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A Five-Day Faculty Development Programme on Artificial Intelligence Foundations for Engineers

20 December 2025

The Department of Electrical and Electronics Engineering (EEE), NMAM Institute of Technology, Nitte, organised a Five-Day Faculty Development Programme (FDP) on "Artificial Intelligence Foundations for Engineers" between 15-19 December 2025. The institution, a constituent college of Nitte (Deemed to be University), is nationally recognised for its academic excellence and strong industry linkages and placed in the NIRF 2024 rank band of 151–200. With the state-of-the-art laboratories, active research centres and collaborations with several international universities and industries, NMAMIT provides a conducive environment for advancing engineering education and research.

The FDP was designed to introduce faculty members and researchers to the core principles, mathematical foundations and practical applications of Artificial Intelligence (AI) along with Machine Learning (ML) and Deep Learning (DL) techniques. Expert resource persons from NITK Surathkal, NMAMIT Nitte and MIT Manipal delivered a balanced mix of conceptual sessions, hands-on labs and research-oriented discussions. The program emphasised real-world engineering applications of AI-especially in domains such as computer vision, electric vehicle technologies, battery management systems and speech processing.

Through systematic exposure to AI tools, platforms like Python and KNIME and domain-specific modelling frameworks, the FDP aimed to build foundational competence among participants. By the end of the program, participants were expected to gain conceptual clarity, practical AI implementation skills and insights into emerging research opportunities across engineering disciplines.

Day 1:

The Five-Day Faculty Development Programme on "Artificial Intelligence Foundations for Engineers" commenced with a formal inauguration on 15 December 2025 at the PG & Research Laboratory, Sir M. Visvesvaraya Block, NMAMIT, Nitte. The ceremony was graced by Dr. A. V. Narasimhadhan, Associate Professor, Department of Electronics & Communication Engineering, NITK Surathkal, who served as the Chief Guest. Dr. Suryanarayana K, Professor and Head, Department of EEE, NMAMIT, Nitte welcomed the guests and briefed about the

![NITTE - NMAM Institute of Technology logo]

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objective of the FDP. Dr. Chiranjeevi Yarramsetty, Assistant Professor, Grade-III briefed about the contents to be covered in the FDP and provided the details of resource person of FDP. Dr. Nagesh Prabhu, Vice Principal stressed on the importance of adopting ourselves to recent advancement like AI and wished every success for the FDP. Dr. Girisha Joshi, Associate Professor proposed the vote of thanks. The inaugural session set the tone for the program by highlighting the significance of AI-driven technologies in modern engineering and the need for faculty to stay abreast of emerging computational methodologies. The invocation was sung by Miss. Siddhi Sharma B and Dr. Nandini K K, Assistant Professor, Grade-III compered the inaugural ceremony.

Following the inauguration, Dr. A. V. Narasimhadhan delivered an insightful keynote address, offering a comprehensive perspective on the evolution of Artificial Intelligence and its transformative impact on engineering systems. His talk emphasized the foundational concepts, real-world applications and the expanding research landscape in AI. The session provided participants with a strong conceptual grounding, effectively setting the stage for the technical sessions that followed over the subsequent days.

The session on "Mathematical Foundations of Artificial Intelligence and Machine Learning" provided the participants with a rigorous introduction to the core mathematical principles that underpin modern AI systems. Dr. Narasimhadhan began by reviewing essential linear algebra concepts such as vectors, matrices, transformations and their role in representing data and model parameters. He highlighted the significance of calculus-particularly gradients and partial derivatives-in the training of machine learning models through optimisation techniques like gradient descent.

Day 2:

The first session, "Transforming Electronics with AI", delivered by Dr. Bhawana Rudra from NITK Surathkal, explored how Artificial Intelligence is reshaping modern electronic systems by enabling smarter sensing, adaptive control and predictive functionality. Dr. Rudra discussed the integration of machine learning algorithms into embedded platforms, demonstrating how AI enhances signal processing, system reliability and real-time decision-making in electronic devices. She highlighted practical applications where AI-driven models significantly improve fault

detection, system optimisation and automation across various electronic domains. The session provided the participants with valuable insights into the convergence of electronics and intelligence, emphasizing that future innovations in electronic design and applications will be deeply influenced by AI-enabled technologies.

The next session "Deep Learning for Computer Vision", conducted by Dr. Dinesh Naik from NITK Surathkal, introduced the participants to the core principles of deep learning architectures used in modern vision systems. Dr. Naik explained how convolutional neural networks (CNNs) extract hierarchical features from images and enable tasks such as classification, detection and segmentation. Through illustrative examples, he highlighted the progression from traditional image-processing methods to data-driven feature learning, emphasizing the efficiency and accuracy of CNN-based approaches. In the subsequent hands-on session, participants gained practical exposure by implementing basic computer-vision models, experimenting with dataset preparation, filtering operations, feature extraction and training small CNN models. The session allowed them to observe the effect of hyperparameters, activation functions and optimisation techniques on model performance. Conducted in the Computer Lab at the CV Raman Block, the hands-on workshop strengthened conceptual understanding by translating theory into practice, ensuring that participants were confident in applying deep-learning techniques to real-world visual tasks.

Day 3:

The session "Introduction to Machine Learning Concepts and Supervised and Unsupervised Learning" provided participants with a comprehensive foundation in the core ideas, terminology, and methodologies that define the field of Machine Learning (ML). Dr. Manjula Gururaj began by introducing the fundamental objective of ML enabling systems to learn patterns from data and make data-driven predictions or decisions without being explicitly programmed. She explained the essential components of an ML workflow, including data collection, preprocessing, feature engineering, model training, validation and deployment. Special emphasis was given to understanding how learning occurs through optimization techniques such as gradient-based approaches. She elaborated on Supervised Learning, the most widely used paradigm in real-world applications. Through examples like classification and regression tasks, she demonstrated how labelled datasets guide algorithms to map inputs to outputs. Algorithms such as Linear

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Regression, Logistic Regression, Support Vector Machines, k-Nearest Neighbors and Decision Trees were introduced conceptually. Dr. Manjula stressed the importance of evaluating model performance using metrics such as accuracy, precision, recall, F1-score and error functions, highlighting how these metrices help in model improvement. The role of overfitting and underfitting was explained, along with strategies such as regularization, cross-validation and hyperparameter tuning. Next, the session moved to Unsupervised Learning, which deals with unlabelled data. Dr. Manjula explained how these methods uncover hidden structures and patterns within datasets. Key techniques discussed included clustering (k-means, hierarchical clustering), dimensionality reduction (PCA) and association rule mining. She provided practical insights into how unsupervised methods are particularly useful for exploratory analysis, anomaly detection, customer segmentation and pattern discovery in large datasets. Comparisons between supervised and unsupervised approaches helped participants clearly distinguish when each technique is appropriate.

A crucial part of the session involved linking ML concepts to engineering-oriented applications. Dr. Manjula illustrated how ML is increasingly used in fields such as electronics, healthcare, energy systems and automated monitoring. Participants were encouraged to think not only about the algorithms but also about data quality, domain context and problem-solving strategies. This holistic perspective helped participants understand ML as an interdisciplinary tool rather than a purely computational procedure.

The session was highly interactive, with participants asking questions related to practical use cases, dataset selection and choosing suitable models for real engineering problems. Dr. Manjula's structured approach ensured that even participants new to ML could grasp the key foundations needed for more advanced sessions in the FDP-especially those on model evaluation, explainable AI and hands-on implementation with Python and KNIME that followed later in the day.

Day 4:

The morning session provided a comprehensive overview of the design, operational principles, and key characteristics of electric vehicle battery systems. Dr. Veerendra Babu discussed the major battery chemistries used in contemporary electric vehicles, including Lithium-ion, LFP, NMC, and emerging solid-state technologies. He emphasised the key performance parameters

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energy density, power density, charge–discharge characteristics, cycle life, thermal behaviour and degradation mechanisms highlighting how these parameters govern overall EV performance. Participants were introduced to the structure of battery packs, including cells, modules and packs, along with design considerations like thermal management, safety mechanisms, mechanical stability and electrical balancing. The session also examined battery challenges, such as aging, capacity fade, thermal runaway risks and the impact of high C-rates on battery health. Through real-world examples, Dr. Babu demonstrated how battery performance directly influences EV range, reliability, safety and lifecycle cost, making battery expertise essential in EV engineering. The second session focused on Battery Management Systems (BMS)—the intelligence behind every EV battery pack. Dr. Babu explained the architecture of modern BMS units, covering sensing, data acquisition, state estimation, control logic, communication modules and safety protection layers.

The key functions discussed included:

- State of Charge (SoC) estimation
- State of Health (SoH) monitoring
- Cell balancing (active & passive)
- Thermal management
- Fault diagnosis and protection algorithms

He highlighted how Artificial Intelligence and Machine Learning models are increasingly used to enhance the accuracy of SoC/SoH estimation, predict battery failures and optimize operating conditions. AI-driven BMS strategies, such as neural-network-based estimators, predictive thermal control and data-driven degradation models were explained using illustrative examples. The participants gained insights into how AI can significantly improve battery lifespan, safety and robustness, especially under dynamic driving conditions. The afternoon hands-on session provided participants with practical experience in modelling battery cells and designing BMS algorithms.

Under the guidance of Dr. Veerendra Babu, attendees worked with simulation tools to:

- Construct basic equivalent circuit models for Lithium-ion cells (e.g., Rint models, RC network models).

> ➢ Understand and simulate open circuit voltage (OCV)–SoC relationships.

> ➢ Analyze cell behavior under varying load profiles.

> ➢ Implement cell balancing strategies and observe their effects on pack performance.

> ➢ Explore estimation techniques used for accurate SoC and SoH determination.

The lab enabled the participants to visualize how real battery data feeds into BMS decisions and how simulation tools assist in predicting and preventing adverse conditions like overcharge, deep discharge and overheating. The practical exposure strengthened their theoretical understanding and demonstrated how modelling supports BMS design, testing and validation in EV systems.
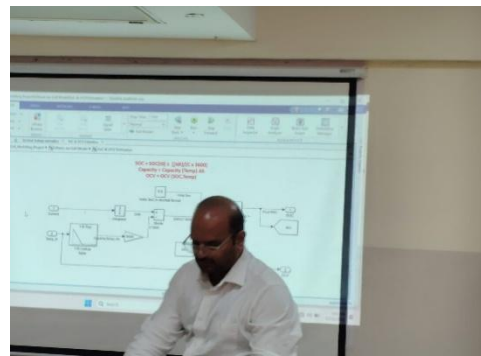
Day 5:

The first session "Basics and Research Avenues in Speech Processing", was delivered by Prof. Sashidhar G. Koolagudi from NITK Surathkal, an eminent researcher in the field of speech and audio signal processing. The session began with a foundational introduction to the nature of speech signals, covering essential concepts such as acoustics, phonetics, sampling, feature extraction and common signal representations like spectrograms and Mel-frequency cepstral coefficients (MFCCs). Prof. Koolagudi highlighted how speech differs from other signals because of its linguistic, acoustic and physiological dimensions, making its analysis both rich and complex.

He introduced classical and modern techniques used in speech processing, ranging from traditional signal-processing approaches to deep-learning-based architectures widely adopted today. The participants gained insights into key tasks such as speech recognition, speaker identification, emotion recognition, and speech synthesis. Building on these fundamentals, Prof. Koolagudi discussed emerging research avenues, including low-resource language modelling, multilingual speech systems, affective computing, and AI-driven speech analytics for real-world engineering applications. By integrating theoretical explanations with practical examples, the session helped participants understand not only how speech systems work but also where the field is progressing. It set a strong foundation for the subsequent hands-on session, enabling participants to better engage with tools and techniques used in modern speech-processing pipelines.

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The final session of the FDP, "Zupa Learning – Smarter Learning", was conducted by the expert team from Zupaoop Private Limited, who introduced participants to emerging AI-driven educational technologies that are reshaping the landscape of teaching and learning. The session focused on demonstrating how intelligent learning platforms can personalize content delivery, track learner progress and enhance conceptual clarity through adaptive assessments and automated feedback systems. The speakers showcased the features of the Zupa Learning ecosystem, highlighting its ability to leverage AI models for customizing study paths based on individual learner behaviour, performance analytics and content interaction patterns.

The Valedictory Ceremony of the Five-Day Faculty Development Programme on "Artificial Intelligence Foundations for Engineers" was held on 19 December 2025 at the Computer Lab, CV Raman Block, NMAM Institute of Technology, Nitte. The event marked the successful completion of the FDP, which spanned five days of intensive lectures, hands-on sessions and expert interactions delivered by resource persons from NITK Surathkal, MIT Manipal and NMAMIT Nitte. The ceremony was graced by the presence of faculty members, participants and the FDP coordinators. The participants, resource person, coordinators and the HoD shared their experience about the FDP in the feedback. Many acknowledged that the FDP broadened their understanding of AI applications in engineering and inspired new directions for teaching, research, and student engagement.

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Book Chapters Review: Cambridge University Press and Assessment, India

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Dr. Rajalakshmi Samaga B L, Professor and PG Coordinator, Department of Electrical and Electronics Engineering (EEE), NMAM Institute of Technology, Nitte received an invitation to review three chapters of a book provisionally titled "MATLAB Programming: A Self Learning Guide" meant for the undergraduate students of Computer Engineering, Electronics Engineering, Electrical Engineering and Science branches as Computer Science, Physics and Mathematics to be published by the Cambridge University Press and Assessment, India, a subsidiary of University of Cambridge, United Kingdom. She accepted the invitation and provided her valuable feedback on the said chapters of the book on-time that was well appreciated by the Cambridge University Press and Assessment, India.

Participation in AICTE – QIP – PG Certificate Programme in Artificial Intelligence and Data Science

20 December 2025

Dr. Latha Shenoy K, Associate Professor, Department of Electrical and Electronics Engineering, NMAM Institute of Technology, Nitte successfully completed a six months Certificate Programme in Artificial Intelligence and Data Science (AIDS) post-graduate level certification programme conducted by the Indian Institute of Information Technology (IIIT), Kottayam under the AICTE Quality Improvement Programme – Post Graduate (QIP-PG) scheme. This initiative was intended to strengthen expertise in emerging technologies among engineering faculty members and professionals. It bridged the gap between traditional engineering education and emerging technologies, equipped the faculty members with the AIDS skills, fostering interdisciplinary research and integrates data-driven and cybersecurity concepts into teaching and research. The programme was conducted over six months in hybrid mode with five months of online classes and one month of offline sessions. It carried a total of 18 credits combining theory, lab work and project.

Offline Sessions:

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30 June – 11 July 2025 and 08 - 19 December 2025

Online Sessions:

31 July – 25 November 2025

The inaugural function was held on 30 June 2025 at 10 AM in the Seminar Hall, IIIT Kottayam that was inaugurated by Dr. M. Radhakrishnan and Dr. Rubell Marion Lincy G., Head, Department of Computer Science. The programme was attended by 65 faculty members from various states across India representing core engineering disciplines. The course included the following key concepts:

1. Fundamentals of Mathematics and Statistics for Data Science
2. Python for Data Science
3. Artificial Intelligence Engineering
4. Machine Learning Principles and Practices
5. Data Mining

The programme coordinator Dr. Vengadeswaran S and programme co-coordinator Dr. Selvi C were great support during the course. During the offline sessions, IIIT Kottayam provided free accommodation and necessary facilities to all the participants, ensuring a comfortable and conducive learning environment.

The valedictory function was held on 19 December 2025, marking the successful completion of the programme. The programme successfully enhanced faculty competencies in AIDS and contributed significantly to strengthening interdisciplinary engineering education and research.

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Details of the Workshop / STTP/ Faculty Development Program attended by the faculty of E&E Engg in the month of December 2025

Sl. No.	Name	Dept	Title of the Programme	Place	Date
1.	Mrs. Nutana Shetty	E&E Engg	STP on Mental Wellness, Personal Growth and Life Skills	UGC-Malaviya Mission Teacher Training Centre, University of Kashmir, Srinagar	27 November - 03 December 2025
2.	Mrs. Akshatha N M	E&E Engg	STP on Mental Wellness, Personal Growth and Life Skills	UGC-Malaviya Mission Teacher Training Centre, University of Kashmir, Srinagar	27 November - 03 December 2025
3.	Mrs. Swathi K	E&E Engg	STP on Mental Wellness, Personal Growth and Life Skills	UGC-Malaviya Mission Teacher Training Centre, University of Kashmir, Srinagar	27 November - 03 December 2025
4.	Mr. Naveen J	E&E Engg	Trends in Next Generation Wireless Network using Simulation Tools	Dept of Computer and Communication Engineering, NMAMIT, Nitte in Association with IQAC	01-05 December 2025
5.	Mr. Naveen J	E&E Engg	Awareness on Prevention Of Sexual Harassment	Staff Development Centre, Nitte (DU)	06 December 2025

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Sl. No.	Name	Dept	Title of the Programme	Place	Date
			(POSH) at workplace		
6.	Mr. Naveen J	E&E Engg	ROS 2 for Mobile Robotics from fundamentals to Autonomous Deployment	Dept of Robotics and Artificial Intelligence, in Association with SDC, Nitte (DU)	08-10 December 2025
7.	Mr. Naveen J	E&E Engg	Innovative Trends in Data Science and Electric Mobility: IPR Opportunities and Challenges	Birla Institute of Technology, Mesra	08-13 December 2025
8.	Mrs. Swathi K	E&E Engg	Application of Machine Learning Techniques in Healthcare	Dept of ISE in association with AICTE-Atal, New Delhi	08-13 December 2025
9.	Mr. Anand Bhat B	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
10.	Dr. Anitha Marina Colaco	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
11.	Dr. Girisha Joshi	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
12.	Dr. Dhananjaya B	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025

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Sl. No.	Name	Dept	Title of the Programme	Place	Date
13.	Mrs. Raksha Adappa	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
14.	Mr. Naveen J	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
15.	Mrs. Swathi K	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
16.	Mrs. Nutana Shetty	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
17.	Mrs. Akshatha N M	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
18.	Dr. Krishna Rao	E&E Engg	Artificial Intelligence Foundations for Engineers	Dept of E&E Engg in association with SDC, Nitte (DU)	15-19 December 2025
19.	Dr. Dinesh Shetty	E&E Engg	Cyber Security of Power Grids	IISc, Bengaluru	23-26 December 2025