LSEI-Day'23

Laboratory of Electrical and Industrial Systems Day 2023

30 November 2023 USTHB, Algiers, Algeria

8:00-8:30	Registration		
8:30-9:30	OPENING CEREMONY & WELCOME WORDS		
9:30-10:30	Plenary by: Dr. S. Ziani Pr. M.Menaa; Dr. N.Kouba ***Title:*** *Verdissement de l'énergie et augmentation de la disponibilité des actifs dans le secteur ferroviaire*		
10:30-11:00	Coffee Break		
11:00-12:00	Poster Session Pr. A. Nait seghir; Dr. N. Chabane; Dr. A. Laissaoui		
	ID:1	***Title:*** *Power System Stability Analysis in Presence of Renewable Energies and FACTS Devices* ***Abstract:*** This paper deals with power system transient stability analysis in presence renewable energy sources (RES) and FACTS devices including: wind farm, solar photovoltaic PV generator, STATCOM and SVC. The integration impact of RES on dynamic behavior of power system transient stability haven analyzed using the Western System Coordinating Council (WSCC) IEEE 9 bus system. The main purpose was to enhance the Critical Clearing Time (CCT) and avoid the point of the collapse of the power system when the network occur transient stability by a huge of failure. The disturbance considered in the transient stability analysis was a three-phase short circuits, which incur large excursion in generator rotor angles. Various case studies have been simulated and presented using the Power System Analysis Toolbox (PSAT) in MATLAB software.	BRIK Amel
	ID: 5	***Title:*** *A Review in Geometric Optimization of Propellers for Electric Propulsion* ***Abstract:*** This paper addresses the optimization of propellers for electric propulsion, whether in the maritime or aeronautics domain. The aim is to enhance their performance while reducing structural issues and fuel consumption in the propulsion system.	YAMNAINE Abdelmouncef

		This improvement is achieved by applying an intelligent approach through the use of single and multi-objective functions. Various case studies are presented, using different metaheuristic optimization algorithms such as DA, GA, and SCA algorithms.	
	ID: 6	***Title:*** *Implementing Architecture of CORDIC Iterations and Parallel in FPGA for Sine and Cosine Computation* ***Abstract:*** This paper presents a comprehensive exploration of the iterative and parallel architectures of the CORDIC (Coordinate Rotation Digital Computer) algorithm implemented on an FPGA (Field-Programmable Gate Array) platform. The study focuses on the adaptability of CORDIC for the computation of sine and cosine values, offering versatile solutions for trigonometric calculations. In the iterative approach, the algorithm performs accurate angle calculations over multiple iterations, while the parallel architecture operates in real-time, eliminating the need for clock synchronization. The research demonstrates the efficacy of CORDIC in FPGA-based applications, providing high-precision sine and cosine computation. This work delivers valuable insights to engineers and researchers seeking efficient and accurate solutions for trigonometric calculations in various domains, showcasing the potential of CORDIC in practical applications.	HAMOUDA Salim
	ID:11	***Title:*** *Advanced Control and Integration of Multi-Microgrids with Energy Storage and HVDC transmission lines* ***Abstract:*** This article delves into the control of multi-micro grids integrating storage systems and HVDC lines. Drawing insights from relevant research articles, it highlights significant advances in this field. The author's work primarily comprises literature review and participation in training programs. The author's personal contribution entails an assessment of the Algerian PIAT network, demonstrating how the integration of new technologies can enhance its performance. In summary, this article provides an overview of the current challenges in multi-micro grid control and future prospects.	BOUDOUCHA Aimed
	ID:12	***Title:*** *Optimal Preventive Maintenance for Series-Parallel Multi State System Using Differential Evolution Algorithm* ***Abstract:*** In this work, the differential evolution algorithm is applied to a multi-state series parallel system in order to determine the optimal inspection and maintenance periods that minimize the total maintenance cost of the system under constraints of mission time and availability. The obtained results are compared with two well-known algorithms, namely Particle Swarm Optimization and Artificial Bee Colony, in order to prove the robustness of the DE algorithm in solving this problem.	BELKACEM Kamel
	ID:14	***Title:*** *Model for Predicting and Optimizing electrical energy consumption in Smart Home*	YOUNSI Sarah

		Abstract: Prediction and load management serve a crucial role in optimizing residential electrical energy consumption in the residential sector. In this paper, we present a model for forecasting electrical load based on machine learning, incorporating region-specific meteorological data. This model relies on a two-tiered neural network to predict the daily consumption of the three primary electrical loads, which represent the main consumers. Additionally, we introduce an intelligent algorithm developed for real-time load management, based on priority sequences defined according to occupants' habits. The model and algorithm have been validated using a dataset published by [1], including measurements of appliance consumption and meteorological data. The resulting forecasting model was evaluated using performance metrics, including absolute error. The models successfully replicate consumption curves with a high average accuracy of 98%.	
	ID:16	***Title:*** *Electric Propulsion System, Example Ships* ***Abstract:*** This paper considers the modelling and representation of one of the electric motors in the electric propulsion system. This system is based on doubly-fed induction motors. Studies have shown the importance of this type and its preference over other types. The electric propulsion system for ships was considered as an example for this study.	SAHNOUNE Mohammed Aymen
	ID:17	***Title:*** *Modelling Method and optimal design of a 7-phase Doubly Salient Permanent Magnet Motor For Low Speed Application* ***Abstract:*** 3-phase Doubly Salient Permanent Magnet Machines can be an interesting choice for high power direct drive propulsion system and high-power wind and tidal power generation with low speed. However this configuration leads classically to a high level of torque ripple. In this paper a design of 7-phase machine is studied to reduce torque ripple and increase reliability. This structure is expected to lead to more benefits such as less magnet volume and mass which is suitable for these applications. The paper presents a methodology to study and analyze the performances of this new machine. The structure is optimized and is performances will be compared with a 3-phase conventional permanent magnet synchronous machine designed for these applications.	ABBAD Yacine
	ID:18	***Title:*** *Study of polyphase machine power supply based on scott transformer* ***Abstract:*** Multiphase machines have become serious business for many applications due to their ability to improve energy efficiency, reliability and performance in diverse fields such as industry, electric vehicles, renewable energies and many others. They play a key role in the transition to a more sustainable, energy-efficient economy. To obtain an n-phase power supply from a three-phase network, a Scott transformer was chosen, consisting of two primary windings and two secondary windings. One of the primary windings is connected to a three-phase power source,	BATOUCHE Mohammed

		while the other winding is connected to a single-phase or three-phase power source. The two secondary windings are configured to supply the required multi-phase voltages, typically with a 90-degree offset between them. This article explains the proposed Scott connection and its matrix, then confirms the results by simulation with MATLAB.	
	ID:19	***Title:*** *A Polyphase Power Transformer Utilizing the Scott Connection for Three-Phase Input* ***Abstract:*** Polyphase machines are widely used in the field of naval or automobile propulsion due to their advantages over three-phase machines. However, this adds more complexity to the adopted power converters. Alternatively, passive transformation is a viable solution to obtain n-phase power from the three-phase network. This paper studies existing passive transformation connections and proposes a transformation, based on the well known Scott connection, to convert three-phase network voltages into an n-phase supply. In comparison with conventional transformer connections, the proposed connection uses only two magnetic cores with less total number of coils, therefore less total transformer volume. The article also presents the general equivalent circuit per phase for three-phase to n-phase transformers, as well as the results obtained by simulation.	KIBBOU Nazih
	ID:20	***Title:*** *Design and implementation of an energy management system based on cloud computing in a smart grid* ***Abstract:*** The growing global energy demand underscores the importance of renewable energy sources, which encounter integration challenges into electrical grids due to their variability. Emerging solutions such as the "smart grid" and the "Internet of Energy" are positioned to reshape the energy landscape, with AI and cloud computing playing pivotal roles. In this paper's introduction, we outline the developmental phases of our Intelligent Energy Management System (IEMS), a novel architecture tailored to optimize demand-side energy management with a specific emphasis on renewable sources. Within the IEMS framework, we delve into two key studies. The first study employs an LSTM deep learning model for solar PV forecasting, tested on data from Adrar, Algeria, and demonstrates superior time series handling capabilities. The second study focuses on wind energy, where a GRU-based attention mechanism proves to outperform several established deep learning techniques. These studies, integral to the ISEMS initiative, underscore the transformative potential of AI in renewable energy forecasting, marking a significant step toward achieving the sustainable development goals.	BOUCETTA Lakhdar Nadjib
12:00-13:30	Lunch		

	Oral Session		
	Dr. M.L. Amrani ; Dr. N. Achaibou, Dr. S. Mezoued		
	ID: 2 13:00-13:15	***Title:*** *3D FEM electromagnetic study for an induction heater with axial PMs inductors* ***Abstract:*** This paper presents a 3D finite element method (FEM) study of an induction heater composed of axial permanent magnets (PM) inductors using the heating power produced by induced current density. The proposed electromagnetic model is formulated and computed in Comsol software. This computation provides heating power values for different velocities obtained through the integration of volumetric electromagnetic losses in the studied system. Then, that heating power is exploited in a 3D heat transfer model to calculate the temperature through time. The main purpose of this study is to pinpoint the optimum parameters to obtain the desired heating temperature in a short period of time.	HEBOUCHE Sarah
13:30-14:30	ID:3 13:15-13:30	***Title:*** *Implementation of Global Control and Energy Management in a Hybrid AC DC Microgrid for Residential Areas* ***Abstract:*** This paper presents a general study of the instruments and control strategies involved in the design of a hybrid micro grid (HMG) with multi-source generation units spread in both DC and AC lines. The main goal behind this work is to observe, analyze and make notes on the feasibility and performance of this type of structure. The characteristics of the employed devices, namely; current source converters (CSC) on the DC side and paralleled voltage source inverters (VSI) are viewed from a power generation standpoint. For the DC part of the HMG the power production control is achieved by super imposing the currents of the sources to possible values that correspond to a desired point on each source's power production chart. On the AC side, a droop controller is implemented to coordinate the energy production of the different source supplying the AC bus.	DRID Mohamed
	ID:8 13:30-13:45	***Title:*** *Sensor less Control of an Electric Powertrain Using Optimized Fuzzy MRAS* ***Abstract:*** The paper investigates the performances of speed sensor less indirect field-oriented control of two induction motors used to propel an electric vehicle. The powertrain model, which includes induction motor, electronic differential and vehicle models, is first presented, then an adaptation mechanism based on fuzzy logic controller is designed and optimized by genetic algorithms to ensure the optimal operation of the model reference adaptive system speed estimator. The simulations performed with MATLAB/Simulink software show satisfactory performances of the FuzzyMRAS speed sensorless control over different road conditions.	SEBBOUA Zakaria

	ID:9 13:45-14:00	***Title:*** *Detection of false data injection attack in smart power grid using supervised learning models* ***Abstract:*** False Data Injection Attacks (FDIAs) are among the most common cyber threats targeting measurement data and sensor readings in power systems. These attacks pose a significant risk to the integrity of power system data, as they can evade conventional Bad Data Detection (BDD) mechanisms. This evasion can lead to incorrect decisions by power system operators and control centers during Power System State Estimation (PSSE), potentially resulting in serious damage to the system topology. This paper presents an approach to detect these attacks. Principal components analysis PCA is presented and the imbalanced dataset has been collected from smart grid units such as PMUs. this study performed and different results demonstrated that this method is effective for data dimensionality reduction and is not affected by lack of features as the time is evaluated in each training and testing process.	GASMI Younes
14:30 – 15:30	Poster Session Pr. A.A. Ladjici; Dr. D. Khelil		
	ID: 23	***Title:*** *Fault Diagnosis in the Photovoltaic System Using Artificial Intelligence Methods* ***Abstract:*** This study, presents a comprehensive approach to diagnosing faults in photovoltaic (PV) systems. The study delves into the exploration of various types of faults that may occur in a PV system, both at the level of the solar cells themselves and within DC/DC converters. This step is crucial for identifying potential issues these systems may face. The research discusses diagnostic methods employing artificial techniques, highlighting two primary approaches: neural networks and Support Vector Machines (SVM). These methods are commonly used for data analysis to identify and classify faults. It underscores the importance of vigilant monitoring to ensure optimal system performance.	SAADOUNI Amine
	ID:24	***Title:*** *Optimal sizing of PV/DG water pumping system with hybrid storage using SOA* ***Abstract:*** Water is the driving force behind all human endeavor. In remote areas of Algeria, the scarcity of water resources has led to the use of groundwater as a source of water. To address this issue, a Hybrid Water Pumping System (HWPS) provides reliable access to water. The main objective of this research is to investigate and analyze an optimization strategy for photovoltaic-diesel energy systems used for irrigation application, incorporating both battery and tank storage solutions. The objective is to determine the most appropriate system component sizes, taking into account both technical and economic factors. Optimization is carried out using the Seagull Optimization Algorithm (SOA), which minimizes the Life Cycle Cost (LCC). The proposed LCC model	NEMOUCHI Wissem

		considers three costs: initial capital cost, operating cost and replacement cost. In this study, an autonomous HWPS has been specifically designed to meet the water needs of an agricultural field in the semi-arid region of M'sila, Algeria, over a 20-year period.	
	ID:25	***Title:*** *Brushless Doubly Fed induction Machine Based on Slot MMF Harmonics* ***Abstract:*** The BDFIM (Brushless Doubly -Fed induction Machine) is supplied with two stator windings, including the power winding, the control winding, and an especial cage rotor. In this paper, time and space harmonics in a BDFM are studied to find a criterion for evaluating different rotor designs and develops a brushless doubly fed machine (BDFIM) with wound rotor. The machine consists of two stator windingswithp1andp2pole-pairs, respectively. The rotor has a symmetrical multi-phase winding, in which rotating MMFs with p1 and p2 pole-pairs are induced by their stator counterparts. When the number of rotor slots equals the sum of p1 and p2, the two MMFs rotate in opposite directions with respect to the rotor, satisfying the requirement of a BDFM.	CHERFAOUI Manel
	ID:26	***Title:*** *Optimal Power Management and Control of Smart Interconnected Multi-Nanogrids* ***Abstract:*** The purpose of this paper is to present the state- of-the-art literature review in nanogrid power management and control in presence of clean generation sources (solar, wind) in order to supply several kinds of loads. The management of the energy transit will be done using the DMS and EMS system, the interconnection of multi-nanogrids will subsequently create the microgrid with a larger power range. The management work includes two axes, the first being the management of the energy, the second that of the dynamic analysis and control of frequency, but before all this should determine the state estimate of the system, what would be the difference between the power produced and that consumed. In the event that the system encounters a surplus of production, energy storage will be supported according to a predetermined order of priority in the form of scenarios specific to the chosen storage types (electric vehicles, superconductors, fuel cells or the interconnection between nanogrids). In a first place the procedure will be to carry out an inventory on the various works that have been carried out in the research scope, take stock of the different prospects achieved so far in the field of energy management and the control of multi-nanogrids as well as work to optimize the different energy models. A case study will be presented as an example in this article.	HADJAZ Sabrina

	ID:27	***Title:*** *ANALYSIS STUDY OF LIGHTNING ROD INTERCEPTION USING NEURAL NETWORKS* ***Abstract:*** In this article, a comprehensive analysis and evaluation of the effectiveness of lightning rod interception is conducted. This is achieved through the development of a neural network algorithm for prediction. The focus lies on examining the influence of several critical parameters on the validity and precision of the constructed neural network. These two parameters are the number of epochs and activation function. A thorough evaluation of the prediction results generated by the program is carried out by comparing them with existing experimental data. To gain a better understanding of the limits and stability of the prediction algorithm, a systematic variation of these parameters is performed to study their impact on the performance of the neural network. This approach reveals that variation in the number of epochs, have a significant role in achieving accurate prediction results while avoiding overfitting issues. Furthermore, the significance of the neural network's architecture is addressed, emphasizing its substantial role in the learning process and its impact on overall prediction accuracy.	MEDJDOUB Abderaouf
	ID:28	***Title:*** *Fault Detection and Diagnosis in Wind Generators* ***Abstract:*** This study is part of the field of wind turbine fault diagnosis, focusing on the Doubly Fed Induction Generator (DFIG). The growth of wind energy has been remarkable, driven by its cost effectiveness and environmental benefits. Despite its advantages, generator faults remain a challenge, significantly contributing to operational and maintenance costs. Early detection of incipient faults is critical to reduce maintenance expenses and prevent unscheduled downtimes. In this context, current signature analysis (CSA) is explored as a widely adopted diagnostic technique for DFIGs. The study categorizes various faults, including bearing, stator, rotor and other components, and discusses their associated frequency components. The study concludes by highlighting the potential of CSA for DFIG fault diagnosis, setting the stage for future innovative techniques.	AMMARI Zineb
	ID:30	***Title:*** *2D and 3D finite element modeling and analysis of planar permanent magnet eddy current brake* ***Abstract:*** This paper presents a finite element calculation and analysis of a permanent magnet (PM) linear eddy current brake with different inductor topologies with normal and halbach magnetization. In order to obtain a good compromise between precision and computation time, a 2D and 3D models are developed on Comsol Multiphysics software. By keeping the same geometry parameters, a performance comparison of both topologies is done through braking forces.	DAOUDI Bouchra Hania

	ID:31	***Title:*** *Real-time Identification and Control of Doubly Fed Induction Machines* ***Abstract:*** The asynchronous machine, traditionally designed for constant speed applications, has become, with the evolution of power electronics and mastery of vector control or direct torque control, the machine most used for variable speed drive. This machine has the advantage to be more robust and less expensive, to equal power, than other machines.	KEDJADJA Soumia
	ID:32	***Title:*** *Modeling and simulation of an horizontal axis wind turbine* ***Abstract:*** In this article we made a simulation of an horizontal axis wind turbine on the Matlab/Simulink environment, the latter allows us to discover the different mechanism and control the properties of this turbine to avoid damage that could happen and we make a almost perfect model.	OUCHEFOUN Zoulikha
	ID:33	***Title:*** *Control of Brushless Doubly-Fed Generator using Lightweight Neuro-fuzzy regulators* ***Abstract:*** Accurate brushless doubly fed induction machine (BDFIM) control is considered as a good alternative to traditional generators. In this study, a cascaded field oriented control based on neuro-fuzzy regulators is investigated. The design of this control reduces the design complexity as well as the size and training time by using a lighter neuronal network for rules generation and defuzzification . Simulations in MATLAB/SIMULINK environment are used in order to compare the effectiveness of the results with classic PI and fuzzy controller field-oriented control .	TOUAMI Sounia
	ID:34	***Title:*** *Fuzzy logic Type 2 In Photovoltaic System* ***Abstract:*** Recently, many of research works are focused on the use of renewable energies which are clean, inexhaustible and contribute to protecting the environment from carbon emission. In order to maximize the energy efficiency of the PV panels, a maximum power point algorithm is used. In this study two algorithms are shown. The first is a conventional one named “Perturb and Observe” (P&O) which is simple and easy to implement, the second one belongs to the intelligent techniques based on the Fuzzy logic type 2. Compared to the traditional algorithm “P&O”, the Fuzzy logic type 2 Controller results show a faster response and better efficiency under uniform meteorological conditions.	BELARBI Saida
15:30-16:00	Coffee Break		

	Oral Session		
	Pr. Yazid. K; Dr. Abdi. A		
16:00-17:00	ID:13 16:00-16:15	***Title:*** *Permanent Magnet Number Impact on Performance of Optimal Design of Low-Speed Vernier Toothed Doubly Salient Permanent Magnet Machine* ***Abstract:*** This paper explores the impact of variations of rotor and stator tooth pitch, commonly referred as the Vernier effect, and permanents magnets pairs numbers on the performance of low-speed doubly salient permanent magnet machine. The studied machines have same volume and material characteristics (magnets, iron, and copper). They are designed and optimized using Particle Swarm Optimization (PSO) algorithms and Finite Element Method (FEM) simulations. The electromagnetic performance and geometric data of these machines are compared with those of the reference 3-phase permanent magnet synchronous machine designed for wind energy conversion (10 kW, 50 rpm, 2000 N.m). The results indicate that adjusting stator and rotor tooth pitches and varying permanent magnet pair's numbers reduces the torque ripples, and improves EMF waveforms.	KENDJOUH Tarek
	ID:15 16:15-16:30	***Title:*** *Enhancing distribution network resilience with DGs and line switch control with PSO and GA*. ***Abstract:*** One of the crucial factors to consider when examining an electric power system's robustness against severe occurrences is its resilience. Multiple defects, such as short circuits, equipment breakdowns, overloads, and intermittent renewable energy sources, frequently affect electric power networks. These flaws are typically addressed beforehand by planning studies or predetermined remedies since certain criteria make them foreseeable. However, catastrophic events that threaten electric power networks, such hurricanes, floods, cyberattacks, and earthquakes, have a low chance but a high effect, necessitating resilience studies. In this paper, we will evaluate the resilience following a simulation of these extreme events on an IEEE 33 noeud network test, followed by improvement actions by destributed generators and line commutators to determine the level of system resilience in the face of the same events	ABDALLAH Imadeddine
	ID:21 16:30-16:45	***Title:*** *Remaining useful life prediction based on improved exponential HI and adaptive neuro-fuzzy inference system ANFIS* ***Abstract:*** Rolling bearing are essential components within rotating machinery systems, and there failure can cause a significant financials loses, that is why estimating the remaining life of the bearings is considered a promising solution and becoming a trendy research topic among researchers and industrialists to adopt a strategy for maintenance using artificial intelligence and machine learning techniques. Hence, the construction of an appropriate health	MEDJOUDJ Islam

		indicator that can precisely characterizing the degradation process is a critical step in data-driven remaining useful life estimation. Therefore, this paper introduces a comprehensive health indicator construction approach based on principal component analyses technique that considers the entire process to examine prediction model using adaptive neuro-fuzzy inference system, the effectiveness of this approach was validated using the prognostics and health management 2012 challenge dataset.	
	ID:22 16:45-17:00	***Title:*** *Real-time virtual instrumentation of NI MyRio and LabVIEW based PV panel characteristics* ***Abstract:*** This paper describes a virtual instrument based on an embedded board to monitor and plot the PV panel characteristics under real operation condition. The system design is based on a NI myRIO acquisition board. The acquisition is made through a current and voltage sensor and the data are transmitted in LabVIEW by using Toolkit for NI myRIO. Hence, the I-V (current voltage) and P-V (power-voltage) characteristics for PV panel, which processed under actual conditions, can be obtained and plotted directly on a monitoring platform in LabVIEW. The proposed instrument can be used for educational or research purposes using an easily hardware without having extensive knowledge about electronic engineering. The present instrumentation technique provides easy access to the collected data for further analysis.	KASSA BAGHDOUCHE Kamel
17:00	**Closing Ceremony**		

08:00-17h00 **Exhibition booths by:** Dr. Saliha Arezki