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(Autonomous Status Since the Academic Year 2010-11 & Extended up to 2031-32)
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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Estd: 1998

Department of Electronics and Communication Engineering

Report on One Week Online FDP on
"Advanced Signal Processing for Sensing, Health and Intelligent Systems" using Microsoft Teams

Event Type : FACULTY DEVELOPMENT PROGRAM (FDP)

Date / Duration : 23rd – 28th Febraury, 2026 (ONE WEEK)

Resource Persons :

1. **Dr. Pradeep Kumar Gajendra Bhale, IIITDM, Kancheepuram**
2. **Dr. E. S. Gopi, Professor, NIT, Tiruchirappalli**
3. **Mr.T.Venkata Krishna , Harman International**
4. **Dr.G.L.N. Murthy, Professor, Lakireddy Bali Reddy College of Engineering, Mylavaram**
5. **Mr.T.Anil Raju , Associate Professor, Lakireddy Bali Reddy College of Engineering, Mylavaram**

Convener : Dr. G.Srinivasulu, Professor & HoD

Coordinator : Dr. G L N Murthy, Professor
Co-Coordinators : Mr. T.Anil Raju, Associate Professor
Mr.v.V.Ramakrsihna, Associate Professor
Mr.M.Sambasiva Reddy, Sr. Assistant Professor

Total no of Participants: 334 (Internal Count=37 & External Count=297)

Objective of the event: The Faculty Development Program (FDP) on Advanced Signal Processing for Sensing, Health, and Intelligent Systems aims to enhance the knowledge and research capabilities of faculty members in emerging signal processing techniques and their interdisciplinary applications. The program focuses on bridging the gap between classical signal processing concepts and modern technological requirements in areas such as biomedical signal analysis, smart sensing systems, radar and sensor networks, and intelligent autonomous systems.

The FDP also aims to expose faculty to current research trends, practical case studies, and application-driven approaches that address challenges in healthcare monitoring, environmental sensing, and intelligent decision-making systems. By integrating theoretical foundations with practical insights, the program seeks to encourage interdisciplinary research, strengthen teaching methodologies, and motivate participants to develop innovative solutions for next-generation sensing, healthcare, and intelligent technologies.

Outcome of event   :

- ➢ Provides deeper understanding of modern signal processing techniques used to analyze complex, non-stationary, and noisy signals in real-world applications such as sensing, healthcare monitoring, and intelligent systems.
- ➢ Develops the ability to process and interpret signals from biomedical devices, radar systems, and sensor networks using advanced analytical and computational methods.
- ➢ Makes familiar with current trends in sensing technologies, smart healthcare systems, autonomous systems, and integrated communication–sensing frameworks.
- ➢ Enhances the ability to identify research problems, formulate methodologies, and contribute to high-quality research in advanced signal processing.
- ➢ Promotes collaboration across domains such as electronics, biomedical engineering, and intelligent systems.

Description / Report on Event:

The one week online FDP program began with brief inaugural that was addressed by Principal Dr.K.Appa Rao , Head of the Department Dr.G.Srinivasulu. In his inaugural speech, Dr.G.Srinivasulu highlighted the significance of carrying out the multidisciplinary research by embedding current trends in the area of artificial Intelligence. In his inaugural address, Dr.K. Appa Rao mentioned that the FDP is aimed at getting acquainted with the current trends which in turn useful for the students in carrying out their projects and supports lifelong learning. It was also told that the FDP will obviously help the young faculty members to carry out the research in the emerging areas of signal Processing. Later the Dr.G.L.N.Murthy, Coordinator of the FDP has given the keynote address. It was told that irrespective of the latest trends technology, the scope of signal processing is still an ocean.

This was followed by a lecture on the emerging areas of signal processing and related challenges by Dr.G.L.N.Murthy. The lecture began with a discussion on the transition from classical signal processing techniques to advanced methodologies required for handling complex, real-world signals. Emphasis was placed on the analysis of signals obtained from modern sensing environments such as biomedical monitoring systems, radar and sensor networks, and intelligent autonomous platforms. The session highlighted the inherent challenges associated with these applications, including the non-stationary nature of physiological signals, low signal-to-noise ratio, environmental uncertainties, high-dimensional data streams, and real-time decision requirements in intelligent systems. These challenges demand sophisticated analytical frameworks beyond conventional techniques. The lecture therefore introduced advanced signal processing approaches such as time–frequency analysis, adaptive filtering, sensor fusion, and optimization-based signal processing methods that enable reliable extraction of meaningful information from complex datasets. Special attention was given to the role of advanced signal processing in enabling smart healthcare monitoring, modern sensing systems, and intelligent decision-making platforms. Through relevant examples and case studies, the session demonstrated how these techniques contribute to improved signal interpretation, system reliability, and efficient information processing. Overall, the lecture established a strong conceptual foundation for participants and highlighted key research opportunities in sensing, healthcare, and intelligent system applications.

On day2, Dr.E.S.Gopi, Professor, NIT, Tiruchurapalli has delivered a lecture on Dimensionality Reduction Techniques for Health and Intelligent Systems that focused on addressing the challenges associated with processing high-dimensional data generated by modern sensing and monitoring technologies. In many healthcare and intelligent system applications, large volumes of data are collected from multiple sensors such as ECG, EEG, wearable devices, imaging systems, and environmental sensors. These datasets often contain redundant or correlated features, which increase computational complexity and may degrade system performance. Dimensionality reduction techniques play a crucial role in extracting the most informative features while minimizing data redundancy.

The session introduced the theoretical foundations of dimensionality reduction and its importance in improving data representation, computational efficiency, and model interpretability. Classical techniques such as Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) were discussed for transforming high-dimensional data into lower-dimensional spaces while preserving important statistical properties. The session also highlighted advanced approaches capable of capturing nonlinear relationships in complex datasets, which are particularly useful in biomedical signal analysis and intelligent decision-making systems.

Applications of dimensionality reduction in healthcare monitoring systems, disease diagnosis, wearable sensor data analysis, and intelligent autonomous platforms were presented to illustrate practical relevance.

On day 3, Mr.T.Anil Raju Associate Professor, Department of ECE has exposed te participants to Advanced Perfusion MR Imaging for Brain Stroke Detection . Stroke is a critical neurological condition caused by the interruption or reduction of blood flow to the brain, leading to potential brain tissue damage. Early and accurate diagnosis is essential for timely medical intervention and effective treatment. Perfusion Magnetic Resonance Imaging (MRI) plays a significant role in evaluating cerebral blood flow and identifying affected brain regions during the early stages of stroke. The session explained the principles of perfusion MR imaging, where parameters such as cerebral blood flow (CBF), cerebral blood volume (CBV), and mean transit time (MTT) are measured to assess the hemodynamic condition of brain tissues. Advanced signal processing techniques are used to analyse dynamic contrast-enhanced MRI data and extract meaningful physiological information from complex imaging signals. These techniques help distinguish between the ischemic core and the surrounding penumbra, which is critical for determining appropriate therapeutic strategies. The session also provided the basic mathematics behind the perfusion imaging. The lecture also discussed the integration of advanced image processing and computational methods to improve the accuracy and reliability of stroke detection.

Dr.Pradeep Kumar Gajendra Bhale has presented a talk the security threats in IoT and sensing environment on day4. The session on "Unlocking Hidden Patterns in IoT and Cyber-Physical Signals" focused on the role of advanced signal processing techniques in analysing and extracting meaningful information from signals generated by Internet of Things (IoT) devices and Cyber-Physical Systems (CPS). Modern IoT environments consist of interconnected sensors and devices that continuously generate large volumes of data related to physical processes such as environmental monitoring, industrial automation, smart transportation, and healthcare systems. These signals are often complex, dynamic, and affected by noise, interference, and varying operational conditions. The session highlighted the challenges associated with processing IoT and CPS signals, including high data dimensionality, heterogeneous sensor sources, and the need for real-time analysis. Advanced signal processing methods such as time–frequency analysis, feature extraction, data fusion, and pattern recognition play a crucial role in identifying hidden patterns and correlations within these data streams. These techniques enable efficient interpretation of sensor signals and support intelligent decision-making in real-time applications.

In continuation of day 5, Dr. Pradeep has elaborate the role of machine learning and signal processing in dealing the security threats in sensing environment. focused on the importance of advanced signal processing techniques for identifying cyber threats in Internet of Things (IoT) environments. Modern IoT systems consist of interconnected sensors, devices, and communication networks that continuously exchange data. Due to their distributed nature and limited computational resources, IoT networks are often vulnerable to various cyber-attacks such as spoofing, jamming, denial-of-service (DoS), and data manipulation. Detecting such malicious activities in real time is therefore a critical challenge.

On the final day of the one week FDP, Mr.T.Venkata Krishna, Harman International has highlighted the real time environments where signal processing plays a vital role. The session focused on the role of intelligent audio signal processing techniques in enhancing safety, comfort, and user interaction within modern smart vehicles. With the rapid advancement of intelligent transportation systems, smart cars are increasingly equipped with multiple microphones and audio sensors that continuously capture acoustic signals from both the vehicle interior and external environment. These signals include driver voice commands, passenger speech, traffic sounds, sirens, and other environmental acoustic events.

The lecture highlighted how Artificial Intelligence (AI) and advanced audio signal processing techniques are used to analyze and interpret these complex acoustic signals in real time. Techniques such as feature extraction, speech recognition, sound classification, and noise suppression enable the system to accurately identify relevant audio cues while filtering out background noise from engines, road vibrations, and wind disturbances. AI-based models help distinguish between different acoustic events such as emergency vehicle sirens, driver commands, and abnormal vehicle sounds.

Applications of AI-based audio processing in smart cars include voice-controlled infotainment systems, driver assistance systems, emergency siren detection, driver behaviour monitoring, and cabin noise reduction. These capabilities significantly improve driver safety, situational awareness, and overall driving experience.

Feedback/Suggestions:

1. Sessions during evening
2. Practical Sessions
3. FDPs on emerging areas Quantum Computing, Block chain technology, Digital image processing with Quantum technology

Photographs:
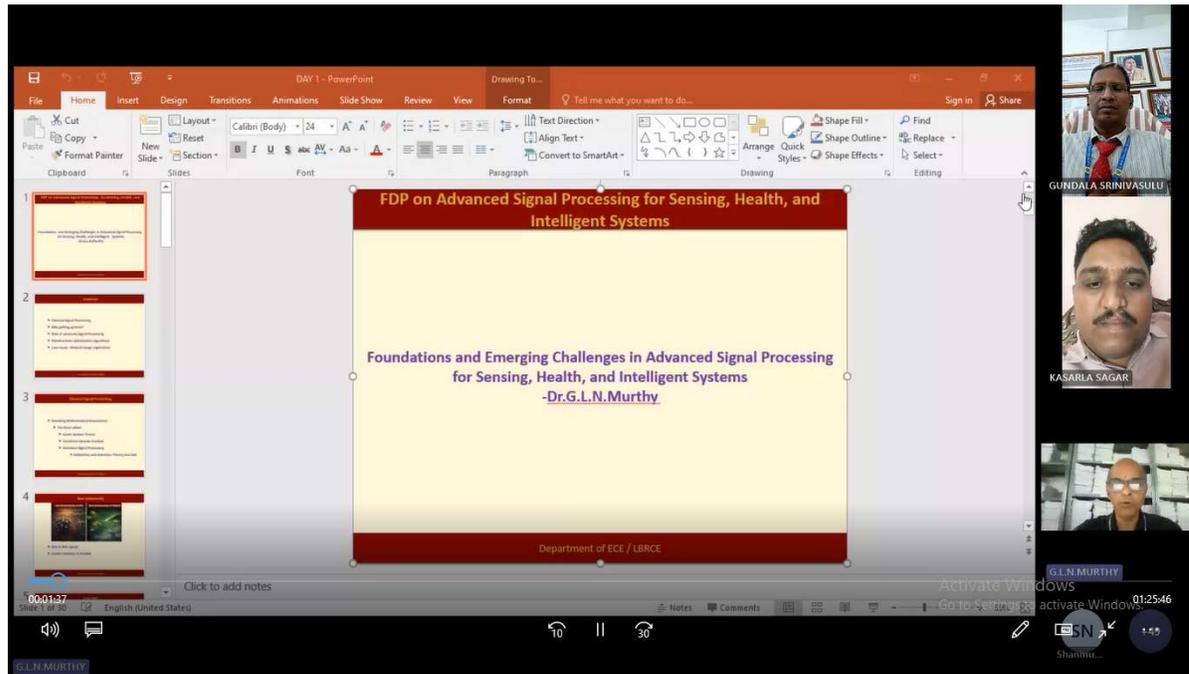
Addressing by Dr.G.Srinivasulu, Head of the department

Dr.G.L.N.Murthy, resource Person for Day1 delivering the session
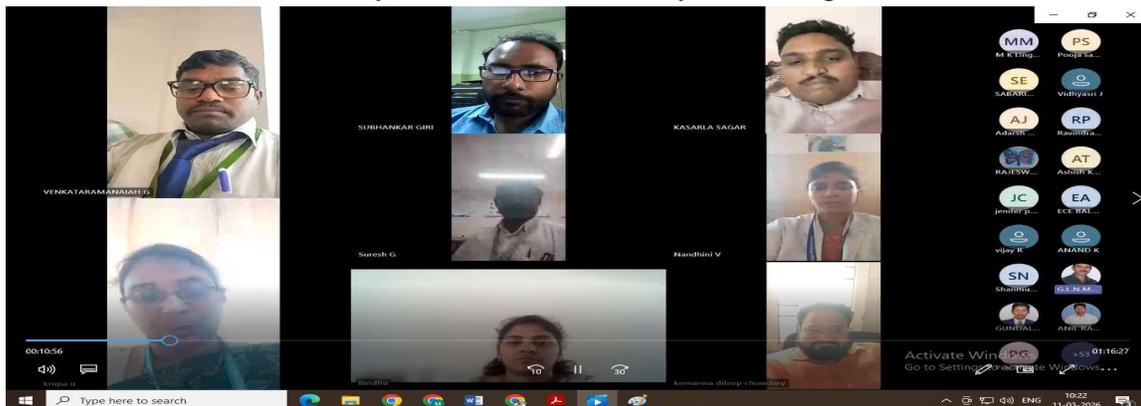
Participants from reputed organizations on Day1

Dr.E.S.Gopi delivering his lecture on dimensionality reduction on Day2

Mr.T.Anil Raju delivering lecture on Advanced Perfusion MR Imaging for Brain Stroke Detection on Day 3

Dr.Pradeep Kumar Gajendra Bhale introducing the building blocks of IT on Day 4

Dr.Pradeep Kumar elaborating the role of Signal Processing on Day 5

Mr.T.Venkata Krishna, resource person for Day 6, delivering a lecture on current trends in signal processing

Participants listening to Mr.Venkata Krishna
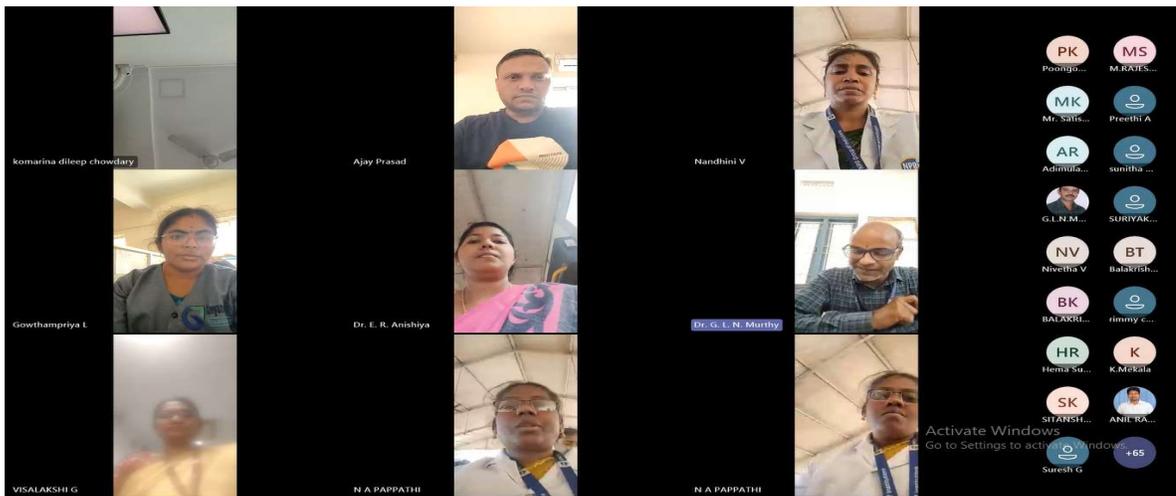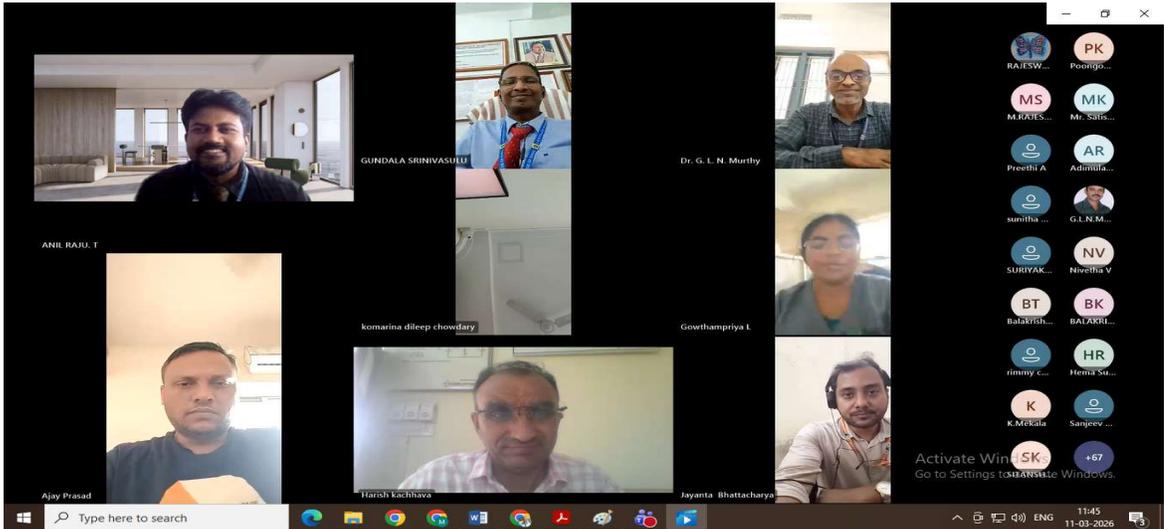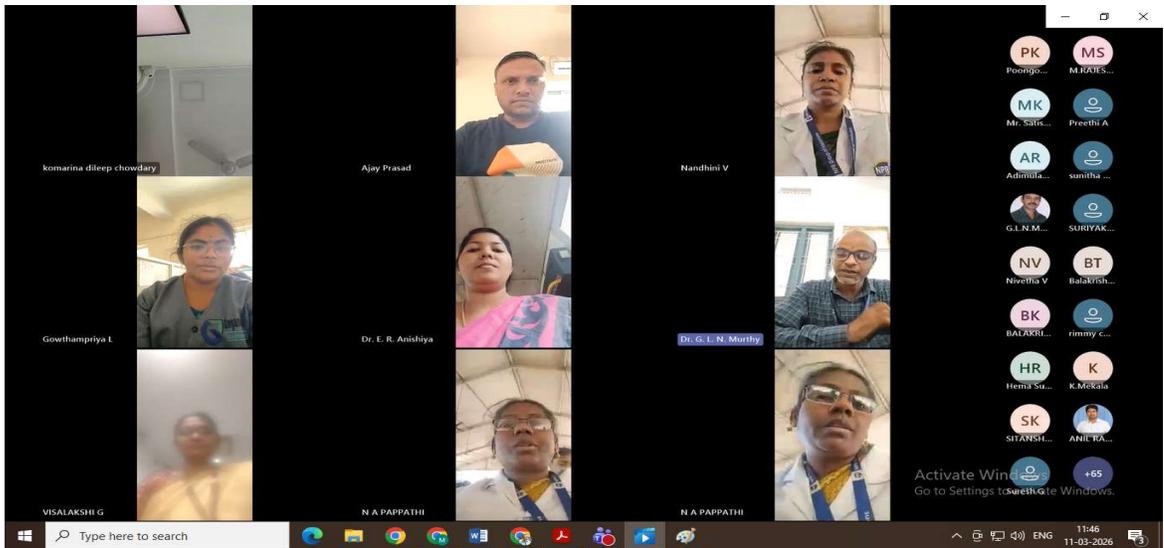
Participants on the last date of the one week online FDP