INSPIREEE

Inspirational Scripts, Personalities and Innovative Research of EEE

NEWS LETTER EEE / VOLUME 13 / ISSUSE 1

APRIL 2024-2025

K.L.N.COLLEGE OF ENGINEERING

(An Autonomous Institution,
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)

(Accredited by NAAC for 5 Years W.e.f November 2018) (Accredited by NBA for EEE)

(An ISO 9001:2015 Certified Institution)
Pottapalayam -630612,Sivagangai District,Tamilnadu

INSPIREEE

IN spirational **S**cripts, **P**ersonalities and **I**nnovative **R**esearch of **EEE**

VISION OF THE DEPARTMENT

To become a high standard of excellence in Education, Training and Research in the field of Electrical & Electronics Engineering and allied applications following Ethical values and Social commitment.

MISSION OF THE DEPARTMENT

1. To create graduates possessing excellent knowledge and skill in Electrical and Electronics Engineering fundamentals.
2. To provide employable graduates for industry and to do high quality research.
3. Emphasis on Ethics, professional conduct for societal development.

K.L.N. College of Engineering (Autonomous)

Pottapalayam–630612, Sivagangai District, TamilNadu,I ndia

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MESSAGEFROMHEADOFTHEDEPARTMENT

Dr.S.M.KANNAN,M.E.Ph.D., FIE,

MISTE, MIEEE (USA)

Professor&Head,EEE,

K.L.N.CollegeofEngineering

MESSAGE

Greetings,

I am very happy to inform that the EEE Department got Accredited, 5th time by NBA, New Delhi. It is a very prestigious moment for us. I wish to thank, in this occasion, all the well-wishers of KLNCE-EEE for their kind support and valuable assistance.

Issues 1 have been nicely prepared starting with beautiful cover page. Topics focusing latest trends in EEE filed covering FACTS, Smart Grid etc., are well informed. The articles by Final year students show their dedicated work, presenting the material in a nice manner, and their depth of knowledge. The fourth issue is focusing on social impact of Electrical field. Their presentation is also very good. Engineers should develop such writing skills, once they reached the quality, they are the expert. Engineers can acquire the best of their writing skills by reading Novels, Newspapers and watching best Hollywood movies. Once they develop such skills, their writing will like a thriller, everyone love to read, and thereby the reader get benefitted. Students can claim later, any where about their contribution on the work they submitted for the Newsletter. I thank the contributors of this issue for publishing as per the schedule. Best wishes to all.

Dr.S.M. KANNAN

Head of the Department-EEE

EDITORIALCREW

EDITORIN-CHIEF:

Dr.S.M.KANNAN[Professor &Head]

EDITOR:

Mr.R.JEYAPANDIPRATHAP[Assistant Professor2]

STUDENTIN-CHARGE:

1. **JOSHUA S 212303 IVYEAR/VIISem**
2. **ISRAEL D - 232914 IIIYEAR /VI Sem**
3. VISHNUPRIYA K K **232001 IIYEAR/ IV Sem**
4. THIRUMALAI AYYAPPAN R J 232017 **IIYEAR/ IV Sem**

Sustainable Development Goals (SDG)

Number	Icon	Name	Text
1		No poverty	End poverty in all its forms everywhere
2		Zero hunger	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3		Good health and well-being	Ensure healthy lives and promote well-being for all at all ages
4		Quality education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5		Gender equality	Achieve gender equality and empower all women and girls
6		Clean water and sanitation	Ensure availability and sustainable management of water and sanitation for all
7		Affordable and clean energy	Ensure access to affordable, reliable, sustainable and modern energy for all
8		Decent work and economic growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9		Industry, innovation and infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10		Reduced inequalities	Reduce inequality within and among countries
11		Sustainable cities and communities	Make cities and human settlements inclusive, safe, resilient and sustainable
12		Responsible consumption and production	Ensure sustainable consumption and production patterns
13		Climate action	Take urgent action to combat climate change and its impact
14		Life below water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15		Life on land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16		Peace, justice and strong institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17		Partnerships for the goals	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

The Department of Electrical and Electronics Engineering of KLNCE identified, the following SDGs, based on which, various academic activities are implemented.

Goal 7: Affordable and Clean Energy.
Goal 8: Decent work and Economic Growth.
Goal 9: Industry, innovation and Infrastructure.
Goal 11: Sustainable cities and communities.
Goal 13: Climate Action.

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
(An Autonomous Institution, affiliated to Anna University)
Department of Electrical and Electronics Engineering
List of Publications of International/National Journal by Faculty - Academic year 2023-2024

S.No	Authors Name	Title of the paper	Title of the Journal	Volume/Issue /Month & Year of Publications	ISBN/ ISSN Number	Indexed
1.	Dr.S.M.Kannan	Design of Single Switch improved high gain Boost Converter with reduced voltage stress	ESP Journal Engineering & Technology Advancements.	Vol: 4 Issue: 2 April 2024	ISSN : 2583-2646	
2.	Dr.S.M.Kannan	Improvement of Solar Energy Load Management based on IoT Integrated MPPT Charge Controller	International Research Journal Of Modernization In Engineering Technology & Science	Vol:6, issue:04 2024-April	ISSN:2582-5208	
3.	Dr S. Venkatesan Dr. P. Loganthurai Mr. A. Marimuthu	Design and Analysis of cascaded Buck-Boost Converter using Solar MPPT method for electric vehicle charging applications	ESP Journal of Engineering & Technology Advancements	Vol: 4 Issue: 2 April 2024	ISSN : 2583-2646	
4.	Dr.S.Venkatesan, Dr.S.M.Kannan, Dr.P.Loganthurai	Design and Analysis of Quadrupler boost converter and BMS for Electric Vehicle Battery Charging Applications	IRJMETS JOURNAL	Vol:6, issue:04 2024-April	ISSN:2582-5208	
5.	Dr K. Gnanambal, Mr N VimalRadhaVignesh	Underground cable fault detection using Arduino	AIP Conference Proceedings, 2023	Vol: 2831 Issue: 1 Sept 2023	ISSN 1551-7616	Scopus
6.	Dr K. Gnanambal	Efficient Utilization of Hybrid Power	JTSEIT JOURNAL	Vol:12, issue:05 April-2024	ISSN:1009-6744	
7.	Dr K. Gnanambal	Single-Phase Bridgeless Three- level Power Factor Correction	Journal of Transportation System Engineering and Information Technology	Vol:12, issue:05 2024-April	ISSN:1009-6744	
8.	Dr.S.Parthasarathy MrR.Thangasankaran	Green Drive Charger- Harnessing Renewables for EV's Li-ion Batteries with Cutting-Edge Boost Converter	JTSEIT	Vol12, Issue5 2024-April	ISSN NO :1009-6744	
9.	Dr S. Venkatanarayanan	An Optimized Design Modeling of PV Integrated SEPIC Based Single-Phase System	Technical Gazette	Vol:31 Issue:2 pp-518-524 2024	ISSN 1848-6339	Scopus
10.	Dr S. Venkatanarayanan	Competent Energy Executing Structure in the Solar Sheet in the IoT Environment	Electric Power Components and Systems	Vol 52, Issue 3 pp 445-456 2024	ISSN: 1532-5008	Scopus
11.	Dr S. Venkatanarayanan	Energy Audit in MSME Industries	Journal of Transportation System Engineering and Information Technology	Vol:12, issue:04 2024-April	ISSN:1009-6744	

12.	Dr S. Venkatanarayanan	Energy audit solutions for chemical industries	Journal of Transportation system Engineering and Information Technology	Vol 12 Issue 4 2024	1009-6744	
13.	Dr S. Venkatanarayanan	An IoT based optimization to improvise a PV Efficiency in Real world weather conditions	Journal of Transportation system Engineering and Information Technology	Vol 12 Issue 4 2024	1009-6744	
14.	Mr A. Marimuthu	Charging of car battery in electric vehicle using wind energy	ESP Journal of Engineering & Technology Advancements	Vol: 4 Issue: 2 April 2024	ISSN : 2583-2646	
15.	Dr. P. Loganthurai Dr. S. Venkatesan Mr A. Marimuthu	Effective Utilization Of Solar Energy and Batteries in Dual Battery in Electric Vehicles	Journal of Transportation System Engineering and Information Technology	Vol:12 issue:04 2024-April	ISSN:10 0 9-6744	
16.	Dr.M.Jegadeesan	Design and Implementation of Single-input-multi-output DC- DC Converter topology for Electric Vehicles	ESP Journal of Engineering & Technology Advancements	Vol: 4 Issue: 2 April 2024	ISSN : 2583-2646	
17.	Dr.M.GaneshKumari	Active Voltage Restoration Technique for Elevating Power Quality	ESP Journal of Engineering & Technology Advancements	Vol: 4 Issue: 2 Mar 2024 PP 51-59	ISSN : 2583-2646	
18.	Mr.M. Jeyamurugan	Smart Waste Bin Monitoring System Using Arduino	ESP International Journal of communication Engineering & Electronics Technology	Vol: 2 Issue: 1 Feb 2024	ISSN : 2583-9217	
19.	Mr.M. Jeyamurugan	Industrial Waste Water Monitoring Using IoT	ESP Journal of Engineering & Technology Advancements	Vol: 4 Issue: 1 Mar 2024	ISSN : 2583-2646	
20.	Mr.M.Balamurugan	Line Fault Detection with GSM	Journal of Transportation System Engineering and Information Technology	Vol:6, issue:04 2024-April	ISSN:25 8 2-5208	
21.	Mr.R.JeyapandiPrathap	Efficient QR Component Dispensing System for Seamless Industrial Automation	ESP Journal of Engineering & Technology Advancements	Vol: 4 Issue: 1 Mar 2024	ISSN : 2583-2646	
22.	Mr.R.JeyapandiPrathap	Integration of AI in 3D Printing	ESP Journal of Engineering & Technology Advancements	Vol: 4 Issue: 1 Mar 2024	ISSN : 2583-2646	
23.	Mr.N.VimalRadha Vignesh	Design and Implementation of an efficient energy conservation system.	Journal of Transportation System Engineering and Information Technology	Vol:12, issue:04 2024-April	ISSN:10 0 9-6744	
24.	Mr.N.VimalRadha Vignesh	A Noval Approach for Revolutionizing clean living with Advanced air purification technology	ESP Journal of Engineering & Technology Advancements	Vol:4 issue:02 2024-April	ISSN no: 2583-2646	
25.	Mr.A.Manoj	Maximizing agriculture yield using UV Ray and IoT	ESP Journal of Engineering & Technology Advancements	Vol:4 issue:01 2024-April	ISSN no: 2583-2646	

K.L.N.COLLEGE OF ENGINEERING
(An Autonomous Institution, Affiliated to Anna University, Chennai)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
EVENTS ATTENDED BY STAFF
ACADEMIC YEAR (2024-2025)

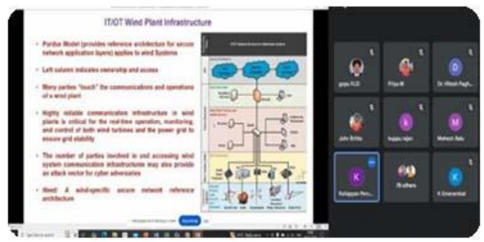
Academic Year (2024-2025)			
S.No.	**Name of the Faculty with Designation**	**SEMINAR / WORKSHOP / COURSE ATTENDED / RESOURCE PERSON**	**DATE / PLACE**
1.	Dr.S.M.Kannan, Prof.&Head	Resource person under Margdharshan scheme.	04.10.2024/ Sri Raaja Raajan Engineering College, Karaikudi
2.	Dr.S.Venkatesan, Prof./EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “IoT and Cyber Security in Power Systems”	03.02.2025 to 08.02.2025/ .L.N. College of Engineering, Sivagangai Dt.
		Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Emerging trends in optimal design of Electric Vehicles and Hydrogen fuel cell Vehicles for sustainable futures” .	27.01.2025 to 01.02.2025/ SRM Madurai College for Engineering & Technology, Madurai.
		Participated in the Five Day International Faculty Development Program on “Outcome Based Education”.	01.07.2024 to 05.07.2024/ Velammal College of Engineering and Technology, Madurai.
3.	Dr.K.Gnanambal, Prof./EEE	Participated in the one day NBA Awareness Workshop on “Outcome Based Education and Accreditation”.	09.02.2025/ Anna University, Chennai.
		Resource person under Margdharshan scheme.	09.11.2024/ Solamalai College of Engineering
		Resource person under Margdharshan scheme.	15.10.2024/ Fatima Michael College of Engineering & Technology. Madurai.
		Resource person under Margdharshan scheme.	04.10.2024/ Sri Raaja Raajan Engineering College, Karaikudi
		NPTEL–AICTE Faculty Development Programme on “System Design Through Verilog”.	July-Sep 2024 8 Week Course) IIT Guwahati.
		Resource person under Margdharshan scheme.	26.09.2024/ Fatima Michael College of Engineering & Technology, Madurai.
		Resource person under Margdharshan scheme.	21.09.2024/ Sri Raaja Raajan Engineering College, Karaikudi
		Resource person under Margdharshan scheme.	13.09.2024/ Fatima Michael College of Engineering & Technology, Madurai.

		Resource person under Margdharshan scheme.	14.08.2024/ Solamalai College of Engineering
		Resource person under Margdharshan scheme.	06.07.2024/ Fatima Michael College of Engineering & Technology, Madurai.
4.	Dr.S.Parthasarathy, Prof./EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “IoT and Cyber Security in Power Systems”	03.02.2025 to 08.02.2025/ .L.N. College of Engineering, Sivagangai Dt.
		Acted as a Resource Person for School Students Career guidance.	30.01.2025/ The TVS School, Madurai.
		Participated in Workshop on “National Electrical Code of India 2023”	20.12.2024/ Courtyard by Marroit, Madurai.
		Resource person in one day Faculty Development program organized by Margdarshan Cell.	23.11.2024/ Sri Raaja Raajan Engineering College, Karaikudi
		Acted as a Judge for Inter School Competition.	16.11.2024/ K.L.N.Vidyalaya CBSE Senior Secondary School, Madurai.
		Acted as a Judge for Computer Science-Project Display Student’s Projects Expo.	24.10.2024/ The TVS School, Madurai.
		Participated in Seminar on CII 7th Edition Connect Madurai 2024-Connecting the Technology Ecosystem.	03.10.2024/ Courtyard by Marroit, Madurai.
		Participated in Consultative Meeting-SIPCOT Industrial Innovation Centre-CII Madura zone.	01.08.2024/ Fortune Pandian Hotel, Madurai.
5.	A.Marimuthu, ASP/EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “IoT and Cyber Security in Power Systems”	03.02.2025 to 08.02.2025/ .L.N. College of Engineering, Sivagangai Dt.
		Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Emerging trends in optimal design of Electric Vehicles and Hydrogen fuel cell Vehicles for sustainable futures” .	27.01.2025 to 01.02.2025/ SRM Madurai College for Engineering & Technology, Madurai.
		Participated in the Five Day International Faculty Development Program on “Outcome Based Education”.	01.07.2024 to 05.07.2024/ Velammal College of Engineering and Technology, Madurai.
6.	Dr.P.Loganthurai, ASP/EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Emerging trends in optimal design of Electric Vehicles and Hydrogen fuel cell Vehicles for sustainable futures”.	27.01.2025 to 01.02.2025/ SRM Madurai College for Engineering & Technology, Madurai.
		Delivered a Lecture on the topic “Core Placement Opportunities and Learning Techniques” and acted as an Auditor for Academic Course File Auditing.	28.01.2025/ Velammal College of Engineering and Technology, Madurai.
		Participated in the Five-days AICTE Training and Learning (ATAL) Academy Faculty Development Program on ”Emerging Technologies in Power Energy: Shaping the Future of Sustainable Solutions”.	19.11.2024 to23.11.2024/ Dream Institute of Technology, Kolkata.
		Participated in the Five Day International Faculty Development Program on “Outcome Based Education”.	01.07.2024 to 05.07.2024/ Velammal College of Engineering and Technology, Madurai.
		Certificate earned by Completing NPTEL Online Certification course on “A Basic Course on Electric and Magnetic Circuits”.	July-Oct2024 (12 Week Course) IIT Kharagpur.
		Certificate earned by Completing NPTEL Online Certification course on “Electrical Measurement and Electronic Instruments”.	July-Oct2024 (12 Week Course) IIT Kharagpur.

7. 444	Dr.M.Jegadeesan, ASP/EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Emerging trends in optimal design of Electric Vehicles and Hydrogen fuel cell Vehicles for sustainable futures”.	27.01.2025 to 01.02.2025/ SRM Madurai College for Engineering & Technology, Madurai.
		NPTEL–AICTE Faculty Development Programme on “Cloud Computing”.	July-Oct2024 (12 Week Course) IIT Kharagpur.
		Participated in the Five Day International Faculty Development Program on “Outcome Based Education”.	01.07.2024 to 05.07.2024/ Velammal College of Engineering and Technology, Madurai.
8.	Dr. M. Ganesh Kumari, AP(Sr.Gr.)/EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Navigating the Green Revolution: Integrating Electric Vehicles and Hydrogen Fuel Technologies for Sustainable Mobility”.	03.02.2025 to 08.02.2025/ Kamaraj College of Engineering & Technology, Viruthunagar Dt.
		Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Emerging trends in optimal design of Electric Vehicles and Hydrogen fuel cell Vehicles for sustainable futures” .	27.01.2025 to 01.02.2025/ SRM Madurai College for Engineering & Technology, Madurai.
		Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Artificial Intelligence Edge – Soft Computing”	09.12.2024 to 14.12.2024/ Dr. Sivanthi Aditanar College of Engineering,
		Participated in the Five Day International Faculty Development Program on “Outcome Based Education”.	01.07.2024 to 05.07.2024/ Velammal College of Engineering and Technology, Madurai.
		Participated in Two day Workshop on “Writing Quality Research Proposals”.	26.07.2024 & 27.07.2024/ K.L.N. College of Engineering, Sivagangai Dt.
9.	M. Balamurugan, AP/EEE	Participated in the 5 days Faculty Development Program on “Methodologies of Renewable Energy Systems Research and Implementation Analysis”.	20.01.2025 to 24.01.2025/ J.P.College of Engineering, Tenkasi.
10.	R. Jeyapandiprathap, AP/EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “IoT and Cyber Security in Power Systems”	03.02.2025 to 08.02.2025/ K.L.N. College of Engineering, Sivagangai Dt.
		Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Emerging trends in optimal design of Electric Vehicles and Hydrogen fuel cell Vehicles for sustainable futures” .	27.01.2025 to 01.02.2025/ SRM Madurai College for Engineering & Technology, Madurai.
		Participated in the Five Day Online Faculty Development Program on” Advanced Tools Techniques for Industrial Automation and Robotics”.	30.12.2024 to 04.01.2025/ K.L.N. College of Engineering, Sivagangai Dt.
		Participated in the Five Day Online Faculty Development Program on “Emerging Technologies in Power Energy: Shaping the Future of Sustainable Solutions”.	19.11.2024 to 23.11.2024/ Dream Institute of Technology, Kolkata.
		Participated in the “Hands - on Training on Generative AI for Engineering Applications”.	28.09.2024 to 02.11.2024/ K.L.N. College of Engineering, Sivagangai Dt.

		NPTEL–AICTE Faculty Development Programme on “Google Cloud Computing Foundations”.	Aug-Oct 2024 (8 Week Course) IIT Kharagpur.
11.	N.Vimal Radha Vignesh, AP/EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Navigating the Green Revolution: Integrating Electric Vehicles and Hydrogen Fuel Technologies for Sustainable Mobility”.	03.02.2025 to 08.02.2025/ Kamaraj College of Engineering & Technology, Viruthunagar Dt.
		Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “Emerging trends in optimal design of Electric Vehicles and Hydrogen fuel cell Vehicles for sustainable futures” .	27.01.2025 to 01.02.2025/ SRM Madurai College for Engineering & Technology, Madurai.
12.	R.Thangasankaran, AP/EEE	Participated in the 6 days AICTE Training and Learning (ATAL) Academy Faculty Development Program on “IoT and Cyber Security in Power Systems”	03.02.2025 to 08.02.2025/ K.L.N. College of Engineering, Sivagangai Dt.
		NPTEL–AICTE Faculty Development Programme on “Problem Solving Through Programming in C”.	July-Oct2024 (12 Week Course) IIT Kharagpur.
		NPTEL–AICTE Faculty Development Programme on “Introduction to Internet of Things”.	July-Oct2024 (12 Week Course) IIT Kharagpur.

Short term courses/seminar/symposium organized by the Department:

DATE	TITLE	DETAILS OF RESOURCE PERSON	NO. OF PARTICIPANTS
Date: 07.05.2025 Time: 01.30pm to 02.30pm **Type:** Expert Talk	Awareness Program **on** **“Revolutionizing Design and Automation in Electrical Engineering”** ”	.  **<u>Resource Person:</u>** Ms. Anusuya Devi, Designer, Technical Trainer, CADD Centre, Madurai.	**Participant Details:** Total:**53** **Roll:53** Students: 45 Nos. Percentage: 45/53=84.91% B.E–EEE- Third Year/ VI Semester [2022-2026Batch] **Co-ordinator(s):** Dr.M.Ganesh Kumari, AP(Sr.Gr.)/EEE **Organizing Student Chapter: ISTE**
Date: 03.02.2025 to 08.02.2025 (6 Days) Time: 6.00pm to 9.00pm	**Type: online FDP** ATAL Sponsored Online Faculty Development Programme on “IoT and Cyber Security in Power Systems”	 **<u>Resource Person:</u>** Dr.B.Chittibabu Designation & Organization: Associate Professor, IIITM, Kancheepuram, India. Dr. A.V. Giridhar, NIT, Warangal, India. Dr.G.Y. RajaaVikhram, SRM Institute of Science and Technology, Chennai, India. Prathap N.P.,Senior Electrical Engineer, NEL Electric Power Engineering Inc.USA. Mrs. Hemalatha Shanmugam Technical lead,Vantiva UK, Palaniappan Senthil Project manager Cognyte Bangkok, Thailand. Dr. P Kaliappan, Joint Director / HoD, CPRI,India. Vignesh M A,Assistant Engineer,Subload Dispatch Centre Madurai,India.	**Participant Details:** Total:**143** **Faculty: 143Nos.** **Co-ordinator(s):** Dr.K.Gnanambal, Prof.EEE **Co-Coordinators:** Dr.P.Loganthurai, ASP/EEE Mr.R.Thangasankaran, AP/EEE **Sponsor & Amount:** ATAL & Rs.1,00,000/-
Date: 27.01.2025 to 31.01.2025 (5 Days) Time: 09.15pm to 4.00pm **Type:** **Value Added Course**	Value Added Course on “Embedded Systems and Controller Applications ” **Participant Details:** Total:**53** **Roll:53** Students: 53 Nos. Percentage: 53/53=100% B.E–EEE- Third Year/ VI Semester [2022-2026 Batch]	 **<u>Resource Person:</u>** Mr.V. Selvaganesh, Director –Electrical R&D, Mrs. Aparna Selvaganesh, Proprietor, Shubham Solutions, Madurai	**Co-ordinator(s):** Dr.S.Venkatesan, Prof.EEE Dr.M.Ganesh Kumari, AP(Sr.Gr.)/EEE **Organizing Student Chapter: IEEE&IIPC**

Date: 06.01.2025 to10.01.2025 (5 Days) Time: 09.15pm to 4.00pm **Type:** Professional Development Course	Professional Development Course on “ PCB Design and Arduino training ” **Participant Details:** Total:**42** Students: 42 Nos. Percentage:42/42=100% B.E–EEE- Second Year/ IV Semester [2023-2027 Batch]	 **Resource Person:** M.Gayathrilakshmi, S.Vishnu Dev, B.Jai Narayan Hi-Tech Academy, Madurai.	**Co-ordinator(s):** Dr.P.Loganthurai, Associate Professor/EEE Mr.A.Marimuthu, Associate Professor/EEE Mr.R.Jeyapandiprathap, AP/EEE **Organizing Student Chapter:** **IEEE&IIPC**
Date: 06.01.2025 to 10.01.2025 **(5 days)** Time:9.15 am to 4.00pm **Type: Competency Development Program**	5 days Competency Development Program on **“Aptitude Training Program”**	 **Resource Person:** Sreehari. R, Senior Trainer - Aptitude & Skills, Connect Training Solutions, Tirunelveli.	**Co-ordinator(s):** Dr.M.Ganesh Kumari, AP(Sr. Gr.)/EEE Mr.N.Vimal Radha Vignesh , AP/EEE **Organizing Student Chapter: IEEE** **Participant Details:** Total:**42** Students: 42 Nos. (B.E.EEE -III year / VI Semester [(2022-2026Batch)] Percentage:42/42=100%
Date: 03.10.2024 Time: 11.15am to 12.30pm **Type:** Guest Lecture	Guest Lecture on “Emerging Technologies and Carrer Opportunities for Graduates”	 **Resource Person:** Er.Kiruthiga,(Alumini 2007 Batch) Founder of InvestorIndia	**Participant Details:** Total:**73** **Roll:65** Students: 65 Nos. Percentage: 65/73=89% B.E–EEE- Final Year/ VII Semester [2021-2025Batch]
Date: 20.09.2024 **Type:** Symposium **Participant Details:** Total:87 External**:**73Students Internal:14 Students	State Level Technical Symposium on ECHELON 2K24	 **Resource Person:** Chief Guest:**MR.J.PRAVIN THANGARAJ** (2012 - 2016 BATCH ALUMNUS) CLOUD & DEVOPS ARCHITECT HCL, MADURAI.	**Co-ordinator(s):** Dr.S.Venkatesan, Prof/EEE Dr.M.Ganesh Kumari, AP(Sr.Gr)/EEE Mr.A.Manoj, AP/EEE Mr.R,Jeyapandiprathap, AP/EEE **Organizing Student Chapter:** **IEEE** **Sponsor & Amount:** IIPC,ISTE , IIC & Rs.20,000/-
Date: 22.8.2024 Time: 1.30pm- 2.30pm **Type:** Expert Talk	Expert Talk on “EMBEDDED SYSTEM FOR MODERN ELECTRONICS AND COMPUTER ENGINEERING” **Participant Details:** Total:**50** **Roll:53** Students:50 Nos. Percentage: 50/53=94% B.E–EEE- III Year/ V Semester	 **Resource Person:** Er.S.Rekha, Chief Trainer-	**Co-ordinator(s):** Dr.M,Ganesh Kumari, Assistant Professor(Sr.Gr.)/EEE **Organizing Student Chapter: IEEE**

	[2022-2026Batch]	ELISIUM Academy, Madurai.	
Date: 20.8.2024 Time: 1.30pm-2.30pm **Type:** Expert Talk	Expert Talk on “EMBEDDED SYSTEM FOR MODERN ELECTRONICS AND COMPUTER ENGINEERING” **Participant Details:** Total**:36** **Roll:40** Students: 36Nos. Percentage:36/40=90% B.E–EEE- IV Year/ VII Semester/B Sec [2021-2025Batch]	 **Resource Person:** Er.S.Rekha, Chief Trainer- ELISIUM Academy, Madurai.	**Co-ordinator(s):** Dr.M,Ganesh Kumari, Assistant Professor(Sr.Gr.)/EEE **Organizing Student Chapter: IEEE**
Date: 09.8.2024 to 14.08.2024 09.8.2024 & 10.08.2024 (Physical Class Mode) 12.08.2024 to 14.08.2024 (Online Mode)Time: 9.15am to 04.00pm	5 Days Technical Core Training Program on “ELECTRIC CIRCUIT THEORY” **Type:** Technical Training Program **Participant Details:** Total**:51** **Roll:53** Students: 51 Nos. Percentage: 51/53=96% B.E–EEE- III Year/ VSemester [2022-2026Batch]	 **Resource Person:** Mr.V.Yuvaraj, Sr.Technical Trainer Mcube Training, Madurai.	**Co-ordinator(s):** Dr.M,Ganesh Kumari, Assistant Professor(Sr.Gr.)/EEE **Organizing Student Chapter: IEEE**
Date: 12.07.2024, 15.07.2024 & 16.07.24 Time: 9.30am to 04.00pm **Type:** Technical Training Program	3 Days Technical Core Training Program on“ELECTRICAL ENGINEERING” **Participant Details:** Total**:48** Students: 48 Nos. Percentage: 48/48=100% B.E–EEE- IV Year/ VII Semester [2021-2025Batch]	 **Resource Person:** Mr.V.Yuvaraj, Sr.Technical Trainer Mcube Training,Madurai.	**Co-ordinator(s):** Dr.S.Venkatesan, Prof.EEE Mr.N.Vimal Radha Vignesh,AP/EEE Mr.A.Manoj,AP/EEE **Organizing Student Chapter: IEEE**
Date: 08.07.2024 to 11.07.2024 Time: 9.30am to 04.00pm **Type:** Skill Development Program	4 Days Skill Development Program on “APTITUDE TEST PREPARATION”	 **Resource Person:** Mr.S.Srihari & Mr.R.Muralidharan, Connect Training Solutions, Thirunelveli	**Participant Details:** Total**:52** Students: 52 Nos. Percentage: 52/52=100% B.E–EEE- IV Year/ VII Semester [2021-2025Batch]

Date: 02.07.2024 to 05.07.2024 Time: 9.30am to 04.00pm **Type:** Skill Development Program	4 Days Skill Development Program on "JAVA BASICS & CODING SKILLS" **Participant Details:** Total**:60** Students: 60 Nos. Percentage: 60/60=100% B.E–EEE- IV Year/ VII Semester [2021-2025Batch]	 **<u>Resource Person:</u>** Ms.Arthisree, Sr. Consultant & Freelance Trainer, Chennai.	**Co-ordinator(s):** Dr.S.Venkatesan, Prof.EEE Mr.N.Vimal Radha Vignesh,AP/EEE Mr.A.Manoj,AP/EEE **Organizing Student Chapter: IEEE**

BASIC ECONOMICS OF POWER GENERATION TRANSMISSION AND DISTRIBUTION

JOSHUA S - 212303 -IV YEAR /VIISem

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The economics of power generation is the process of calculating the cost of producing electrical energy per unit (i.e. KWH). Customers utilize electric power when it is supplied at reasonable rates. So, power engineers have to find cost-effective methods to provide electricity to customers at affordable prices.

While designing or constructing a power station, engineers will take care of the overall economy so that the per-unit cost of production is as low as possible. So that the electric supply company can sell electrical energy at a profit and ensure reliable service. The main aim of a power engineer is to minimize production costs without sacrificing quality. Power system aims to deliver power to a large number of consumers.

As we know, power demand is not constant. It varies with the usage of different consumers. Due to the variation in usage of consumers, the load on the power system is never constant. It varies from time to time. This variation of load on the power system is called as the variable load on the station.

So, as the demand changes then power supplied by the power system also changes. The power demanded by the consumers is supplied by the power system through transmission and distribution lines.

Terminologies

Several terms are used in connection with power supply to an area . some of them are given below :

- **Connected load :** A consumer may have different electrical appliances with different wattages. The sum of these ratings is said to be his/her connected load . For example , used in bulbs , tubes , fans, washing machine, refrigerator, air conditioner, electrical motors and power plugs etc. Now sum of the ratings of these all appliances (W , KW, or MW) is connected load in home.
- **Maximum demand :** Maximum demand is the maximum load used by a consumer at any time . It can be less than or equal to the connected load. Generally , the maximum demand will be less than the connected load as all appliances are never run at full load at a time . The maximum demand is usually measured in kilowatts (KW) or megawatts (MW) .
- **Load factor :** Load factor is the ratio of average demand to the maximum demand . It may be daily load factor , monthly load factor or an annual load factor . Load factor is always less than one because average load is smaller than the maximum demand . If load factor is high then cost per unit generated will be less .

  Load factor = average demand / maximum demand
- **Demand factor :** Demand factor is the ratio of maximum demand to the connected load . Here maximum demand and connected load must be expressed in same units.

  Demand factor = maximum demand / connected load
- **Average load :** Average load is the total number of KWH supplied by a station in one day is divided by 24 hours .

  Daily average load = KWH in one day / 24

  *Yearly average load = KWH in one day / (365 * 24)*
-
- **Diversity factor :** Diversity factor is the ratio of sum of the individual maximum demands to the maximum demand of the system . Maximum demand on the power is always less than the sum of the individual maximum
-
- demands . So diversity factor always greater one .

  Diversity factor = sum of individual maximum demands / maximum demand on the system
- **Cold reserve :** Cold reserve is the reserve generating capacity that is not in operation , but available for service.
- **Hot reserve :** Hot reserve is the reserve generating capacity that is in operation , but not available for service .
- **Spinning reserve :** Spinning reserve is the reserve generating capacity that is connected to bus bars and ready to take the load .

Isolated and Integrated Operation

The isolated and integrated operations are discussed below:

Isolated Operation

In isolated operation , each power plant retains its unique identity and serves the load demand of its designated area independently , without centralized control . The absence of central control necessitates sufficient reserve capacity in each system to ensure reliable electricity supply .

This requirement for extra capacity elevates the initial cost of establishing the power plants .The need for redundant capacity arises from the lack of of interconnection between systems , mitigating the risk of blackouts or disruptions .The efficiency of isolated operation is less compared to integrated operation.

The stability limit of the isolated operation is less . But the capital cost and overall cost per unit generation are comparatively less .Isolated system cannot provide a continuous power supply .In isolated system , we need to take care of planning and investment to balance reliability with cost effectiveness in supplying electricity to isolated regions or areas without access to a centralized grid network .

Integrated Operation

In integrated operation , entire system is one and the identity of individual plant is lost .This integrated operation overcomes the challenges faced by isolated operation .It features a central office for maintenance enhancing operational oversight .

This system boosts supply reliability and diminishes the need for excessive reserve capacity at each station .Unlike , isolated operation , the integrated system functions collectively , optimizing resource utilization and minimizing redundancies . Through interconnection , power stations benefit from shared resources and coordinated management , ensuring consistent and dependable electricity supply across the network .

This integrated operation not only improves reliability but also streamlines operation offering a more sustainable and cost effective solution for meeting energy demands on a broader scale . It reduces capital cost and overall capital cost and overall cost per unit energy generated .

Differences Between Isolated and Integrated Operation

Some of the differences between isolated operation and integrated operation

Isolated operation	Integrated operation
The individual plants in the system retains identity .	The individual plants identity in the system merges .
The initial cost of the plant is higher due to the reserve capacity.	The initial cost of the plant is low due to the shared resources.
In isolated operation systems operate individually.	In integrated operation systems are interconnected and operate as whole.
It requires significant reserve capacity .	Reserve capacity requirement is low .
There is no central control office .	It requires central control office.
In these systems , reliability is less due to isolated setup .	In these systems , reliability is high due to interconnection .
Each system manages its load independently .	It is having coordinated load management across the network .
Limited maintenance required for each plant.	Centralized maintenance is required .

Advantages of Economics of Power Generation

- Enhanced reliability of the power supply due to the interconnected systems .
- The need for reserve capacity is reduced .
- Optimized resource utilization which reduces waste and maximizes the efficiency.
- Improved grid stability which reduces frequency deviations and voltage fluctuations .
- Increased flexibility in managing demand which allows more flexible response for changing conditions .
- Lower operational costs leads to more cost effective electricity generation .
- It can be expanded more easily to accommodate growing energy demands by adding capacity and integrating new sources of generation.
- Interconnected systems provide redundancy ,ensuring that if one part of the system fails , then other parts continue to supply electricity .

Cost of Electrical Energy

The cost of electrical energy is defined as the amount of money required to generate and produce a unit of electricity . There are three types of cost of electrical energy . They are :

- Fixed cost Semi-fixed cost
- Running or operating cost

Fixed Cost : Fixed costs are the expenses that remain constant irrespective of amount of electric produced and consumed . It is independent of maximum demand ,

capacity of the plant and total energy generated . These costs remain fixed in all conditions . It is due to the salaries of employees i.e. higher officials , annual cost of central organization and interest on capital cost on land .

Semi-fixed cost : Semi-fixed costs are the expenses that are depend upon the maximum demand but it is independent of the energy generated . Semi-fixed costs are directly proportional to the maximum demand .This is due to the capital costs on the land ,construction costs , equipment cost and transmission and distribution costs . This also depends on salaries of the management and also installation costs.

Running or operating cost : Running or operating cost are the expenses that only depend on the energy generated by the plant .This is due to wear and tear of the plant , fuel cost that varies with the type of the plant ,maintenance cost and repairs of the plant , lubricating oil and also salaries of operating staff.

Tariff - Its Types

Tariff is the price that is charged for the energy supplied to the consumers . The energy produced by the power station is supplied to large number of consumers .The consumers utilize electricity when it is supplied at reasonable prices. The tariff includes total cost of producing electrical energy and also earns profit . The main objective of tariff is not only to return the cost but also earns reasonable profits . It recovers the cost on the capital investment in transmission and distribution , cost of producing electrical energy in the power station and cost of operation and maintenance of electrical energy . There are different types of tariffs . Some of them are :

- Simple tariff
- Flat rate tariff
- Block rate tariff
- Two part tariff
- Power factor tariff

Simple tariff : Simple tariff is the rate that is fixed per unit of energy consumed . It is also called as uniform tariff . The rate per unit consumed is constant . It is the simplest tariff and easy to understand . As it is fixed rate then every consumer i.e. both domestic and bulk consumers has to pay equal amount. The cost per unit delivered is high and doesn't encourage the use of electricity.

Flat rate tariff : Flat rate tariff is the rate in which different consumers will pay different rate per unit energy .In this type , consumers are classified into different types so that each type of consumers is charged at a different uniform rate . It is more fair and it can be understood by different types of consumers . It is difficult to classify different types of consumers . Sometimes separate meters are required if both lighting and power load is present . So , it makes system costly .

Block rate tariff : Block rate tariff is the tariff which involves block of energy is charged at a specified rate and other block of energy charged at a reduced rates. The cost of each block is in decreasing order i.e. cost of first block is high when compared to other and cost of last block is low . So , the consumer who consumes more energy will pay less money . As the tariff increases the load factor , cost of unit generated is decreases . It is difficult to divide each block .

Two part tariff : Two part tariff is the tariff in which energy is charged on the basis of maximum demand and number of units consumed by the consumer .

As the name itself tells that total charges are divided into two parts i.e. fixed charges and running charges . The fixed charges depend upon the maximum demand whereas running charges depend on the number of units consumed by the customer .Here total charges is the sum of charge per KW of maximum demand and charge per KWH of energy consumed . It is easy to understand . It is tough to calculate maximum demand of the consumer. The consumer has to pay fixed charges whether he /she utilized electrical energy or not .

Power factor tariff : Power factor tariff is the tariff in which power factor of the consumer load is taken into consideration . Low power factor of the system increases the equipment rating and line losses . So that system must operate at economical power factor .The consumer who's having low power factor has to pay penalty

AI IN ELECTRIC POWER SYSTEMS PROTECTION AND CONTROL

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Artificial intelligence (AI) is revolutionizing the field of electric power systems by enhancing protection and control mechanisms. These advancements are pivotal as they contribute to the stability, efficiency, and reliability of power grids, which are fundamental to modern societies. AI technologies, such as machine learning and deep learning, are being deployed to predict and manage complex scenarios in real time, addressing challenges that traditional systems might not handle efficiently. For example, AI can predict equipment failures before they occur, minimizing downtime and preventing large-scale disruptions. Additionally, AI facilitates the integration of renewable energy sources into the grid by predicting fluctuations in power supply and optimizing energy distribution.

This not only ensures a steadier power supply but also enhances the sustainability of the power grid. Furthermore, AI algorithms improve the accuracy of fault detection and isolation, speeding up the restoration process after outages. This article explores the multifaceted applications of AI in the protection and control of electrical power systems, highlighting recent innovations, real-world implementations, and the future prospects of AI technologies in transforming electrical grids.

Early Concepts and Theoretical Foundations of AI The journey of artificial intelligence (AI) from the realm of mythology to a pivotal field of modern technology illustrates a fascinating transformation of an ancient dream into a contemporary reality. This transformation has roots stretching back to ancient myths and spans up to the sophisticated algorithms and theories that underpin today's AI technologies.

Early Myths and Automata: The origins of AI can be traced back to the myths and stories of various ancient cultures, where automata (mechanical beings) and crafted life forms were often featured. In Greek mythology, for instance, Hephaestus, the god of craftsmanship, created mechanical servants made of gold, which could move and act on their own. Similarly, in Jewish folklore, the Golem—a clay figure animated by mystical means—reflects the idea of imbuing inanimate matter with life, an early conceptualization of artificial life.

These mythological stories, while metaphorical, underline a long-standing human fascination with creating life-like entities, which laid the foundational curiosity and ambition necessary for the development of AI. As civilization moved into the Renaissance and the Age of Enlightenment, this fascination evolved into practical experimentation with mechanical automata. Notable examples include the mechanical knight by Leonardo da Vinci, designed in the late 15th century, and the various clockwork automata of the 18th century, which could perform complex tasks such as writing or playing music.

Theoretical Foundations and Formal Theories: The scientific groundwork for AI began with the formalization of logic and mathematics. Pioneers like Gottfried Wilhelm Leibniz, who conceived of a universal language or "calculus of thought" that would allow all conceptualizations to be processed like mathematical statements, contributed to early theoretical frameworks. In the 19th century, George Boole developed Boolean algebra, which would later be fundamental in computer logic and programming.

The concept of machines being capable of performing tasks reserved for human intellect was formally proposed by Alan Turing, a British mathematician, in his seminal 1950 paper "Computing Machinery and Intelligence." Turing introduced the concept of what is now known as the Turing Test—a criterion of intelligence in a machine being its ability to exhibit indistinguishable behavior from that of a human. Turing's work was preceded by the development of cybernetics by Norbert Wiener, which studied regulatory and control systems, and was analogous to the behavior of machines and living organisms.

Early Computers and Development of AI as a Discipline: The invention of the electronic computer during the Second World War was a leap forward in the development of AI. The ENIAC, built between 1943 and 1945, was one of the earliest examples. These machines, initially designed for ballistic calculations, soon showed the potential for much broader applications.

The formal establishment of AI as a distinct field occurred at a workshop held at Dartmouth College in 1956, organized by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon. Here, the term "artificial intelligence" was coined, and the participants proposed that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it."

Symbolic AI and Beyond: Following the Dartmouth workshop, the field of AI branched into several directions. One significant approach was symbolic AI, which focuses on manipulating symbols and using them to represent problems and knowledge in a manner that computers can use to solve complex tasks. The development of Lisp in 1958, a programming language suited for AI because of its excellent handling of symbolic information, was a significant milestone.

The progress in AI during this period included the creation of expert systems, which attempted to codify the knowledge and decision-making processes of human experts into a computer program. One of the most famous examples was MYCIN in the early 1970s, an expert system used in medical diagnosis to identify bacteria causing severe infections and recommend antibiotics.

The AI era of Machine Learning and Neural Networks The field of artificial intelligence (AI) has undergone profound transformation over the last few decades, marked significantly by the shift from rule-based systems to machine learning models and the rapid evolution of neural networks. This new era is characterized by systems and models that learn from data, improve with experience, and perform tasks that were once deemed possible only for human intelligence.

From Rule-Based Systems to Machine Learning: Rule-based AI systems, or expert systems, were the mainstay of AI from the 1970s through the late 1980s. These systems operated on a series of hardcoded rules and logic that defined how they should behave in response to specific inputs. They were designed to mimic the decision-making ability of human experts by following an extensive set of if-then rules derived from the domain's knowledge. While effective within their limited scope, rule-based systems were inherently inflexible, unable to learn from new data, and labor-intensive to update as they required manual tweaking of rules.

The limitations of rule-based systems led to the advent of machine learning in the 1980s, a paradigm shift initiated by the need for more adaptive systems capable of generalizing from data patterns. Machine learning algorithms, driven by statistical methods, allow systems to learn from and make predictions or decisions based on data. This ability to learn and adapt without being explicitly programmed for specific tasks marked a significant advancement in AI capabilities.

Introduction and Evolution of Neural Networks: Neural networks, inspired by the biological neural networks that constitute animal brains, are a set of algorithms, modeled loosely after the human brain, that are designed to recognize patterns. They interpret sensory data through a kind of machine perception, labeling, or clustering raw input. The basic building blocks of these networks are neurons — nodes that are interconnected and pass signals to each other. These signals are processed through the network layers, which perform various transformations on the input data to learn to perform tasks without having explicit instructions. Although the concept of neural networks dates back to the 1940s with the work of Warren McCulloch and Walter Pitts, significant advancements were stifled until the 1980s due to the lack of powerful computational resources and the understanding of key theoretical elements, such as how to effectively train large networks.

Rise of Deep Learning: The resurgence of interest in neural networks in the 21st century, especially with the advent of 'deep learning', has been transformative. Deep learning involves training large neural networks with many layers (hence "deep") on vast amounts of data. These networks perform remarkably well in tasks such as image and speech recognition, language translation, and even complex decision making. The pivotal moment for deep learning came in 2012 when a model designed by Alex Krizhevsky, Ilya Sutskever, and Geoffrey Hinton significantly outperformed other models in the ImageNet competition, a benchmark in visual object recognition.

Deep learning has benefited greatly from the availability of large data sets and advances in computing hardware, such as GPUs (Graphical Processing Units) that can perform computations much faster than traditional CPUs for the tasks involved in training neural networks. This has allowed deep learning models to scale up dramatically, increasing both their complexity and their capability.

Reinforcement Learning: Another significant development in AI is reinforcement learning, an area of machine learning concerned with how software agents ought to take actions in an environment so as to maximize some notion of cumulative reward. Unlike supervised learning where the model is trained with the correct answer key, reinforcement learning operates through a process of trial and error, where the model learns to achieve a goal in an uncertain, potentially complex environment. This methodology has been famously applied in systems that learn to play-and master-complex games, such as AlphaGo developed by Google DeepMind.

Reinforcement learning models are particularly interesting because they can learn to make a sequence of decisions. The agent learns to achieve a goal in an uncertain, potentially complex environment. This is achieved through exploration (trying unfamiliar actions) and exploitation (leveraging known actions), balancing between these two modes to maximize the overall reward.

The Evolution of AI in the 21st Century

The 21st century has witnessed an unprecedented acceleration in the field of artificial intelligence (AI), fueled largely by significant advances in computational power, data availability, and the integration of technologies such as big data analytics, cloud computing, and the Internet of Things (IoT). This confluence has not only transformed AI from a largely theoretical discipline into one of the most practical and impactful fields in technology but has also reshaped industries, economies, and day-to-day human interactions.

Advances in Computational Power & Data Availability: The explosion in AI capabilities can largely be traced back to the dramatic increase in computational power. Moore's Law, which posited that the number of transistors on microchip doubles about every two years though the cost of computers is halved, has held true for much of the technology's development, leading to faster, smaller, and more affordable processors. This trend has enabled the development of high-performance computers required for AI. The advent of GPUs (Graphics Processing Units) and TPUs (Tensor Processing Units) specifically designed for handling the massive computations necessary for AI tasks, especially those involving deep learning, has significantly decreased the time required for training models and increased the complexity of tasks that can be undertaken.

Parallel to the surge in processing power, there has been an exponential growth in data generation and collection—termed "Big Data". This data comes from myriad sources: social media feeds, internet search queries, e-commerce transactions, and IoT devices, among others. The digital universe is expected to reach 44 zettabytes by 2020. AI thrives on large datasets; the more data an AI system can access, the better it can learn and the more accurate it becomes. Hence, the availability of big data has been a critical enabler in the development of more sophisticated AI models.

The Rise of Big Data Analytics: Big data analytics refers to the process of collecting, organizing, and analyzing large sets of data to discover patterns and other useful information. This field has grown in tandem with AI, as the insights gleaned from big data analytics are often fed into AI systems. Techniques such as predictive analytics use statistical algorithms and machine learning techniques to identify the likelihood of future outcomes based on historical data. This is invaluable for industries ranging from healthcare, where predictive models can forecast disease outbreaks, to retail, where they can predict consumer buying behaviors.

Impact of Cloud Computing: Cloud computing has been another crucial factor in the AI boom. By allowing data and AI systems to be hosted on the Internet, rather than on local computers or servers, cloud computing has dramatically lowered the barrier to entry for utilizing AI technologies. It provides businesses and individuals with access to powerful computing resources and vast amounts of storage space without the need for significant upfront investment in physical hardware. This democratization of access has allowed startups and smaller companies to deploy AI solutions that were previously the preserve of large corporations.

Moreover, cloud platforms often offer as-a-service options for machine learning and deep learning, which further simplifies the process of developing and deploying AI models. These platforms continuously update and maintain their hardware and software, ensuring that users always have access to the latest advancements without additional cost or effort on their part.

The Role of IoT in AI's Growth: The Internet of Things (IoT) describes the network of physical objects-"things"-that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet. IoT has exponentially increased the number of data points available for analysis, providing AI systems with a more comprehensive view of the world.

IoT devices permeate various sectors, including healthcare (with devices that monitor patient health in real time), transportation (with smart sensors for fleet management and vehicle safety), and manufacturing (with sensors to monitor and optimize industrial processes). The data collected from these devices not only helps in immediate operational functions but also feeds into larger AI-driven analytics, improving system efficiencies and capabilities over time.

The Integration of AI into Electric Power Systems

The integration of Artificial Intelligence (AI) into electric power systems represents a transformative shift towards more efficient, reliable, and intelligent grid management. By harnessing the capabilities of AI, particularly machine learning (ML) and deep learning, utilities are now better equipped to predict and identify system faults, enhance real-time monitoring, optimize power flow, and stabilize the grid. This integration not only promises significant improvements in operational performance but also in reducing downtime and maintenance costs through predictive maintenance strategies.

AI for Fault Detection and Diagnosis: Traditionally, fault detection in electric power systems has relied on rule-based systems that require extensive manual inputs and adjustments. These methods can be slow and often lack the ability to adapt to new or unseen fault conditions, leading to delays in response times and potential escalations in system failures. In contrast, AI-driven approaches, especially those utilizing machine learning models, offer a dynamic solution capable of learning from vast datasets, including historical performance data, real-time sensor data, and environmental conditions.

Machine learning models can be trained to recognize patterns that precede faults or anomalies, enabling them to predict and identify issues much faster and with greater accuracy than traditional methods. For example, a deep learning model can continuously analyze the electrical load data and instantly detect deviations that may indicate a fault or an emerging issue, thereby prompting preemptive actions to mitigate potential impacts.

Real-Time Monitoring and Anomaly Detection: AI applications extend significantly into real-time monitoring and anomaly detection. One such application is the use of neural networks to monitor power lines and substations continuously. These networks are trained on historical data, including instances of equipment failures, weather conditions, and load demands, allowing them to detect anomalies that could suggest equipment malfunctions or external threats like physical damages or cyber-attacks.

For instance, AI-driven systems in California are currently used to analyze weather data, predict potential fault lines during wildfires, and dynamically reroute power to minimize fire risk and ensure supply continuity. Similarly, in Europe, grid operators use machine learning to detect and respond to anomalies in real-time, enhancing their ability to maintain system stability even under fluctuating conditions and unexpected load variations.

Adaptive Control Systems for Power Flow and Voltage Regulation: AI-powered adaptive control systems represent another significant advancement in the smart grid domain. These systems utilize algorithms to optimize power distribution based on real-time data, thereby enhancing efficiency and reliability. For instance, reinforcement learning, a type of machine learning where algorithms learn to make specific decisions by trying to maximize a reward signal, can be used to adjust power flows automatically and manage voltage levels across the grid.

This capability is crucial for integrating renewable energy sources, such as solar and wind, which can introduce variability in power generation. AI systems can dynamically adjust to changes in power supply and demand, ensuring optimal grid performance and preventing voltage instability or outages.

AI in Demand Response and Grid Stabilization: Demand response programs are critical for grid stability, especially as the penetration of renewable energy sources increases. AI can significantly enhance these programs by predicting peak load periods and enabling utilities to manage demand more effectively. Machine learning models analyze consumption patterns, weather forecasts, and economic factors to forecast demand peaks and suggest optimal responses such as temporary price adjustments or automatic reduction of consumption in commercial and residential buildings.

Moreover, AI applications in grid stabilization include deploying algorithms that can instantly calculate and execute the best response to sudden changes, such as a renewable source suddenly going offline. These algorithms not only balance the load to prevent a power failure but also ensure that the transition is smooth and largely unnoticed by consumers.

Implementations of AI in power system protection

The integration of Artificial Intelligence (AI) into power system protection has revolutionized the way electricity grids are monitored, analyzed, and maintained. AI's influence spans several critical areas, including fault detection, predictive maintenance, and real-time operational adjustments. This deployment not only enhances the efficiency and reliability of power systems but also addresses complex challenges that traditional methods struggled with.

AI in Fault Detection and Diagnosis: One of the most impactful applications of AI in power system protection is in the area of fault detection and diagnosis. Traditional systems rely on predefined settings and simple algorithms that often fail to cope with the dynamic nature of modern power grids, which include renewable energy sources and variable load patterns. AI models, particularly those based on machine learning and deep learning, excel in these environments due to their ability to learn from vast amounts of data and adapt to new, previously unseen scenarios.

For example, utilities are now using AI to monitor transmission lines in real time. By analyzing data from sensors and weather stations along with historical fault data, AI systems can predict and identify potential issues before they lead to failures. These systems can differentiate between normal fluctuations and those that signify problems such as a damaged cable or an overloaded circuit. This proactive approach not only prevents outages but also minimizes the wear and tear on infrastructure by avoiding unnecessary stress on components.

Predictive Maintenance: Predictive maintenance is another area where AI significantly contributes to power system protection. Traditional maintenance schedules are typically based on estimated life expectancies and periodic checks, which often lead to either premature maintenance or unexpected failures. AI changes this scenario by enabling a condition-based maintenance strategy.

Using data collected from sensors installed on various components like transformers, breakers, and bushings, AI algorithms analyze the operating conditions and performance to predict when maintenance should be performed. This method ensures that maintenance is only conducted, when necessary, which optimizes resource use and reduces downtime. For instance, a North American energy provider implemented AI-driven predictive maintenance and reported a reduction in unexpected equipment failures by 30%, leading to increased grid reliability and reduced operational costs.

Real-Time System Adjustments: AI also plays a crucial role in real-time system adjustments in power grids. Dynamic line rating systems, which use real-time weather data to calculate the maximum safe operational capacity of power lines, are an example. AI algorithms analyze temperature, wind speed, and solar irradiation to adjust the power flow, which can prevent overheating and reduce the risk of line sagging. Such systems allow for more power to be transmitted safely during favorable conditions, thus optimizing the usage of existing infrastructure.

Challenges in Implementation: While the benefits of AI in power system protection are clear, the implementation of these technologies is not without challenges. The accuracy of AI models heavily depends on the quantity and quality of the data they are trained on. In many cases, collecting comprehensive and clean data from power systems can be difficult, especially from older components that were not designed with data collection in mind.

Additionally, the integration of AI into existing power systems often requires significant upfront investment in both technology and training. Power system operators need to be trained not only on how to use the new systems but also on how to trust and interpret the decisions made by AI, which can sometimes seem opaque or counterintuitive.

Cybersecurity is another critical concern. As power systems become more connected and smarter, they also become more vulnerable to cyber-attacks. Ensuring the security of AI-driven systems is paramount to protect critical infrastructure from potential threats.

Biographies:

ChatGPT is an AI language model developed by OpenAI, based on the GPT (Generative Pre-trained Transformer) architecture. Launched in November 2022, ChatGPT is designed to generate human-like text responses in a conversational manner. It is trained on a diverse dataset from books, websites, and other texts to perform tasks like answering questions, providing explanations, and generating creative content. ChatGPT aims to assist users across various domains, including education, customer support, and content creation, by offering insights, solving problems, and engaging in detailed discussions. Its capabilities are continuously evolving, driven by advances in AI research and user feedback.

DALL-E is an AI program developed by OpenAI, first introduced in January 2021. Named as a portmanteau of the famous surrealist artist Salvador Dalí and Pixar’s animated character WALL-E, it utilizes a version of the GPT-3 architecture to generate images from textual descriptions. This AI is capable of creating original, high-quality images and art from a simple text prompt, showcasing the ability to understand and manipulate concepts across different styles and contexts. DALL-E pushes the boundaries of creative AI, demonstrating its potential in assisting and augmenting human creativity in fields such as graphic design, advertising, and digital art

ARTIFICIAL INTELLIGENCE TECHNIQUES IN RENEWABLE ENERGY SYSTEMS

VISHNUPRIYA K K - 2320001 -II YEAR / IV Sem

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AI techniques are increasingly used in renewable energy systems to enhance efficiency, reduce costs, and improve reliability. They are applied in areas like predictive maintenance, energy optimization, smart grid management, and forecasting, ultimately contributing to a more sustainable energy future.

Here's a more detailed look at AI applications in renewable energy:

1. Predictive Maintenance:

- AI algorithms, such as artificial neural networks (ANNs), can analyze historical data and real-time sensor readings to predict potential equipment failures in wind turbines and solar farms.
- This allows for timely maintenance and repairs, minimizing downtime and reducing operational costs.

2. Energy Optimization:

- AI can optimize energy production and distribution in renewable energy systems. For instance, in solar energy, AI can improve forecasting, optimize the distribution of solar energy, and enhance the efficiency of power plants.
- In wind energy, AI can optimize the operation of wind turbines, such as determining the optimal yaw angle or blade pitch to maximize power output.

3. Smart Grid Management:

- AI is crucial for managing the integration of renewable energy sources into the power grid, particularly due to their intermittent nature.
- AI algorithms can predict power output from renewable sources, optimize grid stability, and manage the flow of electricity to meet fluctuating demand.

4. Forecasting:

- AI models can forecast wind speeds, solar irradiance, and power output from renewable sources with greater accuracy than traditional methods.
- This allows for better grid dispatch, demand-side management, and grid balancing, improving the reliability of the power system.

5. Specific AI Techniques:

- **Artificial Neural Networks (ANNs):**

  Widely used for forecasting, optimization, and decision-making in renewable energy systems.
- **Genetic Algorithms (GAs):**

  Effective for optimization tasks, such as finding the best parameters for renewable energy systems or optimizing the layout of solar panels.
- **Fuzzy Logic:**

  Useful for risk mitigation and decision-making in uncertain environments, such as managing the impact of weather on wind turbine performance.
- **Other Techniques:**
  Support Vector Machines (SVMs), Adaptive Neuro-Fuzzy Inference Systems (ANFIS), and other machine learning algorithms are also employed in renewable energy systems.

6. Benefits of AI in Renewable Energy:

- **Improved Efficiency:**

  AI helps optimize energy production and distribution, leading to higher energy output and reduced costs.
- **Reduced Downtime:**

  Predictive maintenance and early fault detection minimize equipment downtime and reduce operational costs.
- **Enhanced Reliability:**

  AI-driven smart grids and power systems improve reliability and stability.
- **Cost Savings:**

  AI-driven optimization and automation can reduce operational costs and improve profitability.
- **Increased Sustainability:**
  By optimizing energy production and distribution, AI contributes to a more sustainable energy future.
- Artificial Intelligence in Renewable Energy - RatedPower

ARTIFICIAL INTELLIGENCE TECHNIQUES IN SMART GRID

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AI plays a crucial role in smart grids, enabling more efficient, reliable, and sustainable energy systems. It optimizes energy management, predicts failures, and integrates renewable energy sources, leading to a more resilient and responsive grid.

Here's a more detailed look at AI's applications in smart grids:

1. Enhanced Energy Management:

- **Load Forecasting:**

  AI algorithms predict energy demand, helping grid operators balance supply and demand, ensuring reliable energy delivery.

- **Energy Optimization:**

  AI optimizes energy production, storage, and consumption, improving overall grid efficiency.

- **Energy Storage Optimization:**
  AI helps manage energy storage systems (like batteries) by predicting when and how to store surplus energy most efficiently, ensuring a consistent energy supply, especially with fluctuating renewable sources.

2. Improved Grid Reliability and Security:

- **Fault Detection and Isolation:**

  AI-based systems can quickly identify and isolate faults, minimizing the impact of outages on consumers.

- **Predictive Maintenance:**

  AI analyzes historical and real-time data to predict equipment failures and maintenance needs, reducing downtime and costs.

- **Cybersecurity:**
  AI enhances grid security by detecting and mitigating cyber threats in real-time.

3. Enhanced Integration of Renewable Energy:

- **Integration of Distributed Energy Resources (DERs):**

  AI helps coordinate and control DERs like solar panels and wind turbines, ensuring grid stability and efficiency.

- **Addressing the "Duck Curve":**
  AI can help rebalance the peaks of production and consumption, making renewable energy sources easier to manage.

4. Other Applications:

- **Dynamic Pricing:**

  AI can help calculate dynamic energy prices based on supply and demand, leading to better energy supply and demand matching.

- **Building Automation Systems:**

  AI enhances building automation systems by analyzing building-wide data in real time to optimize systems based on usage patterns and environmental conditions.

- **Improved Communication and Collaboration:**
  AI can facilitate better communication and collaboration between different grid components and users.

Challenges and Considerations:

- **Data Quality and Accessibility:**

  AI relies on high-quality data, and ensuring data accessibility is crucial.

- **Cybersecurity Risks:**

  AI systems can be susceptible to cyber threats, requiring robust security measures.

- **Regulatory Frameworks:**

  Regulatory frameworks may need to be updated to accommodate AI in smart grids.

- **Public Acceptance:**
  There may be concerns about data privacy and potential job displacement, requiring public education and engagement.

VISION

To become a high standard of excellence in Education, Training and Research in the field of Electrical and Electronics Engineering and allied applications

MISSION

To Produce excellent, innovative and Nationalistic Engineers with Ethicalvalues and to advance in the field of Electrical and Electronics Engineering and Allied Areas