Certificate of Attendance

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Towards Smart Automation: An IoT-Integrated Control Strategy for Industry 4.0

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Towards Smart Automation: An IoT-Integrated Control Strategy for Industry 4.0

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ABSTRACT

The Internet of Things (IoT) plays a central role in the conversion to Industry 4.0 by enabling intelligent connectivity, real-time remote monitoring, and advanced automation of industrial processes. In this context, the main purpose of automatic bottle filling and cap systems is to improve production efficiency by minimizing or eliminating human intervention. One of the most important performance goals is to reduce filling accuracy, reduce operational errors, increase overall and reduce labor costs.

This paper presents a concrete example of IoT integration in industrial automation through the design and implementation of intelligent bottle filling and capping systems based on an Arduino microcontroller. The system enables real-time and remote control monitoring via an IoT platform, and uses components such as infrared sensors, relay modules, DC engines, and specialized mechanical structures to recognize and manage filling and cap processes.

By using IoT technology, the system is consistent with Industry 4.0 principles. This improves operational visibility, reduces human dependency, and reduces process optimization. This approach is particularly relevant to sectors such as food, drinks and medicines where accuracy, hygiene and efficiency are of great importance.

KEY WORDS

The Internet of Things(Iot) ;Industry 4.0 ; automatic bottle filling and cap systems; communication ; Arduino microcontroller.

I. INTRODUCTION

Industrial automation is currently a fundamental pillar of the development of production and management processes in industry. From the first automated assembly lines to sophisticated robotic systems, automation has increased productivity, improved product quality, and reduced risks associated with human intervention [1]. With the creation of Industry 4.0, the new paradigm takes a form characterized by the convergence of digital, physical and biological technologies. This industrial revolution integrates advanced concepts such as ubiquitous connectivity, artificial intelligence, big data, and in particular the Internet of Things (IoT), and traditional industrial systems are fundamentally transformed into intelligent systems capable of self-government, self-optimization and real-time communication [2-3].

Therefore, IoT occupy the strategic position of intelligent systems by enabling the collection, exchange, and large-scale analysis of data from interconnected sensors and devices. This ability paves the way for better product followers, predictive expectations, optimized resource management, and more flexible and more responsive automation [4]. However, this transformation adds to the big challenges. In particular, there is an increased need for advanced automation, the need to ensure reliable real-time traceability, and the constant pressure to reduce production costs. These challenges require innovative technical solutions that integrate robustness, security and intelligence into the system [5].

Automated systems are essential in modern industries to improve efficiency, accuracy and scalability. Programmable logic controllers (PLCs) are often used for robustness and actual time processing, but high costs can prevent acceptance by small and medium-sized businesses. As seen on the Arduino platform, microcontrollers offer cheap and flexible alternatives for small-scale automated applications.

The choice of PLC and microcontrollers depends on complexity, cost, and scalability requirements. Recent progress in IoT, AI, and cloud computing expands automation capabilities, enabling more intelligent and more adaptive processes. Many studies [6–21] have used a variety of control strategies (SPS, PID controllers, microcontrollers, SCADA) to examine automated bottle filling systems. However, most do not have full IoT integration, limited remote monitoring and analysis.

This paper aims to examine various aspects of industrial automation in the context of Industry 4.0. This focuses on the role of IoT in the development of intelligent industrial systems. The purpose of this work is to examine the use of IoT in industry 4.0 via bottle negotiation systems and explain how this technology meets the requirements of automation, improves traceability, and optimizes costs in modern industrial environments.

II. INTELLIGENT AUTOMATION TECHNOLOGY AND INTEGRATION INTO INDUSTRIAL 4.0 BEVERAGE PRODUCTION LINE

A. AUTOMATION TECHNOLOGIES IN BEVERAGE PRODUCTION LINES

Drinking and Cover Lines are complex industrial systems that require high levels of accuracy, efficiency and consistency. Initially, based on basic mechanical and electromechanical components, these systems were developed by including programmable logic controllers (PLCs), industrial robotics, and SCADA platforms for monitoring and control [1]. Today's advanced setups use precise fluid tax, conveyor systems for bottle transport, and actuators for mechanical or electromagnetic mechanisms of the cover. All of these are adjusted by SPS to maintain production speeds and ensure quality standards.

B. EXISTING INDUSTRY 4.0 APPROACHES FOR FILLING AND CAPPING SYSTEMS

The development of Industry 4.0 has allowed machines to move beyond simple automation to connect and move towards intelligent and adaptive cyberphysical systems [2]. Currently, line filling and capping benefits from the collection and processing of actual data from devices that allow for dynamic and optimized production management. The control architecture includes communication and cloud-based monitoring of machine-to-machine (M2M) to promote prediction, energy optimization, and batch adaptation [3].

C. IOT USAGE IN PRODUCTION LINES: SENSORS, COMMUNICATION, AND DATA ANALYTICS

The Internet of Things (IoT) plays an important role in converting beverage production lines into intelligent systems. Integration of various sensors (pressure, level, temperature, vibration, vision) in filling and cover stations enables continuous and detailed data collection [4]. This data is sent via the appropriate IoT protocol (MQTT, COAP) to a cloud or edge computing platform for real-time analysis, providing complete product traceability, automatic defect identification (e.g., misdirected caps, inadequate filling), and a rapid decision-making process. For example, an IoT system can recognize unplaced caps and automatically trigger warnings or stop the line to avoid rejection of mass products.

D. LIMITATIONS OF CURRENT SOLUTIONS

Despite considerable advances, current solutions are still subject to some limitations. First, the security of data and communications on the Internet of IoT remains a major issue as the risk of cyberattacks can hinder production [5]. Second, the issue of delay and reliability in IoT networks can limit the reactivity of critical systems, particularly in industrial environments with electromagnetic interference. Finally, the integration of these technologies requires interdisciplinary expertise and considerable investment, which hinders widespread acceptance, particularly in small and medium-sized businesses (small and medium-sized businesses) in the food and beverage sector. These challenges underscore the need to design robust and safe IoT architectures tailored to the special features of line filling and wear.

III. PROPOSED ARCHITECTURE

A. GENERAL DESCRIPTION OF THE FILLING AND CAPPING SYSTEM

The following diagram (Fig.1) illustrates the general mechanisms of automatic bottle filling and damage systems. This can be controlled by any type of microcontroller.

This microcontroller can manage the entire process and with dedicated software support, remote access and monitoring of the entire installation. To simplify the operation of the fill and cap process, Fig.1 illustrates the process flow, which includes the main engine that drives the conveyor belt that mainly transports the bottles. The process begins when the start button is pressed. The conveyor belt begins to move by motor M1 and the bottle begins to move along the line until sensor S2 detects the bottle. At that moment, the motor M1 will stop and the sponsor will stop.

At the same time, valve V1 opens and liquid can be released into the bottle until a certain level is reached, as determined by level sensor S1. As soon as you reach the desired filling level, valve V1 and motor M1 close and move the bottle further forward. S3 When S3 detects the presence of a bottle at the encryption station, piston P1 will activate and the bottle will crack. The next bottle cycle is repeated.

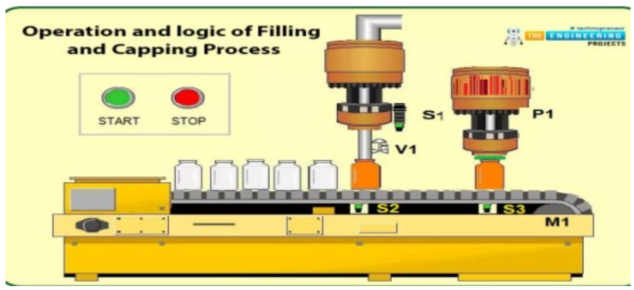

Fig. 1. The Filling and Capping Process

B. INTEGRATED IOT COMPONENTS (SENSORS, ACTUATORS, COMMUNICATION SYSTEMS)

This system allows for real-time and intelligent control monitoring through a variety of IoT components.

- Sensor monitors fluid level, pressure, presence, cap alignment and encryption.
- The car manages fluid tax, cap placement/tightening, bottle movement with pumps, engines and capping units.
- Communications modules, especially Wi-Fi modules, wireless data transmission between the Arduino and the web server confirms wireless data transmission for remote monitoring and control. In the Cyberphysical framework, these components work together to enable flexible production adjustments and predictive maintenance.

IV. DESIGN AND IMPLEMENTATION

A. HARDWARE COMPONENTS AND THEIR FUNCTIONS

- Power supply: This system has two power supplies. The first is an Arduino power supply. This can be either a 5-V -VUSB connection or a 12-V socket. The second is used to supply water pumps and DC motors, and two IR sensors: 12 V.
- IR sensors: Two IR sensors are used to recognize the presence of bottles in both the filling and capping systems. Both are driven by the Arduino itself. These are the only inputs on this system.
- LCD Screen: The LCD screen is used to display the status of the process. It uses an I2C interface and is an output device.
- DC Engine: This system includes two DC engines. One is used to increase and lower the cylinder, while the other is used to turn the bottle cap. Both use 12V.
- Stepper Engine: This system has a stepper motor. Used to drive sponsors.
- Relay: This system has two relays. One is used to control the water pump and the other to control the DC motor of the capping system.
- Servo Motor: Servo Engine is used to cover when the sensor detects the bottle.

- Wi-Fi Module: This module is used to send and receive signals from the Arduino and is displayed on a web server.

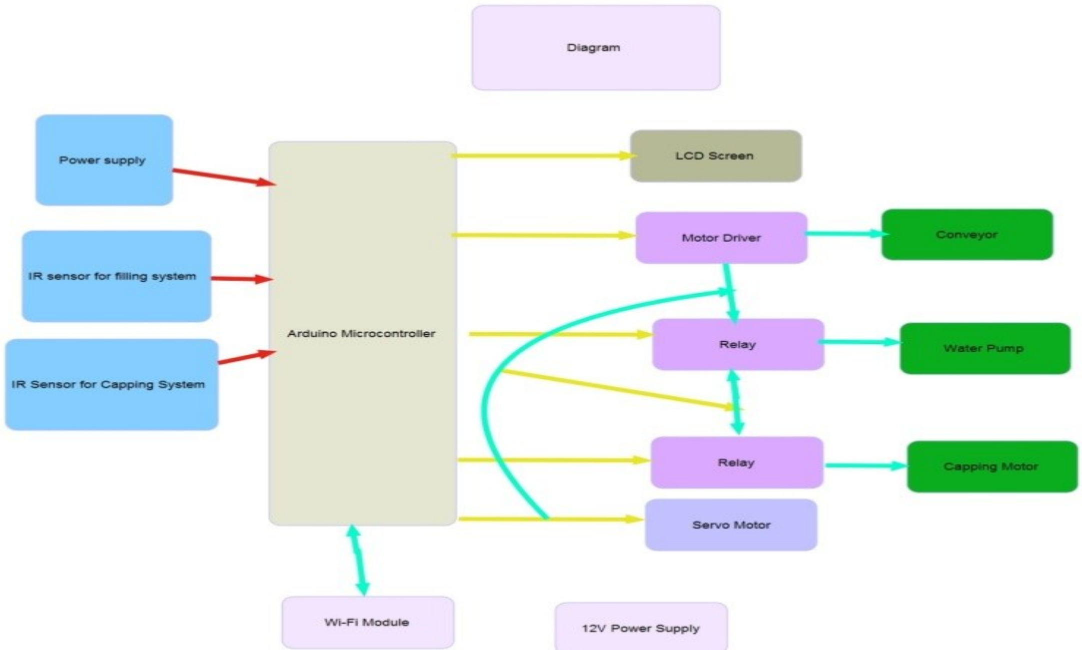

Fig. 2. Functionnal Diagram

B. WORKFLOW DIAGRAM

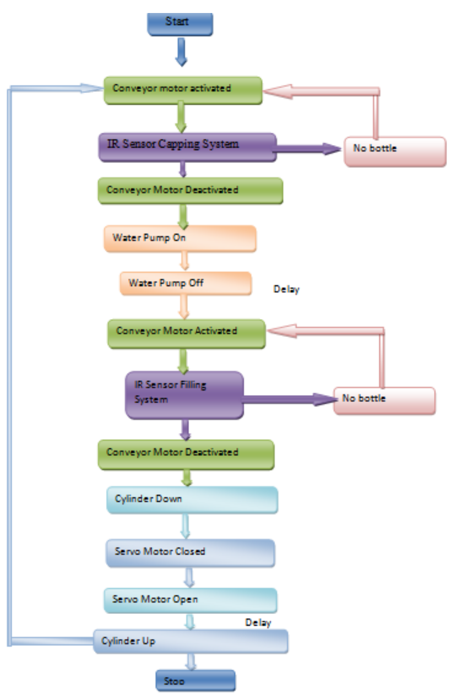

Fig. 3. Workflow Diagram

C. GLOBAL VIEW OF THE SYSTEM

Figure 4 shows the final aspect of the system. The conveyor belt begins and the bottle moves until the IR1 sensor recognizes the bottle's presence. The engine will then stop and the belt will no longer function. At the same time, the valve opens and fills the bottle with water to a certain level. As soon as you reach this level, the valve closes and the engine moves. When the IR2 sensor detects another bottle, the piston activates and seals the bottle. This process takes 40 seconds.

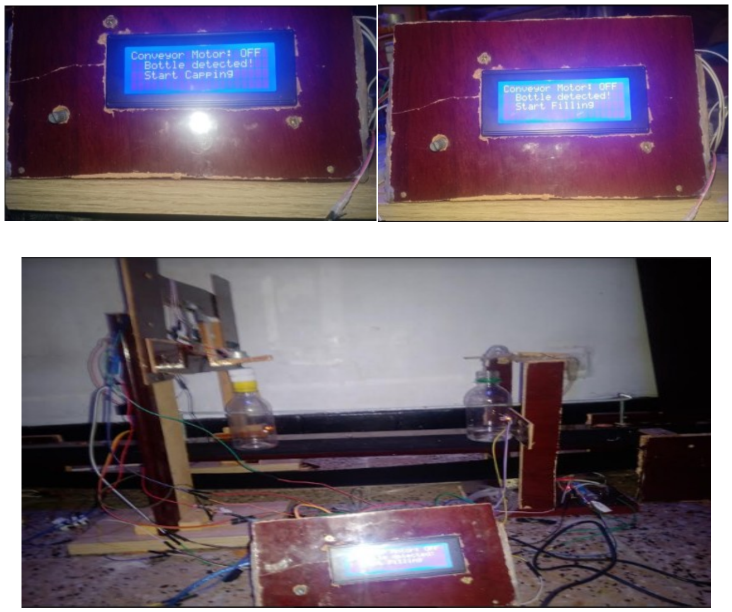

Fig. 4. Global view of the system[22]

D. INTERFACING ARDUINO WITH THE WI-FI MODULE

The system utilizes a **WEMOS D1 R1** board, built around the **ESP8266-12E** chip (similar to NodeMCU), to facilitate wireless communication between the Arduino and a web-based interface.
Digital I/O pins on the WEMOS are linked to those on the Arduino (pins D1 to D8), and the board can be powered via a micro-USB port or its integrated power terminals. It can connect to an existing Wi-Fi network or function as an access point, hosting its own web server.
The web interface is developed using **HTML and AJAX**, enabling asynchronous communication. This means the WEMOS board monitors changes on the Arduino's input/output pins and transmits this data to the server without refreshing the webpage. As a result, users benefit from a smooth, real-time interaction with the system.

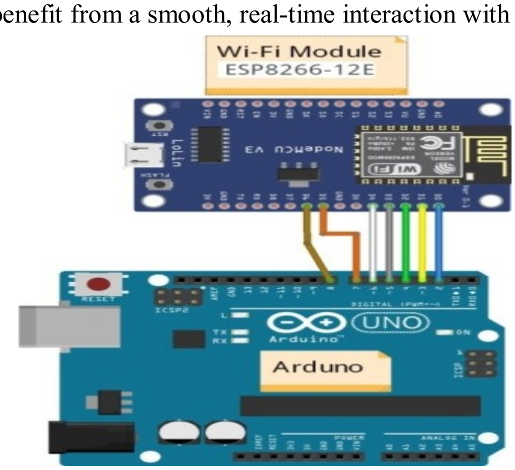

Fig. 5. Connection of the Arduino Wi-Fi Module

E. IMPLEMENTATION OF COMPONENTS WITH ARDUINO

Here, the electrical diagram shows all the connections between the Arduino and the other modules. There are two power inputs. 12V via 5V or Arduino-Fass-Jack input via USB and 12-V performance input for two engines and water pumps. All modular compounds are linked to the Arduino expansion shield attached to the Arduino. This setup simplifies connections and may provide 5-V power.

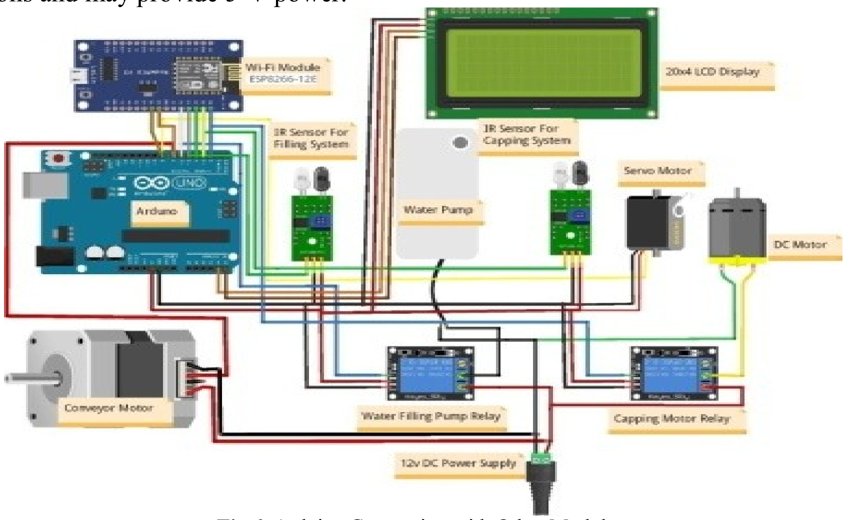

Fig.6. Arduino Connection with Other Modules

V. *HUMAN–MACHINE INTERFACE (HMI) AND IOT INTEGRATION*

A. WEB-BASED HMI OUTPUT

The Human–Machine Interface (HMI) designed for this device is on the market via an internet browser as soon as the tool is hooked up to a nearby community. This interface gives a real-time, interactive visualization of the device`s popularity, permitting far off tracking and manipulate of its principal components.

The net interface affords customers with stay remarks on the subsequent aspects:

- Bottle Presence: Using facts from infrared sensors, the device presentations whether or not a bottle is detected on the filling or capping stations.
- Water Pump Operation: The interface suggests whether or not the water pump is presently going for walks or not.
- Capping Motor Activity: Users are notified whilst the capping motor is engaged, indicating that the capping method is taking place.
- Conveyor Movement: The interface illustrates the popularity and route of conveyor motion, which includes clockwise rotation.
- Bottle Count: A real-time counter maintains music of the full variety of bottles processed with the aid of using the device.
- Operators can without problems manipulate the device the usage of committed START and STOP buttons constructed into the interface, which permit for honest initiation or termination of the process.

Moreover, the interface consists of facts approximately the community connection, which includes the IP cope with assigned to the Wi-Fi module or the net server. This guarantees that customers can without problems perceive and hook up with the device the usage of any well suited tool at the identical community, enhancing accessibility and device clarity.

To make sure a unbroken and responsive consumer experience, the interface is based on AJAX technology (Asynchronous JavaScript and XML). This lets in for automatic, real-time updates of sensor readings and device states without requiring a web page reload—an critical function in contemporary-day IoT-primarily based totally automation systems.

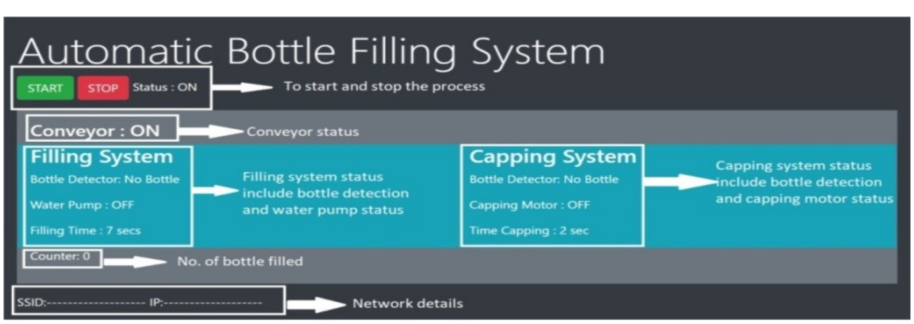

Fig.7. Human-Machine Interface(HMI)

The Human–Machine Interface (HMI) capabilities because the number one conversation hyperlink among the operator and the automatic setup. It gives real-time remarks at the repute of various device additives and lets in the consumer to oversee and manipulate the operation from a distance.

B. WI-FI-BASED HMI ARCHITECTURE

This setup uses IoT functions by connecting the Wi-Fi module to an Arduino microcontroller. Arduino collects input from components such as IR sensors, engines, relays, and other items and transfers this information to the Wi-Fi module. The module configures a local web server that can be reached via a specific IP address.

- ***Local or Network Hosting:***

The web server can function independently on the local network, allowing all devices connected to the same Wi-Fi to access the interface directly. Alternatively, you can configure a wider network or internet connection to enable remote access. This adaptability increases system accessibility and supports both local and remote monitoring scenarios.

- ***Real-Time Data Display with AJAX***

The web-based Human Machine Interface (HMI) uses Ajax (asynchronous JavaScript and XML) to provide a seamless and responsive user experience. By activating data such as sensor values and motor activity that can be updated in the background without charging the entire page, Ajax minimizes latency and makes real information easy to use. This is very important for effective system monitoring and rapid operational decisions.

C. BENEFITS OF IoT-ENABLED HMI

- Remote Monitoring and Control: The system can be accessed from anywhere via a standard weave browser on your smartphone, tablet or computer, providing greater flexibility and faster response to operational requirements.
- Improved maintenance capabilities: Continuous data collection and real-time notifications support predictive maintenance strategies that help minimize unplanned downtime and extend component life.
- Easy to Scalable Architecture: Thanks to the IoT-based design, the system can be scaled by including new sensors or actuators, supporting several connected devices at the same time.
- Accessible Web Interface: No dedicated software required - users interact with the system via a simple web interface, simplifying and using installation.

To summarise, this solution integrates Arduino detection and control features with wireless communication and dynamic loom technology such as Ajax. The result is an intelligent, connected filling system that provides the efficiency, adaptability and usability of an industrial 4,0 compliant solution.

VI. *CONCLUSION AND FUTUR WORK*

This study demonstrates the effective use of Internet of Things (IoT) technology as part of Industry 4.0 by implementing an automated system for bottle filling and covering at the heart of the Arduino platform. By including components such as infrared sensors, relays, DC engines, and Wi-Fi-based Hue Machine Interfaces (HMIs), the system allows for simultaneous monitoring and control in real time, while minimizing manual participation at the same time. It deals with essential industry needs, such as filling accuracy, increased productivity, and reduced dependence on human work.

The introduction of affordable microcontrollers and often available hardware components ensures that your system remains inexpensive and scalable. This makes it particularly attractive for small and medium-sized businesses (small and medium-sized businesses), especially in the sectors of food processing, drinks and pharmaceuticals, with cleanliness and accuracy being extremely important.

For the future, future improvements include the use of machine learning technologies that enable forecasting and error recognition, and the integration of cloud-based services for real-time data analytics, production monitoring, and secure information storage.

These progresses are aimed at further developing the system into a more autonomous and intelligent solution. This is fully coordinated with the transformational vision of industry 4.0.

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	TUESDAY OCTOBER **28**, 2025		
	Auditorium		
8h00		RECEPTION & REGISTRATION	
8H30		OPENING CEREMONY Representative of Ibn Badis University of Mostaganem Representative of the Faculty of Science and Technology Representative of the local authorities Representative of Conference Organizers	
CAP-HYPROC Auditorium		KEYNOTE SPEAKERS **Moderator** **Prof. Cherif BENOUDJAFER (Univ. Bechar)**	
09H00		Dr. Abdallah KHELLAF CDER, Bouzaréah, Alger. ALGERIA Overview of artificial intelligence applications in hydrogen chain value	
09H45		Pr. Adel MELLIT Seddik Benyahia University, Jijel. ALGERIA The role of artificial intelligence in advancing the solar energy sector: Bridging the gap between academic research and industry	
10H30 – 11H00		COFFEE BREAK offered by FST-Mostaganem	
12H15		Dr. Benameur NEHAR Abou Bekr Belkaid University, Tlemcen. ALGERIA Cultivating Global and Smart Citizenship through Virtual Exchange on the UN SDGs in Higher Education	
Online 01H00		Dr. Gokul PANDY IEEE-SM, Richmond section chair, USA meet.google.com/mrf-syzy-hch Revolutionizing Client Service Agreements: Selenium-Driven Open-Source Robotics Process Automation	
11H00 12H00		POSTER SESSION-1- CAP-HYPROC Hall **Moderators: Prof. Youcef SOUFI (Univ. Tebessa); Mr. Kheireddine MERHOUM (UMBB)**	
		AI-Based Optimization and Control Systems **Prof. Abdelghani AISSAOUI (Univ. Bechar); Dr. Abdelkader HADJ DIDA (ASAL-Oran)**	
11H00	**22**	- Souad TAHRAOUI *AI-Powered Fault Diagnosis in Dynamic Systems with Tornado Algorithm Optimization*	
11H10	**29**	- Azeddine BELOUFA *PSO-Optimized High-Gain Observer-Based Backstepping Control for TRMS Trajectory Tracking*	
11H20	**191**	- Fatima Zohra MEDJAOUI *Experimental Validation of a Square Planar Micro-Coil Model*	

11H30	**218**	- Nawres BOUAM *Optimization of Robotic Navigation for Safety and Efficiency in the Oil and Gas Industry Using the A* Algorithm*
11H40	**149**	- Soumia TOUAMI *Control of Brushless Doubly-Fed Generator BDFIM using Neuro-fuzzy Controllers*
		Photovoltaic Systems and MPPT Techniques **Prof. Abdelghani HARRAG (Univ. Setif); Dr. Fatima BOUTLILIS (Univ. Mostaganem)**
11H00	**106**	- Amel ABBADI *Enhanced Accuracy in Estimating PEM Fuel Cell Parameters Using the Walrus Optimization Algorithm*
11H10	**216**	Yamina BELGAID *Optimal tuning of a PI controller using the Particle Swarm Optimization (PSO) algorithm for wind turbine applications*
11H20	**147**	- Khadidja DERBALI *Optimization of the Solar Cell Double Diode Model Estimation Using the Dung Beetle and Arctic Puffin Optimizers with Lambert-W Function and Newton-Raphson Methods*
11H30	**134**	- Fethia HAMIDIA *Enhanced MPPT Algorithms for PV Panels: Review and Comparative Analysis*
11H40	**188**	- Fatima SALHI *A Comparative Analysis of MPPT Techniques for Grid Connected PV System*
11H50	**209**	- Fatima SALHI *Photovoltaic Pumping System Based On MPPT-DNN*
12H00	**194**	- Mokhtaria DERKAOUI *Stand Alone Photovoltaic Module with an Integrated On-Chip Circular Spiral Inductor*
		Power Electronics and Advanced Converters **Prof. Mouloud DENAI (ESGEE-Oran) ; Dr. Fethi AKEL (UDES-CDER)**
11H00	**183**	- Oqeyl DJEBOURI *A Performance Analysis of a High-Gain three Phase Interleaved Boost Converter with Switched Capacitor Network for Photovoltaic Systems under Different Environmental Conditions*
11H10	**132**	- Brahim LACHI *Direct Torque Control (DTC) of a Synchronous Drive Using a Three-Level NPC Inverter in an Electric Traction Application*
11H20	**150**	- Abdelkader RABAH *A Novel Method for Inverter Open-Circuit Fault Diagnosis Using Improved Variational Mode Decomposition*
11H30	**116**	- Oqeyl DJEBOURI *A Comparative Evaluation of Metaheuristic Algorithm Using Two Different Simulation Current Calculation Methods for Extracting Photovoltaic Single-Diode Model Parameters*
11H40	**138**	- Kada BECHAREF *Development of a Compact Wideband Bandpass Filter Incorporating Complementary Interdigital Resonator E (CIRE) on a Half-Mode Substrate Integrated Waveguide Coupled with Corrugated Structures*
13H30-14H30		POSTER SESSION -2- CAP-HYPROC Hall **Moderators: Prof. Youcef SOUFI (Univ. Tebessa); Mr. Kheireddine MERHOUM (UMBB)**
		Hybrid Energy Systems and Storage Technologies **Dr. Rafika BOUDRIES (CDER Bouzareah); Dr. Missoum IBRAHIM (Univ. Mostaganem)**
13H30	**42**	- M'hamed SEKOUR *Energy Management in a Hybrid Fuel Cell–Battery–Supercapacitor System for Drone*
13H40	**130**	- Abdeldjalil DAHBI *An Experimental Study of a Stand-alone Hybrid system installed in Adrar*
13H50	**172**	- Henia FRAOUCENE *Effect of Rectifier load resistance on the RF received Wake-up Signal at 2.45 GHz*
14H00	**220**	- Abdallah BOUAM *Experimental Feasibility Study of a Cogeneration System Based on the Coupling of a Vortex Tower and NPP Cooling System for Sustainable Energy Production*

14H10	**7**	- Rachid KHELFAOUI *Smart Control and Energy Optimization of a Solar-Driven Absorption Cooling System in Béchar (Algerian Sahara)*
		Smart Agriculture and IoT Applications **Prof. Baghdad HADRI (Univ. Mostaganem) Prof. Saliha AREZKI (USTHB Algiers)**
13H30	**49**	- Zoubir BELGROUN *Development of an ontology-based solution to agricultural semantics*
13H40	**50**	- Zoubir BELGROUN *A Smart Solution for Monitoring Greenhouses Utilizing the Internet of Things*
13H50	**101**	- Mouloud TIZZAOUI *Design Considerations for a Stand-Alone PV-Powered Evaporative Cooling of Greenhouse in the Saharan Environment*
14H00	**27**	Ali BOUZIANE *Clean Combustion Modeling of Premixed DME Flames with LES: A Step Toward RCCI-Compatible Fuels for Green Mobility*
14H10	**204**	- Tewfik LAMRANI *Advancements and Challenges in Multimodal RFID Sensors: From Industrial IoT to Smart Applications*
14H20	**165**	- Mokrane MEHDI *Enhancing Energy Efficiency in Domestic Refrigerators: Experimental and Statistical Evaluation of Phase Change Material Integration*
		Energy Forecasting and Predictive Maintenance **Prof. Mohamed Arezki MELLAL (Univ. Boumerdes) Dr Mohamed BENZIDANE (Univ. Mostaganem)**
13H30	**222**	- Dalila CHERIFI *Predictive Maintenance of Wind Turbines Using Machine Learning: Addressing Fault Detection with SCADA Data*
13H40	**155**	- Walid BOUKERNE *Study and Implementation of an End-to-End OFDM-Based Data Transmission System Using SDR*
13H50	**113**	- Kacem GAIRAA *Intra-Hour Solar Irradiance Forecasting Based on Feature Selection Techniques*
14H00	**159**	- Lamia MAY *A Dynamic Stress-Reset Model for maintenance Optimization Integrating Physics-Informed Fatigue Accumulation and Resource-Aware Intervention Efficiency*
14H10	**196**	- Abderrahmane KHELFAOUI *Solar Declination Measurement Test and Comparison with Declination Tables and Theoretical Methods*
		Thermal Systems and Advanced Energy Technologies **Dr. Mohamed AYAD (UDES); Dr. Slimane SOUAG (Univ. Mostaganem)**
13H30	**181**	- Amina Lyria DEGHAL *Numerical and Analytical Study of the Influence of Geometrical Parameters on the Performance of a Vortex-Type Cooling Tower*
13H40	**219**	- Amel DADDA *Influence of Chimney Geometry on Coriolis Force Generation in a Vortex Tower Prototype*
13H50	**186**	- Ridha ALLICHE *Dimensionless Analysis and Correlation of Nusselt Number in a Regenerator-Free LTD Stirling Engine*
14H00	**127**	- Kheira BELHAMIDECHE *The effect of heat transfer fluid flow rate and heat exchanger installation depth on the performance of low enthalpy geothermal energy*
14H10	**109**	- Abdellah MEKEDEME *Modeling and Simulation of Herschel-Bulkley Drilling Fluids in Vertical Boreholes with Rotating Bits*
14H30 – 15H30		LUNCH

REMOTE SESSION		
ROOM A-1-28		Dr. Akshay SHARMA (SM-IEEE); Dr. Hadj Larbi BEKALOUZ (Univ. Mostaganem) :: meet.google.com/mrf-syzy-hch
15H30	33	-Hamza BENYEZZA IoT-Based Platform for Monitoring and Managing Fuel Delivery Trucks
15H45	58	- Ahmed BOURAIOU Design of Sustainable IoT-Based Weather Monitoring
16H00	85	- Lynda OUZANE *Design and simulation of a smart energy meter for real time monitoring*
16H15	96	- Faycal BENYAMINA *Enhanced LVRT Control of Grid-Tied Inverters under Unbalanced Grid Faults Using Notch Filter-based Sequence Extraction*
16H30	137	- Halima MAHIDEB *Indoor and Outdoor Air Quality Monitoring with IoT-AI Technologies: Current State and Integration Challenges*
ROOM B-1-28		Prof. Amel ABBADI (Univ. Medea); Dr. Sakina ATOUI (UDES-CDER) :: meet.google.com/nzt-jvxh-icq
15H30	60	- Mustapha MEROUAH Enhanced MPPT in PV Systems Using k-Nearest Neighbors and Integral Backstepping Control
15H45	64	- Hizia ABED Real time identification of the parameters of a photovoltaic panel by ant colony optimization in the continuous domain
16H00	94	- Ryma LEBIED Robust Solar System with Different advances techniques
16H15	98	- Samah BOUAROUDJ Novel High Efficiency ZCS DC/DC Interleaved Boost Converter For Photovoltaic Solar System
16H30	206	- Alla Eddine TOUBAL MAAMAR A simple and accurate script to simulate solar panel models at variable environmental conditions of temperature and irradiation
ROOM A-2-28		Prof. Lamia HAMZA (Univ. Bejaia); Dr. Anup KAGALKAR (SM-IEEE) :: meet.google.com/mrf-syzy-hch
17H00	25	- Amina MAZIGHI *Innovation in infiltration estimation: From empirical model to AI-based solutions*
17H15	37	- Sonia BAAZIZ *AI-Assisted Design and Characterization of a Novel Cytosine-Based Hybrid Material for Renewable Energy Applications*
17H30	76	- Abdesselem BEGHRICHE *AI-Driven Smart Management and Optimization of Green Hydrogen Production in Renewable Energy Grids Using Bio-Inspired Algorithms and Edge Computing*
17H45	158	- Sara OUARTI *A Hybrid Deep Learning Approach for Anomaly Detection in Smart Grid Systems*
18H00	199	- Mohamed ADAIKA *Intelligent Fault Detection in Transformer Magnetic Oil Level Indicators Using Machine Learning for Smart Renewable Grids*
ROOM B-2-28		Prof. Fethia HAMIDIA (Univ. Medea); Dr. Nouamen KELLIL (UDES-CDER) :: meet.google.com/nzt-jvxh-icq
17H00	43	- Mokhtar Mahmoud MOHAMMEDI *SMO Speed Sensorless Fault Assessment Technique Based on DFIG-WECS*
17H15	104	- Mourad NAIDJI *A Novel Nature-Inspired Approach for Wind Farm Location Optimization Considering Wake Effects*
17H30	115	- Hadjira MECHRI *Efficient Wind Energy Extraction and Fault Detection in a PMSG-Based WECS with NPC Inverter*
17H45	153	- Lakhdar SAIHI *Fuzzy Logic Control of Variable-Speed Wind Turbine Base on DFIG*
18H00	92	- Samira HADIBI *Impact of System Complexity on the Nonlinear Dynamics of Coupled Axial-Torsional Drilling Models*
COFFEE BREAK		

WEDNESDAY OCTOBER 29, 2025

RooM A		**INTERNET OF THINGS ::** meet.google.com/mrf-syzy-hch **Prof. Abdellah CHAOUCH (Univ. Mostaganem); Dr. Fatiha BECHIRI (Univ. Mostaganem)**
08H00	**162**	- Rafika BOUDRIES *Methanation of CO_2 Removed From Raw Natural Gas for Smart Urban Centers in the In-Salah Region*
08H20	**74**	- Ibtissam CHEKKAL *Artificial Intelligence Applications for Indoor Thermal Comfort in Residential Buildings: A Scoping Review of Early Design Methods*
08H40	**17**	- Farouk BENAHMED *Home Monitoring System using IoT and Deep Learning model*
09H00	**177**	- Imane YAHIAOUI *State of Health Estimation of Lithium-Ion Batteries in Electric Vehicles*
RooM B		**ELECTRICAL VEHICLE & CONTROL ::** meet.google.com/nzt-jvxh-icq **Prof. Emrt Fateh KRIM (Univ. Setif); Dr. Mansour ABED (Univ. Mostaganem)**
08H00	**81**	- Abdelmoumene TOUABI *A Concise Survey on Neural Networks Compression Techniques*
08H20	**175**	- Chahrazad BENGANA *AI-Based Fault Detection for PDC Bit Wear Monitoring Using Random Forest Classification*
08H40	**135**	- Sarah Kawther SEDJAR *Intelligent Optimization and Modeling of Miniaturized Photovoltaic Cells for Embedded Applications using Hybrid AI Techniques*
09H00	**14**	- Fatna LAZGHEM *Artificial intelligence and plant disease detection: A critical analysis of advances, challenges and strategies for resilient agriculture*
RooM A		**GRID-CONNECTED CONTROL SYSTEMS::** meet.google.com/mrf-syzy-hch **Prof. Katia KOUZI (Univ. Laghouat) ; Dr. Saliha REZINI (Univ. Mostaganem)**
09H30	**110**	- Oussama HARROUZ *Short-Term PV Power Forecasting Using LSTM: A Case Study of grid-connected PV system in Adrar City*
09H50	**213**	- Amira LAGHOUATI *A Novel Method for Cost-Effective Green Hydrogen Production Using Sound Wave-Assisted Electrolysis*
10H10	**161**	- Fayçal Hadj Mihoub SIDI MOUSSA *Modeling and Control of a Grid-Connected Hybrid Wind-Photovoltaic System with a PMSG-Based Wind Turbine and PSO-MPPT Algorithm for the PV Array*
10H30	**65**	- Toufik TRIF *Photovoltaic and Wind Power Forecasting Using LSTM Networks with Adaptive Hyperparameter Tuning*
RooM B		**ENERGY MANAGEMENT & MATERIALS in RENEWABLES ::** meet.google.com/nzt-jvxh-icq **Dr. Merzak FERROUKHI (USTHB, Algiers) ; Dr. Saadiya BENATMANE (Univ. Mostaganem)**
09H30	**128**	- Idriss Hadj MAHAMMED *Estimating Power Outputs of Thin Film CIS PV Modules Using Neuronal Approach: A case Study in Arid Environment*
09H50	**152**	- Walid REZIG *Biomass Diatomite-Supported Ferrihydrite Silicide Hybrid Granule Catalyst TiO2: Synthesis and Evaluation for Photocatalytic Dye Removal*
10H10	**19**	- Abdelkarim CHERHABIL *Metaheuristic Approaches for Medical Image Denoising*
10H30	**129**	- Ayoub MEGHEBBAR *When Machines Speak Human: Detecting Computer Generated Reviews Using Transformer Models*
10H50	**13**	- Nadir MAHAMMED *Fake no More: Smarter Social Media Detection With RTGBO*
COFFEE BREAK		

RooM A		SMART ENERGY MANAGEMENT & IoT :: meet.google.com/mrf-syzy-hch **Prof. Adel MELLIT (Univ. Jijel); Dr. Leila GHOMRI (Univ. Mostaganem)**
11H30	**221**	- Saliha AREZKI *Hybrid Simulation-Experimental Framework for Dynamic PV Reconfiguration in Agricultural Applications with Real-Time IoT Supervision*
11H50	**68**	- Abderrahmane HALLOUI *A Review on Optimized Task Offloading Strategies in Fog Computing and IoT*
12H10	**87**	- Mohammed BEKHTI *Comparative Techno-economic and environmental performance of Standalone hybrid energy systems for Telecommunications Towers: A Case study of the African Unity Road in Southern Algeria*
12H30	**141**	- Mansour BENDREF *AI-Driven Real-Time Adaptive Beam Steering for 5G Fixed Wireless Access Antenna Systems*
RooM B		ELECTRICAL NETWORK CONTROL :: meet.google.com/nzt-jvxh-icq **Prof. Benaissa BEKKOUCHE (Univ Mostaganem); Prof. Cherif BENOUDJAFER (Univ. Bechar)**
11H30	**54**	- Seif Elislam CHELLI *Proportional resonance controller versus PI controller performances of PWM controlled rectifier connected to an unbalanced three-phase grid voltages*
11H50	**11**	- Zana KARI *The Interest of Shielding for Integrated Inductance*
12H10	**59**	- Abdelhak FLIH *HVDC fault location using Artificial Neural Network method*
12H30	**117**	- Samia SAIB *Improvement of the performance of the electrical network by the integration of FACTS devices*
12H50	**131**	- Tahani nor el Houda TSRIAT *Performance Analysis of Adaptive P&O, ANN and PSO Based MPPT Algorithms for Photovoltaic Systems*
13H00 – 14H00		LUNCH
RooM A		STORAGE and ELECTRICAL VEHICLE :: meet.google.com/mrf-syzy-hch **Prof. Hadj Adda BENTOUNES (Univ. Mostaganem); Prof. Mohamed Arezki MELLAL (UMBB)**
14H00	**139**	- Bouziane BOUSSAHOUA *A New Priority List Algorithm for power system unit commitment problem solution*
14H20	**182**	- Aissa HAMLAT *Advanced Non-Linear Control Designed for Fuel Cell/Super-Capacitor Hybrid Electric vehicle*
14H40	**212**	- Houaria NEDDAR *Towards a Decarbonized Life: Impact of Fuel Cell Performance Parameters*
15H00	**123**	- Wiame GUENAYA *Evaluating The Performance of NMC and NCA Battery Technologies for Electric Vehic*
15H20	**223**	- Salim DJAHFA *Estimating parameters values of battery lead-acid using Simulink Design Optimization*
RooM B		ENERGY MANAGEMENT & MICROGRIDS :: meet.google.com/nzt-jvxh-icq **Prof. Mostefa RAHLI (USTO); Dr. Khadidja BERADJA (Univ. Mostaganem)**
14H00	**168**	- Zohra OUCHIHA *Effect of EGV cluster on working 2-blade Savonius rotor*
14H20	**154**	- Randa BENKHELIFA *Adaptive Preprocessing for Improving Early Detection and Classification of Anomalies on Photovoltaic Panels*
14H40	**89**	- Djamel SELKIM *Optimal Power Management and Control of Islanded Microgrid to Prevent Under-Frequency Load Shedding During Load Variations*
15H00	**133**	-Hadj Abderrahim MEBARKI *Space Vector Modulation Control of a Three-Level NPC Inverter*
15H20	**184**	- Ahmed DAHIA *Numerical study of the behavior of air flow circulation through Novel Vortex Tower Prototype using CFD code*

15H40	192	- Fatna BAHLOULI *Heat Dissipation Strategies for Planar Inductive Components*
COFFEE BREAK		
THURSDAY 30 OCTOBER 2024		
Welcome COFFEE & TEA		
RooM A-1-30		**Intelligent Control Systems for Renewable Energy::** meet.google.com/mrf-syzy-hch **Dr. Kheyreddine DJOUZI (UMBB) ; Dr. Aoued MEHARRAR (Univ. Tissemssilt)**
9H00	88	- Kheira MENDAZ *Artificial Neural Proportional Integral control Wind Turbine Based Doubly Fed Induction Generator*
9H15	32	- Nesrine NESRINE *Dual-Loop Control Strategy for a Standalone PV Boost Converter Using PSO-Tuned PI and Model Predictive Current Control*
9H30	148	- Mohammed Kabir BOUMEGOUAS *Robust Nonlinear Control for Buck-Boost Converter Using Sliding Mode Control For Battery Storage System of Electric Vehicle*
9H45	121	- Amina Dounia BABOU *Genetic Algorithm Enhanced Backstepping for Real-time Trajectory Tracking of a Twin Rotor MIMO System*
10H00	151	- Habiba HOUARI *Advancing PID Control Quarter-Car Suspension System with Metaheuristic Optimization Comparative Study*
RooM B-1-30		**AI-Based Fault Detection and Diagnostic Systems::** meet.google.com/nzt-jvxh-icq **Dr. Bhushan B. CHAUDHARI (IEEE-SM, India); Dr. A. TAMILSARAN (India)**
9H00	40	- Fatima Zohra BOUDJELLA *Hybrid Approach for DGA Diagnosis of Transformers: Comparison of Supervised Classifiers with Advanced Preprocessing*
9H15	83	-M. ALLAM *Intelligent Control of a doubly fed induction generator for wind energy conversion systems in variable speed*
9H30	70	- Abderrahmene MOKHTARI *Neural Network Sliding Mode Observer Based Fault diagnosis for Wind Turbine Benchmark Model*
9H45	173	- Ahmed DJERBOUB *Intelligent Fault-Tolerant Control for Boost Converter IGBT Failures Using SVM within PV-Integrated Four-Leg SAPF Systems*
10H00	197	- Mohamed ADAIKA *Deep Learning-Based Detection of Environmental Faults in Photovoltaic Systems under Dust and Humidity Conditions*
RooM C-1-30		**Electric Vehicles and Advanced Motor Drives::** meet.google.com/siz-ewma-buv **Prof. Mounir BOUHEDDA (Univ. Medea); Dr. Ahmed MEDIANI (CDER)**
9H00	4	- Nawal TOUHAMI *Classification of Electric Vehicles: A Comprehensive Overview*
9H15	28	- Noarediene AOUADJ *Independent Control with MTPA-DTC of Five-leg inverter-dual IPMSM motors powertrain used in Vehicle propulsion system*
9H30	52	- Norediene AOUADJ *Enhanced Direct Torque Control of PMSM Drives for Electric Traction Systems: A Comparative Study Between Classical DTC and a Hybrid Fuzzy Logic–SVM Approach*
9H45	71	- Mohamed MILOUDI *AI-Driven EMI Analysis and Experimental Measurement in DC Motor Drives: Comparative Study of Chopper Topologies for Enhanced Electromagnetic Compatibility*
10H00	75	- Justin MOSKOLAI NGOSSAHA *Next-Generation Urban Mobility for Developing Countries:AI-Supported Digital Twin Framework*

10H15	**102**	- Abdelkader MERAH *Finite-Horizon LQR and Kalman Estimator Design for Robust Lateral Dynamics Control in Autonomous Driving*
COFFEE BREAK		
RooM A-2-30		**Smart Grid Systems and Power Quality::** meet.google.com/mrf-syzy-hch **Pr. Houaria NEDDAR (Univ. Mostaganem); Dr. Abdelhakim IDIR (Univ. M'sila)**
11H00	**12**	- Khadidja MEDJDOUBI *Study of a Hybrid UPQC with Intelligent Control*
11H15	**16**	- Khadidja MEDJDOUBI *Improving energy quality with renewable energy sources integrated into Algeria's southwest grid*
11H30	**111**	- Abderrezzaq ZIANE *Secure and Scalable Framework for Real-Time Net Metering in Smart Grids*
11H45	**178**	- Boubakar FARADJI *Comparative Study of Centralized and Decentralized Electrical Network Configurations for Equal Installed Power Capacity*
12H00	**142**	- Lakhder AYHAR *Comparative Study of Synchronization Techniques for Grid-Following Inverters*
RooM B-2-30		**IoT and Wearable Smart Systems::** meet.google.com/nzt-jvxh-icq **Dr. Satish KABADE (IEEE-SM, India); Dr. Meriem DJEZZAR (Univ. Khenchela)**
11H00	**62**	- Sabrina MEHDI *Internet of Wearable Things Systems: A Comprehensive Analysis of Development Challenges and Characteristics*
11H15	**169**	- Rania DJEHAICHE *Smart Environment Management Using Dual IoT/M2M Platforms*
11H30	**205**	- Adil BAKRI *Forest Fire Detection using Sensor Networks and Mobile Communication Systems*
11H45	**215**	- Adil BAKRI *A Wearable Smart Glasses Approach for Real-Time Driver Drowsiness and Fatigue Detection to Improve Road Safety*
12H00	**190**	- Ibrahim ALDREES *Giving a Voice: A Novel Approach Combining Visual and Product-based Applications to Sign Language Translation*
12H15	**125**	- Mohamed Ilyas RAHAL *Towards Smart Automation: An IoT-Integrated Control Strategy for Industry 4.0*
RooM C-2-30		**AI for Transportation and Autonomous Systems::** meet.google.com/siz-ewma-buv **Dr. Rajaganapathi Rangdale Srinivasa RAO (IEEE-M), India; Dr. Mokhtar ABBASSI (Tunisia)**
11H00	**9**	- Abdelkader MEKKAOUI *A New Differential Evolution-based Routing Protocol for Surveillance Drones in Urban Areas*
11H15	**55**	- Chaima AYACHI AMAR *Reinforcement Learning for Energy-Aware Vehicle Routing in Renewable-Powered Microgrid Systems*
11H30	**67**	- Fathi Rezzag AOUID *Robust Palmprint Authentication Using Curvature-Enhanced Bifurcation Coding*
11H45	**75**	- Justin MOSKOLAI NGOSSAHA *Next-Generation Urban Mobility for Developing Countries:AI-Supported Digital Twin Framework*
12H00	**179**	-Badia KLOUCHE *Artificial Intelligence-Based Approaches for Misinformation Detection: A Case Study of Ooredoo's Corporate Innovation Strategy*
12H15	**217**	- Abderrahmane TAMALI *A Myoelectric-Controlled 3D-Printed Prosthetic Arm: Design and Implementation*
RooM A-3-30		**Deep Learning for Energy Forecasting and Monitoring::** meet.google.com/mrf-syzy-hch **Prof. Younes CHIBA (Univ. Medea); Dr. Anup KAGALKAR (IEEE-SM), India;**
12H30	**157**	- Lamis SERRAT *Hourly Global Solar Irradiance Forecasting in a Desert Region Using a Deep Neural Model with Hybrid Inputs*

12H45	195	- Lydia TOUAHRI *An Empirical Attention-Based LSTM Approach for Weekly Sales Forecasting in an Agri-Food Firm*
13H00	198	- Mohamed ADAIKA *Intelligent Classification of Partial Shading in PV Systems Using LSTM and DNN Models: A Comparative Study*
13H15	210	- Amira RAMZI *AI-Based Crop Yield Classification from Satellite Imagery: Enhancing Agricultural Monitoring in Algeria*
13H30	143	- Meryem Mamia BENOSMAN *Enhanced RVNN-Based Digital Predistortion for Wideband Power Amplifiers with Memory Effects*
RooM B-3-30		**Hydrogen Production and Hybrid Energy Systems::** meet.google.com/nzt-jvxh-icq **Dr. Maria MALVONI (ENEA-Italia); Dr. Amine HARTANI (Univ. Adrar);**
12H30	95	- Cherif MESKINE *Design and MILP-Based Optimization of Hydrogen-Integrated Multi-Energy Microgrids: Case Study at IMT Mines Albi*
12H45	112	- Hani BELTAGY *Sizing and simulation of a hybrid Photovoltaic-Wind system for green hydrogen production*
13H00	100	- Elaid BOUCHETOB *Efficiency Analysis and Reliability Prediction of DC-DC Boost Converters for PV Application: Wide Band-Gap Devices*
13H15	107	- Boucif ZINA *Numerical Study of a Solar Air Heater Featuring a Corrugated Collector Plate*
13H30	82	-Salah Eddine ZIRAR *Control Strategy of a Wind Energy Conversion System Based on Five-phase Permanent-Magnet Synchronous Generator*
RooM C-3-30		**Advanced Materials and Wireless Communications ::** meet.google.com/siz-ewma-buv **Prof. Abdelkader BENABDELLAH (Univ. Tiaret); Dr. Abdellah REZOUG (UMBB)**
12H30	47	- Ghania DEKKICHE *Facile sonochemical synthesis and characterization of cobalt oxide nanoparticles in the presence of ionic liquid*
12H45	164	- Mayliss YOUSFI *Vulnerability Cost Hardening using Stochastic Games and K-means in VANET Environments*
13H00	156	- Abdelouahab BOURAIOU *Study of the influence of some parameters on the performances of a superconducting patch antenna*
13H15	136	- Khadidja RAHMOUNE *Control of grid-connected PV system associated with LCL filter for power production and power factor correction*
13H30	63	- Yamina BEKRI *New Simple and Accurate Closed-Form Expressions for the Electromagnetic Parameters of a Novel Quasi-TEM Cylindrical Coaxial Directional Coupler for High-Power Telecommunications Applications*
13H45	66	- Amel HAOUZI *Spectrum and Energy Efficiency for DL - NOMA Systems in Cognitive Radio/5G Networks*
14H00 – 15H00		LUNCH
08H00 To 13H45		WORKSHOP ***Prof. Dalila CHERIFI*** (IGEE, UMBB, Algeria) *Introduction to Machine Learning*
13H50		CLOSING CEREMONY

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