

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

ACCREDITED BY NAAC A+



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EXPERT'S ARTICLE

AN INTRODUCTION TO INDUSTRY 4.0 TECHNOLOGIES

INTRODUCTION

The development of the Nation depends on the economic growth and the quality of citizens, in turn depends on the development of technology and its applications for the societal requirements that may change time to time. Infrastructure, power, communication, Agriculture, and service sectors, viz., Education and Health, etc., are various sectors to be prioritized by the Government and various Non Government Organizations to improve the standards and living conditions.

In order to meet the new challenges and growing demand, in 2011 at the Hannover Messe, Germany's most important industrial fair, proposed 'Nine verticals' in Industry 4.0 technologies, viz., (i) Big data Analytics (ii) Cloud computing (iii) Cyber security (iv) Internet of Things (v) System Integration (vi) Digital twins / simulation (vii) 3 D Printing and



Additive Manufacturing (viii) Advanced Robotics (ix) Augmented Reality. In this article, introductory information and applications are provided about these technologies.

INDUSTRY 4.0 TECHNOLOGIES

Big Data Analytics : The qualitative improvement in analyzing data to be addressed by Artificial Intelligence and Machine learning Algorithms that result in improved performance in terms of classification, clustering, recognition, vision, planning, optimization, scheduling, and extraction of knowledge from the data. There is a need to automate the analysis of data, by simulating the human like intelligence. The analysis of Big data is to be done, by considering 4 Vs', viz., Velocity, Veracity, Variety, and Volume. Five types of data analytics, viz., Descriptive, Diagnostic, Predictive, Prescriptive, and Cognitive are to be considered for the data.

The applications are enormous, viz., weather forecasting, stock market prediction, power generation and distribution, improving the qualitative and quantitative production in agricultural and Industrial sectors, and service sectors, viz., education and health sectors, Automobiles and environmental protection etc.

Cloud computing : The qualitative improvement in analyzing data to be addressed by Artificial Intelligence and Machine learning Algorithms that result in improved performance in terms of classification, clustering, recognition, vision, planning, optimization, scheduling, and extraction of knowledge from the data. There is a need to automate the analysis of data, by simulating the human like intelligence. The analysis of Big data is to be done, by considering 4 Vs', viz., Velocity, Veracity, Variety, and Volume. Five types of data analytics, viz., Descriptive, Diagnostic, Predictive, Prescriptive, and Cognitive are to be considered for the data.

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Cyber Security : The qualitative improvement in analyzing data to be addressed by Artificial Intelligence and Machine learning Algorithms that result in improved performance in terms of classification, clustering, recognition, vision, planning, optimization, scheduling, and extraction of knowledge from the data. There is a need to automate the analysis of data, by simulating the human like intelligence. The analysis of Big data is to be done, by considering 4 Vs', viz., Velocity, Veracity, Variety, and Volume. Five types of data analytics, viz., Descriptive, Diagnostic, Predictive, Prescriptive, and Cognitive are to be considered for the data.

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Internet of Things : The qualitative improvement in analyzing data to be addressed by Artificial Intelligence and Machine learning Algorithms that result in improved performance in terms of classification, clustering, recognition, vision, planning, optimization, scheduling, and extraction of knowledge from the data. There is a need to automate the analysis of data, by simulating the human like intelligence. The analysis of Big data is to be done, by considering 4 Vs', viz., Velocity, Veracity, Variety, and Volume. Five types of data analytics, viz., Descriptive, Diagnostic, Predictive, Prescriptive, and Cognitive are to be considered for the data.

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System Integration : System Integration refers to the collection, interpretation, and analysis of data and thereby control of from various Units within the organization (or) among organizations. The integration of systems may be within the same level of Units (Horizontal integration) or can be from different levels (vertical integration). With horizontal integration, processes are tightly integrated at the "field level" – on the production floor, across multiple production facilities, and across the entire supply chain. With vertical integration, all the layers of an organization are tied together – and data flows freely from the shop floor to the top floor and back down again for improved and reliable decision making. In other words, production is tightly integrated with business processes like R&D, quality assurance, sales and marketing, and other departments.

It involves the combination of various computing systems and software in order to create larger system to work at its optimum. This helps the administration for proper decision making and thereby qualitative and quantitative improvement in the efficiency and production with effective management skills. Manufacturers can automate the process and streamline operations, which can lead to increased efficiency and productivity.

Simulation : Simulation refers to mimic the physical object / system / system of systems, to check the functioning of Unit(s), the design objectives, to verify the fault tolerance, efficiency, and risk management. The simulation of the system in the dynamic process ensures various parameters to be optimized, for efficient function of the same. It could aid industries to evaluate the cost and study of the different barriers in the implementation process. Simulation prior to implementation of the physical system in the real world helps to be cost effective and gains the advantage of time and space management.

Simulation finds its applications in various sectors, viz., Automobile and Manufacturing industry, Pharmacy and Health sector, infra development, and Agriculture, etc.

3 D Printing and Autonomous Robots : Additive manufacturing, often known as 3D printing, is a type of digital fabrication technique that builds physical items from a geometrical model. The main difference between 3D printing and additive manufacturing is that 3D printing specifically involves the creation of objects by adding layers of material. Yet additive manufacturing involves the creation of objects by adding material, which may or may not come in layers.

The software that is being developed can be used to formulate the model of interest from given material, to required model, at any location of interest, thereby improving the portability as per our requirement. Autonomous Robots is an interdisciplinary subject which is very useful, to mimic the human acts. Further, the technology is developing to replace the human, in various sector, viz., telemedicine, agriculture, education, tourism, defense, and other sectors. The convergence of Electronics, Mechanical and Instrumentation disciplines resulted the Autonomous Robots to replace the human.

Augmented Reality and Virtual Reality : Augmented Reality, which overlays digital content on a real environment, is a core concept of Industry 4.0. With an AR system, employees use smart glasses or mobile devices to visualise real-time IoT data, digitised parts, repair or assembly instructions, training content, and more when looking at a physical thing – like a piece of equipment or a product. Applications involve Corporate training, health care, hospitality, retail, and Automotives.

Augmented reality (AR) augments your surroundings by adding digital elements to a live view, often by using the camera on a smartphone. Virtual reality (VR) is a completely immersive experience that replaces a real-life environment with a simulated one.

AR uses a real-world setting while VR is completely virtual. AR users can control their presence in the real world; VR users are controlled by the system. VR requires a headset device, but AR can be accessed with a smartphone. AR enhances both the virtual and real world while VR only enhances a fictional reality.

Advanced manufacturing : The use of innovative technologies to create existing products and the creation of new products, is considered as Advanced manufacturing. Innovative technologies, viz., IoT, Autonomous Robots, and other innovative technologies play key role for the development of quality product. The automation of manufacturing result in space and time optimization. Smart factories, using the innovative technologies, result flexible, more efficient and responsive to market changes.

MAJOR ACTIVITIES

FELICITATION TO GATE ACHEIVERS 2K24

On 23rd March 2024, the focus shifts to celebrating the GATE 2024 achiever's success while also providing a platform for them to share insights and experiences. The Vice Chancellor, Principal, HOD of ECE, and all the respected staff members gathered to congratulate the acheivers.



FELICITATION TO DR. L. SUMALATHA REGISTRAR OF JNTUK

On 23 March 2024, Dr. L. Sumalatha , registrar of JNTUK was falicitated on her excellence in research. As she got an award of Top 100 Global Powerful Women in the Category of Research and Excellence Award by Mc Stem Eduversity, India/USA.



MAJOR ACTIVITIES

INAUGURAL REALEASE OF DEPARTMENT MAGAZINE

ECE PRESAGE VOLUME 1

On 23 March 2024, in the bustling halls of our campus, amidst the hum of excitement and anticipation, the inaugural release of the department magazine is a momentous occasion. With each turn of its pages, Major activities of the department, Faculty achievements, tapestry of student voices, talents, and experiences unfolds, encapsulating the essence of our academic community.



ESPARX 2K24



INAUGURAL EVENT

With tremendous excitement and anticipation, **ESPARX**, the eagerly anticipated yearly spectacular, began. The launch ceremony signaled the start of an exciting program full of artistic and intellectual stimulation. It set the stage for what promised to be an incredible trip through creativity and skill with speeches that uplifted and encouraged.

WORKSHOPS

Subsequent to the opening ceremony, **ESPARX** conducted a series of informative workshops designed to help participants improve their skills in a variety of fields. The workshops provide a forum for learning with practical-technical training.

WORKSHOP ON CADENCE

A 2-Day National Level Workshop on Cadence was held on April 26th and 27th, 2024. Mr. Rajendra Engineer from cadence acted as resource person and Dr.P.Pushpalatha, Smt. T. V. Ramani acted as coordinators. More than 60 students had participated in the workshop.



MAJOR ACTIVITIES

WORKSHOP ON LATEX

A 2-Day National Level Workshop on LaTeX was held on April 26th and 27th, 2024. Dr. B. T. Krishna, Professor of ECE, UCEK acted as resource person and Dr. K. Rajasekhar acted as coordinator. More than 60 students participated in the workshop.



WORKSHOP ON PCB DESIGN

A 2-Day National Level Workshop on PCB Design was held on April 26th and 27th, 2024. Mr. M. Chanti, Engineer from AVL Technologies, acted as resource person and Dr. K. Durga Ganga Rao acted as coordinator. More than 50 students participated in the workshop.



WORKSHOP ON DRONE TECHNOLOGY

A 2-Day National Level Workshop on PCB Design was held on April 26th and 27th, 2024. Dr. S. K. Venkata Sateesh, CEO, Rosys virtual solutions Pvt Ltd, Mrs. P. Sai Lalitha, Drone Pilot and Mr. V. Siva Kumar, Drone Pilot acted as the resource person and Dr.R. Madhu Smt.Ch.Krishnaveni acted as coordinators. More than 80 students participated in the workshop.



MAJOR ACTIVITIES

CONTESTS

Our National Tech Fest, **ESPARX 2024** competitions are carefully crafted to evaluate and motivate attendees while encouraging a culture of creativity and quality. Top talent is drawn to these events, which promote collaboration as well as individual success. Participants compete for significant Prize money, rewards and recognition while showcasing their abilities and inventiveness.

HACKATHON

Number of Students Participated : 28
Winners : P.S.S.Sailaja, G. Yeshwanth



QUIZ

Number of Students Participated : 100
Winners : Divya Sree Harshitha, Divya Satya Sri, M Charmika



CIRCUITX

Number of Students Participated : 26
Winners : A. Ramoji Naidu



PAPER PRESENTATIONS

Number of Students Participated : 24
Winners : P. Prudhvi Ram, T. Vinay Sundar



PROJECT EXPO

Number of Students Participated : 15
Winners : P. Prudhvi Ram, T. Vinay Sundar



DEPARTMENT ACTIVITIES

Expert talk was delivered by Dr. H. V. S. SatyaNarayana Chief Scientist CSIR-NGRI Hyderabad, on "Geotechnical Studies and role of Electronics Engineers which was Convened by " Dr. B. Leela Kumari, HoD, ECE at the Department of Electronics and Communication Engineering Department for Faculty, UG/PG students on 23-03-2024. 44 students have attended the same.



Invited talk was delivered by Dr. T. Srinivas Professor, IISC, Bangalore "VLSI – Career Opportunities and Importance of IEEE Forum" which was Convened by " Dr. B. Leela Kumari, HoD, ECE at the Department of Electronics and Communication Engineering Department for Faculty, UG/PG students on 04-04-2024. 40 students have attended the same.



Department of Electronics and Communication Engineering, organized a one day work shop on " Hands-on Session on Microprocessor and Micro Controller Interfacing" on 16th April 2024 at ECE Department in collaboration with Emsys Technologies which was Convened by Dr.B.Leela Kumari, HoD, ECE, coordinated by Dr.K.Jhansi Rani , Assistant professor and Co-coordinated by Mrs. Krishnaveni, Assistant professor (C), Mrs.Prashanthi, Assistant professor (C).



DEPARTMENT ACTIVITIES

Dr. B. Leela Kumari had given a lecture titled "Overview on Implementation of Projects and Technical Seminars and Importance of IEEE Student Branch" which was conducted on April 26-27, 2024. It is organized by the ECE Department of UCEK, JNTUK.



OTHER DEPARTMENT ACTIVITIES

FREE MEDICAL CAMP



FOOD STALLS



RANGOLI



FOOD SERVING IN ESPARX



ARIAL VIEW



NOTICE BOARD



WALL POSTER



DIRECTION MAP



COORDINATORS FOR
ESPARX 2024 WORKSHOPS



NSS ACTIVITY
IN ECE DEPARTMENT, UCEK



B. TECH FINAL YEAR
STUDENTS PROJECT VIVA



LECTURE BY
STUDENT ALUMNI



THESES / DISSERTATION

10 Thesis / Dissertations were awarded to Ph.D. students under the guidance of faculty members in the Department of Electronics and Communication Engineering (ECE).



INDUSTRY INSTITUTE INTERACTION

As a part of Industry institute Collaborative programme, Moschip –UCEK Connect (Industry academia interaction) Was scheduled on 9-04-2024 at 4:00 PM to 4:30 PM. Principal, Vice-principal , Heads of the departments of ECE, EEE along with **Dr. Venkata Narayana Garu** participated through online.



Sri. K. Hari Krishna, an Assistant Professor (c), participated in a two-week program at Mos Chip Technologies in May 2024. UCEK sponsord for this industry institute training.



PAPER PUBLICATIONS

Dr. B. Leela Kumari had presented a paper titled “Lane Departure Warning System” in the International Conference on Recent innovations in Science and technology(RIST-2024) during 26th –27th April 2024.

Dr. B. Leela Kumari had presented a paper titled “Performance analysis of Sound Isolation using CACGMM and PDSA” in the International Conference on Pure, Applied and Engineering Mathematics--2024 during 16th April 2024.

Dr. B. Leela Kumari had presented a paper titled “Performance analysis of Sound Isolation using FDM and ADMM” in the International Conference on Pure, Applied and Engineering Mathematics-ICPAEM-2024 during 30–31 March 2024.

Dr. M. Sailaja, had presented a paper titled “ECG Signal enhancement using selective weight updated filtering techniques for telemetry”, International Conference on Electrical Electronics and Computer Sciences, April 2024.

Dr. B. T. krishna, had got approval of funding of Rs. 10,00,000 for his research proposal under RUSA 2.0.

Dr. K. Padma Priya is leading a project titled “Acoustical Voice Analysis in Women with Polycystic Ovarian Syndrome – Age, Severity, and Onset of the Problem” under RUSA 2.0, with a funding of Rs. 10,00,000.

Dr. K. Rajasekhar, published an article titled “Fractional Order Differentiators and Integrators Design using Transform Techniques”, Journal of Propulsion Technology, April 2024.

Dr. K. Jhansi Rani published an article titled "Evaluation of UDP-based DDoS Attack Detection by Neural Network Classifier with Convex Optimization and Activation Functions" in Ingenierie des Systems d'Information, on June 2024.

Smt. A. Rajani, published an article titled “Mouse using mpu6050”, Journal of emerging trends and novel research, May 2024.

PATENTS

Dr. R. Madhu had sanctioned a patent titled "Multi-Band, Multi-Polarized, High Isolation Flexoelectric Effect-Based Asymmetrically Flared Frustum Dr Antenna for Defence/Space Applications" (Patent No: 541191) was granted on June 10, 2024.

Sri. K. Hari Krishna Published a patent titled "Multi-Walled Carbon Nanotubes" on 24/04/2024 .

Smt. Viswa Bharathi D and Smt. Krishnaveni CH had Published a patent titled "NEURAL NETWORK BASED APPROXIMATE MULTIPLIER DESIGN FOR IMAGE PROCESSING APPLICATIONS" on 19/04/2024 .

Smt. A. D. Bhavani published a patent titled "ELECTRONIC DEVICE FOR READING MAGANATIC CARDS".

PROFESSIONAL DEVELOPMENT

- Dr. B. Leela Kumari served as the convener for Esparx 2024, which was organized by the Department of ECE at UCEK, JNTUK. The event took place on the 26th and 27th of April.
- Dr. B. Leela Kumari acted as the convener for a hands-on workshop on microcontroller and microprocessor interfacing held on April 16, 2024, at the Department of ECE, UCEK, JNTUK.
- Dr. B. Leela Kumari acted as the coordinator for a 21-day Master class on Autonomous Vehicle Design, which took place from February 13, 2024, to April 2, 2024.
- Dr. B.T. Krishna acted as a resource person for a LaTeX Workshop during Esparx 2024, organized by Department of ECE, UCEK, JNTUK during the period of 26-27 April 2024.
- Dr. P. Vinay Kumar acted as the coordinator for the Hackathon event at Esparx 2024, organized by Department of ECE, UCEK, JNTUK during the period of 26-27 April 2024.
- Dr. P. Vinay Kumar participated a Faculty Development Program (FDP) on MATLAB & LABVIEW Applications from April 8, 2024, to April 16, 2024, at the National Institute of Technical Teachers Training and Research in Chennai.
- Dr. K. Rama Devi acted as the coordinator for the Project Expo event, Esparx 2024, organized by Department of ECE, UCEK, JNTUK during 26-27 April 2024.
- Dr. K. Durga Ganga Rao acted as the coordinator for the PCB Design Workshop during Esparx 2024, organized by Department of ECE, UCEK, JNTUK during 26-27 April 2024.
- Dr. K. Rajasekhar acted as a LaTeX Workshop coordinator in Esparx 2024, organized by Department of ECE, UCEK, JNTUK during 26-27 April 2024.
- Dr. R. Madhu acted as coordinator for the Drone Technology Workshop in Esparx 2024, organized by Department of ECE, UCEK, JNTUK during the period 26-27 April 2024.

- 💡 Dr. P. Pushpa Latha acted as coordinated for Cadence workshop at Esparx 2024, organized be Department of ECE, UCEK, JNTUK during 26–27 April 2024..
- 💡 Dr. P. Pushpa Latha participated in a skill training workshop on Efficient Project Management & Documentation, which was held on 16th April 2024 at the Department of CSE, St. Xavier's College of Management & Technology, Patna, Bihar.
- 💡 Dr. K. Jhansi Rani has completed a 12 week NPTEL course, Constitution law and administration in India, Jan–April-2024.
- 💡 Dr. K. Jhansi Rani acted as coordinator Esparx 2024, organized be Department of ECE, UCEK, JNTUK during 26–27 April 2024.
- 💡 Dr. K. Jhansi Rani acted as a Workshop Coordinator, organized a Hands-on Workshop on Microcontroller and Microprocessor Interfacing on April 16th, 2024, in the Department of ECE at UCEK, JNTUK.
- 💡 Dr. K. Jhansi Rani attended a state-level one-day workshop on the Academic Bank of Credits on March 11th, 2024, organized by APSCHE in association with JNTUK, Kakinada.
- 💡 Smt. A. Rajani participated in one-week Faculty Development Program (FDP) on Data Science and its Applications at ACT Academy in Kerala from April 5th to April 12th, 2024.
- 💡 Smt. A. Rajani, acted as Coordinator, organizing a paper presentation for Esparx 2024 on April 26th and 27th, in the Department of ECE at UCEK, JNTUK.
- 💡 Smt. A. Rajani participated a one-week workshop at PVP Siddhartha Institute of Technology in Vijayawada from March 11th to March 15th, 2024.
- 💡 Dr. Gowthami Y acted as quiz coordinator Esparx 2024, organized be Department of ECE, UCEK, JNTUK during 26–27 April 2024.
- 💡 Dr. Gowthami Y participated in 2-day National Level workshop on LaTeX at Esparx 2024 held on April 26th and 27th at the Department of ECE, UCEK, JNTUK
- 💡 Mrs. A. D. Bhavani acted as paper presentation coordinator Esparx 2024, organized be Department of ECE, UCEK, JNTUK during 26–27 April 2024.
- 💡 Mrs. A. D. Bhavani participated a 2-day National Level workshop on LaTeX at Esparx 2024 held on April 26th and 27th at the Department of ECE, UCEK, JNTUK
- 💡 Sri S. Nagarjuna Endorsing for IEEE membership with membership id. 100205795
- 💡 Sri S. Nagarjuna acted as Hackathon coordinator Esparx 2024, organized be Department of ECE, UCEK, JNTUK during 26–27 April 2024.
- 💡 Sri S. Nagarjuna participated in 2-day National Level workshop on Cadence at Esparx 2024 held on April 26th and 27th at the Department of ECE, UCEK.
- 💡 Smt. T.V. Ramani Endorsing for IEEE membership id. 100180705
- 💡 Smt. T.V. Ramani participated the 2-day national-level workshop on Cadence, Esparx 2024, held on April 26th and 27th at the Department of ECE, UCEK, JNTUK.

STUDENT ACHIEVEMENTS

- 56 final-year BTech students have successfully completed online internships organized by **A.P. State Council of Higher Education (APSCHE)**.
- 62 students of B. Tech third year have successfully completed summer internships in various companies and industries, such as **HAL, Infotech, Microlink, and ICDT**.
- 60 students of B. Tech second year have successfully completed internships at various companies and NITs, including **CDAC, NIT-AP, South Central Railway in Vijayawada, and Silicon Info Systems**.

P. Jagadeeswara Rao, S. K. Rafiya Masthana, and K.Gnanendar, “Design and implementation of power Law filters”, National Conference on recent advances in Communicative electronics NCRACE-2024,14-15 March 2024, SRMTP Engineering College, Tiruchurapalli.



E. Jyothi, B. Nivas, and K. Ramamani have presented a paper titled “Lane Departure Warning System” in the International Conference on Recent innovations in Science and technology(RIST-2024) during 26th -27th April 2024.



Mr. Hrushikesh, Mrs. Yoshita and Mrs. Vandana have presented a paper titled “Performance analysis of Sound Isolation using CACGMM and PDSA” in the International Conference on Pure, Applied and Engineering Mathematics--2024 during 16th April 2024.

Mr. Hrushikesh, Mrs. Yoshita and Mrs. Vandana have presented a paper titled “Performance analysis of Sound Isolation using FDM and ADMM” in the International Conference on Pure, Applied and Engineering Mathematics-ICPAEM-2024 during 30-31 March 2024.



Mr. Dileep (M. Tech) has Got posting of Indian Ordnance Factories Service (Weapon Developing in Indian Navy) through UPSC.



ENGAGEMENT & SPORTS

The First Year Girls Batch led by Ms. Harika , I B.Tech, ECE, won the Kho-kho tournament on University Sports Day Celebrations at UCEK, JNTUK.



VISION

To remain a symbol of pride in the fields of Electronics and Communication Engineering by producing holistic and diligent Engineers for industrial and societal needs.

MISSION

To produce high quality learners who are globally competitive and professionally challenged in the field of Electronics and Communication Engineering.

To offer educational programmes that imparts inventive knowledge with high levels of ethical and human values.

To provide a platform to acquire and implement innovative ideas in research and development.

To build up the state of art laboratories and centres of excellence in different areas of Electronics and Communication Engineering.

To train the students and faculty to update their knowledge in pioneering technologies to meet industrial requirements.

OUR TEAM

EDITOR IN CHIEF



DR. LEELA KUMARI BALIVADA
HEAD OF THE DEPARTMENT

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