scale processing for image restoration, and advanced techniques for handling challenging scenarios like low-light imaging and medical image analysis.

- **Deep Learning Dominance:**

CNNs are the primary driving force in modern image processing, offering superior performance in tasks like object detection, image classification, and semantic segmentation due to their ability to automatically learn features at different levels of abstraction.

- **Generative Adversarial Networks (GANs):**

These networks allow for the creation of realistic images by pitting two neural networks against each other - a generator creating images and a discriminator trying to distinguish real from generated images. This is useful for tasks like image inpainting, style transfer, and generating high-resolution images.

- **Multi-Scale Processing:**

This approach analyzes images at different scales to capture details at varying levels of resolution, which is beneficial for tasks like image restoration, where information from multiple scales can be combined to reconstruct a high-quality image.

- **Attention Mechanisms:**

These mechanisms allow the network to focus on specific regions of an image, which can improve performance in tasks like object detection and image segmentation by allocating more attention to important areas.

Specific examples of new algorithms in image processing:

- **U-Net:**

A convolutional neural network architecture often used for medical image segmentation, particularly in tasks like cell detection and tumor boundary delineation.

- **Deep Image Prior:**

A technique for image restoration that leverages the internal structure of a deep neural network to reconstruct missing information in an image.

- **Style Transfer Algorithms:**

These algorithms can apply the artistic style of one image to another, creating visually appealing results.

- **Real-Time Object Detection Networks (e.g., YOLO, SSD):**

These networks are designed for fast object detection in video streams, enabling real-time applications like autonomous driving and surveillance.

Impact on various fields:

- **Healthcare:** Improved diagnosis and analysis of medical images like X-rays, MRIs, and CT scans.
- **Autonomous Vehicles:** Precise object detection and segmentation for self-driving cars
- **Retail:** Enhanced product recognition and customer behavior analysis through video surveillance
- **Security:** Advanced face recognition and anomaly detection systems

Student Corner :

OPTICAL NETWORKING TECHNOLOGY

- ***B. Arooran, IV ECE***

Over 30 years ago, optical communication (OC) for data transmission was first demonstrated. It uses two basic technologies: wireless Free Space Optical (FSO) transmission and fiber optic technology using a physical wire. In terms of distance, bandwidth, speed, dependability, and other improvements that support its use, optical fiber technology has advanced significantly over time.

In order to meet the constantly rising demands for higher capacity, lower energy consumption, and its cost in system design to grant novel applications and emerging new technologies in the optical domain, researchers from all over the world and different expertise from different fields such as electronics, communications, photonics, and signal processing, have contributed side by side.

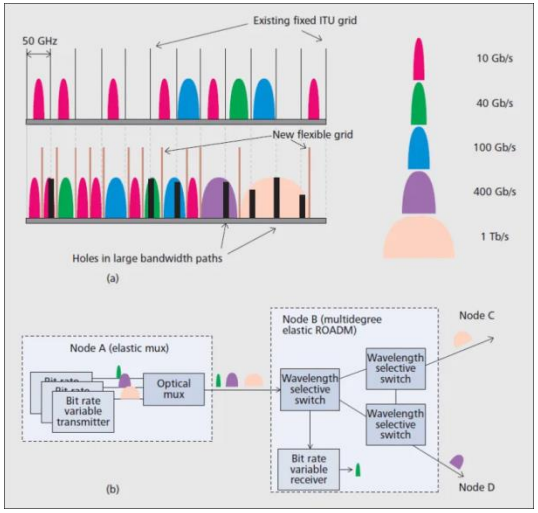
1. Elastic optical network (EON)

The Elastic Optical Network (EON) is a network architecture designed to accommodate the increasing demand for flexibility in optical network resource distribution. It enables flexible bandwidth allocation to support different transmission systems, such as coding rates, transponder types, modulation styles, and orthogonal frequency division multiplexing. However, this flexibility poses challenges in the distribution of resources, including difficulties in network re-optimization, spectrum fragmentation, and amplifier power settings. Hence, it is crucial to closely integrate the control elements (controllers and orchestrators) and optical monitors at the hardware level to ensure efficient and effective operation.

2. OC super-channel with high capacity and speed

A workable alternative that enables extremely fast, long-distance, spectrally efficient, and big data capacity links with dependable performance are the super-channel new technology. It uses dual polarization-quadrature phase shift keying to transmit data over a single channel using a number

of sub-carriers (DP-QPSK). Over a single channel, these special modulation styles can transmit data at speeds of more



than 100 Gbps. However, they are limited in the number of supported links and suffer from multipath fading, nonlinearity loss, phase distortion loss, and other problems. Coherent detection and digital signal processing (DSP) at the receiver terminal are used to reduce these restrictions for better performance

2. OC super-channel with high capacity and speed

A workable alternative that enables extremely fast, long-distance, spectrally efficient, and big data capacity links with dependable performance are the super-channel new technology. It uses dual polarization-quadrature phase shift keying to transmit data over a single channel using a number of sub-carriers (DP-QPSK). Over a single channel, these special modulation styles can transmit data at speeds of more than 100 Gbps. However, they are limited in the number of supported links and suffer from multipath fading, nonlinearity loss, phase distortion loss, and other problems. Coherent detection and digital signal processing (DSP) at the receiver terminal are used to reduce these restrictions for better performance

Technology used to implement OC capabilities

The need for fast solutions is expanding as the demand for very large capacity and high-speed channels for heavy data transfer grows. In order to address the transmission demand and security issues, a wide range of solutions utilizing optical fiber technology and free-space wireless channels have been successful.

1. OAM multiplexing for secure optical communications with high capacity

The orthogonality of the OAM beams is used by orbital angular momentum (OAM) to enable effective demultiplexing. Data transfer applications frequently employ

free-space communication networks that employ radio frequency (RF) or optical waves for communication. A communication system's capacity is boosted by multiplexing and transmitting numerous independent data streams concurrently.

This is accomplished by utilizing electromagnetic (EM) wave characteristics like time, wavelength, and polarization. Effective multiplexing and demultiplexing of multiple data streams are possible.

There is a growing need for very high bandwidth; hence new types of data channel multiplexing are being developed to meet that need. We can get very high xTpbs speed communications by combining OAM multiplexing and polarization.

2. Secure, high-speed, and bandwidth OC based on Chaos

In a secure OC, chaotic systems offer physical layer security. The chaotic carrier's bandwidth determines how much data may be transmitted in chaos-based secure communication. The chaotic carrier can sustain higher transmission rates, the broader its bandwidth.

Various methods have been proposed to increase the bandwidth of chaos, including mutual injection, optical injection, heterodyning couplings, fiber propagation, feedback with parallel-coupling ring resonators, and self-phase-modulated feedback with a microsphere resonator.

3. Intensity modulation signals for optical communications' physical layer security

Attackers cannot intercept the sent encrypted text due to employing a Y-00 quantum-noise randomized stream cipher. This technology combines physical randomness with mathematical multi-level signalling encryption to deliver excellent performance and reliable security. Extremely high-order modulation, quantum noise, and additive noise are all used. Because there is a very small chance that attackers will successfully guess the encrypted data, a high level of secrecy has been established.

4. OWC technology for 5G and the Internet of Things

The average transmission rate of the 5G mobile communication systems is predicted to be 1 Gbps, with a peak rate of 10 Gbps. OWC's distinct qualities—wide spectrum, high data rate, low latency, high security, low cost, and low energy consumption—seem to satisfy the specified requirements. OWC includes optical camera communication (OCC), free-space optics, light fidelity (LiFi), visible light communication (VLC), and (FSO). Its solutions may

contribute to comprehensive IoT device connectivity through sensing, monitoring, and resource sharing while also meeting the high-security requirements of 5G and IoT.

Additionally, a hacker device cannot detect the internal optical signal on an external network. Information can be transferred in a very secure way.

PUZZLES FOR INTERVIEW

- ***Gayathri P,III ECE***

1.You have three bottles of milkshakes that are all mislabelled. One contains Oreo shake, another Kitkat shake, and the third has a mix of both in random proportion. How many minimum shakes would you have to taste to find out how to match the jars' labels correctly?

- A- Oreo Shake
- B- KitKat Shake
- C- Oreo-KitKat Shake (random proportion)

Solution:

We know that all bottles are mislabelled, i.e. Bottle A labelled as Oreo Shake is not Oreo Shake, and the same goes for all the other bottles.

Take a sip from the Mix Bottle, i.e. Bottle C. We know that it is not the mixed shake as it is mislabeled, so if it is the Oreo shake, then Bottle A is KitKat, since Bottle B is mislabeled as KitKat, and therefore Bottle B is Mixed.

Similarly, Bottle C is KitKat. Bottle B is Oreo as Bottle A can't be Oreo [mislabeled as Oreo]. Therefore Bottle A is mixed.
So we can correctly label the bottles in one tasting.

2. A company manufactures robots. Few robots are programmed to tell the truth no matter what, whereas others are programmed to lie. So there are two communities in the factory, i.e. the Truth Community and the Lie Community.You meet with three robots and ask one of them which community do you belong to? Robot 1 replies to something in binary that you don't understand. The Second robot says that Robot 1 belongs to Lie Community. The Third Robot says that the Second Robot is lying. Which community does the Third Robot belong to?

Solution:

Let's assume Robot 1 belongs to the Truth Community. If so, he will not lie and tell he's from the truth community. In this case, Robot 2 is Lying, and Robot 3 is right about it. If Robot 1 belongs to the Lie Community, he will lie from Truth Community, which means Robot 2 is again lying, which makes Robot 3 again being right about it. Therefore Robot 3 is from the "TRUTH COMMUNITY".

GATE Questions based on Digital Electronics

- ***Kamalika.K, IV ECE***

1. The photocurrent of a PN junction diode solar cell is 1 mA1 mA. The voltage corresponding to its maximum power point is 0.3 V0.3 V. If the thermal voltage is 30mV30mV, the reverse saturation current of the diode (in nAnA, rounded off to two decimal places) is _____
2. In an ideal pn junction with an ideality factor of 1 at T=300 K, the magnitude of the reverse-bias voltage required to reach 75% of its reverse saturation current, rounded off to 2 decimal places, is ____mV.
3. A solar cell of area $1.0cm^2$, operating at 1.0 sun intensity, has a short circuit current of 20 mA, and an open circuit voltage of 0.65 V. Assuming room temperature operation and thermal equivalent voltage of 26mV, the open circuit voltage (in volts, correct to two decimal places) at 0.2 sun intensity is _____.
4. A p-n step junction diode with a contact potential of 0.65V has a depletion width of 1μm at equilibrium. The forward voltage (in volts, correct to two decimal places) at which this width reduces to 0.6 μm is _____.
5. In a p-n junction diode at equilibrium, which one of the following statements is NOT TRUE?

   A. The hole and electron diffusion current components are in the same direction.

   B. The hole and electron drift current components are in the same direction

   C. On an average, holes and electrons drift in opposite direction.

   D. On an average, electrons drift and diffuse in the same direction.

Answers:

1. ***4.13nA***
2. ***35.83mV***
3. ***0.608V***
4. ***0.42 V***
5. ***D.On an average, electrons drift and diffuse in the same direction.***

11 Job Interview Skills

- ***B.Manobalan, IV ECE***

Before the interview:

- Self-preparation
- Research
- Mastering your emotions
- Logistical planning

During the interview:

- Communication
- Introducing yourself
- Presenting your qualifications

- Listening
- Asking questions

After the interview:

- Following up with your interviewer
- Reflect on your interview and refine your methods.

BRAIN TEASERS

- ***P.Manikandan, III ECE***

1. What is so fragile that saying its name breaks it?

2. I'm tall when I'm young, and I'm short when I'm old, what am I?

3. What is as big as you are and yet does not weigh anything?

4. What word is spelled wrong in the dictionary?

5. What can travel around the world while staying in a corner?

6. What can run but not walk, has a mouth but never talks, has a head but never weeps, has a bed but never sleeps?

7. Do you know what you can hold without ever touching it?

8. Flat as a leaf, round as a ring; Has two eyes, can't see a thing. What is it?

9. Where can you find roads without cars, forests without trees, and cities without houses (without people)?

10. What loses its head in the morning and gets it back at night?

Answers:

1) Silence
2) Candle
3) Your Shadow
4) Wrong
5) A postage stamp.
6) A river.
7) Your breath.
8) A button.
9) A map.
10) A pillow

Editors Desk

Yoga for Students

Yoga can benefit students in many ways, including improving their mental and physical health, concentration, and self-control.

Mental health

- **Stress reduction**: Yoga can help students manage stress and anxiety
- **Mental clarity**: Yoga can help students focus and be more mindful
- **Emotional balance**: Yoga can help students develop emotional wellness and resilience
- **Self-control**: Yoga can help students learn to control their impulses and make rational decisions

Physical health

- **Strength, balance, and flexibility**: Yoga can help students improve their strength, balance, and flexibility
- **Posture**: Yoga can help students improve their posture
- **Energy levels**: Yoga can help students boost their energy levels
- **Sleep quality**: Yoga can help students sleep better
  Other benefits
- **Memory and concentration**: Yoga can help students improve their memory and concentration
- **Self-esteem and confidence**: Yoga can help students improve their self-esteem and confidence
- **Academic performance**: Yoga can help students improve their academic performance
- **Coping skills**: Yoga can help students learn how to cope with stress and stay productive

Send your suggestions to:

Dr.K.R.Vinothini, ASP/ECE –Editor / ***LEMON NEWSLETTER***
lemonece2013@gmail.com

Student Editors :

1. S.Abirami, IV ECE
2.B.Arooran, IV ECE
3.P.Manikandan, III ECE
4.D.Prithika, III ECE

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