# K L University
## Department of Electrical & Electronics Engineering
# Orientation Lecture Report

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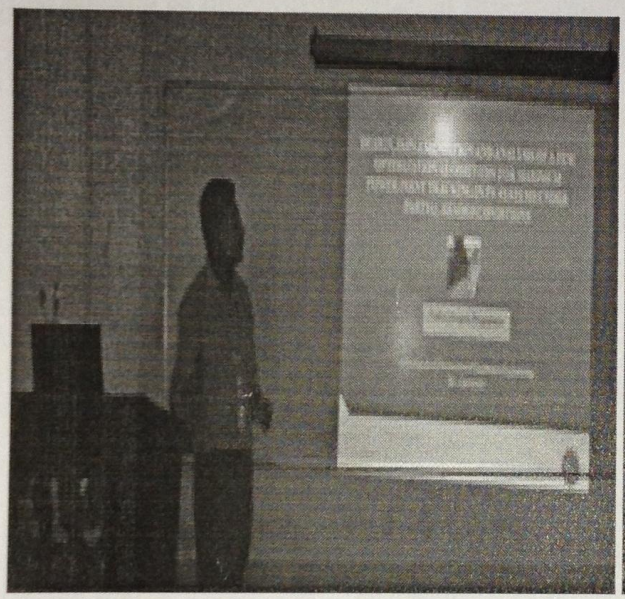
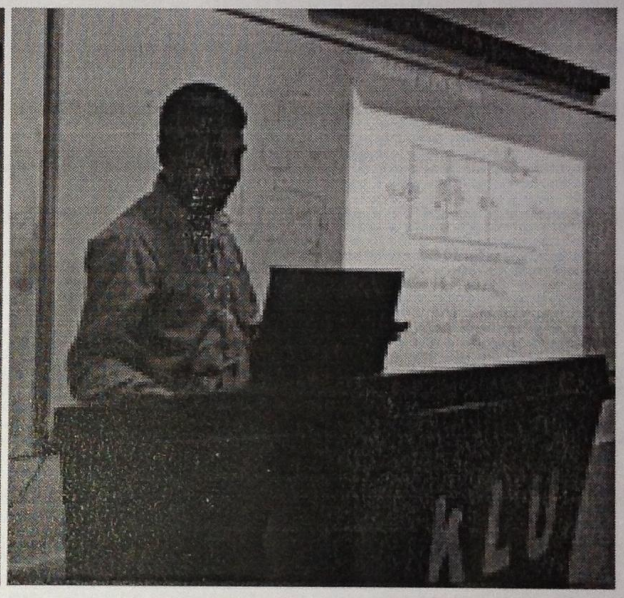
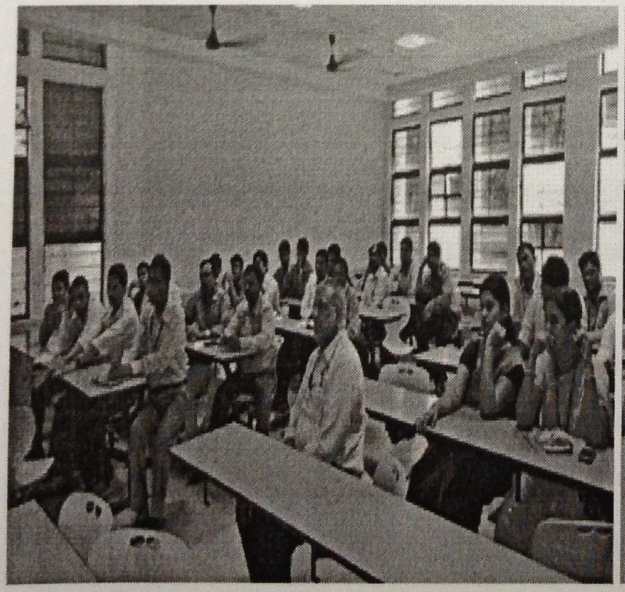
|---|---|
| Name of the Faculty | Mr. P. Sankar, Associate Professor |
| Venue | E 005 |
| Date | 04-04-2015 |
| Time | 3.00 pm to 4.00pm |
| Topic | Design, Implementation And Analysis Of A Few Optimization Algorithms For Maximum Power Point Tracking In PV Systems Under Partial Shaded Conditions |





## ABSTRACT

A photovoltaic power generation system under partial shaded conditions (PSC) exhibits multiple power peaks in the power-voltage characteristic curve and traditional optimization methods fail to detect the global maximum power point (GMPP). This work proposes the application of conventional and bio-inspired optimization algorithms for tracking GMPP in a PV system under non-uniform insolation.

Due to the increased use of renewable energy sources in the recent decades, photovoltaic (PV) power generation systems play a key role in electricity generation. The advantages of PV system include absence of fuel cost, low maintenance requirement; further, it is clean, free and inexhaustible. However, initial investment, low energy conversion efficiency and nonlinear voltage-current (V-I) characteristics with dependency on irradiance and temperature are considered as major drawbacks of this technology. Therefore, an efficient maximum power point tracking (MPPT) technique is necessary that is expected to track the maximum power point at all environmental conditions. Various MPPT schemes such as perturb and observe, incremental conductance, short-circuit current and open-circuit voltage have been addressed in order to operate the PV array at the MPP point under varying atmospheric conditions. These schemes are effective under uniform insolation conditions, where only one peak occurs at the MPP voltage of the array.

When a part or the whole module of the PV array receives non-uniform insolation which is termed as partial shaded condition (PSC), the power-voltage (P-V) characteristic gets more complicated and exhibits multiple power peaks and only one among them corresponds to global maximum power point (GMPP). Under such conditions the conventional MPPT techniques fail to guarantee convergence to GMPP leading to significant reduction in the generated PV power. In order to track the GMPP under partial shaded conditions (PSC), a few methods have been presented in the literature. These methods include development of modified MPPT techniques, array reconfigurations, use of different converter topologies etc. Improved MPPT techniques employ computational intelligent techniques such as fuzzy logic approach and artificial neural network and these methods have been successfully used for GMPP tracking in PV systems under PSC. The major drawback of fuzzy logic method is increased computational burden whereas neural network approach requires more sensors and demands large amount of data for successful training. Another prominent method makes use of swarm intelligence. Recent works indicate that particle swarm optimization (PSO) has been extensively used for GMPP tracking in PV systems under partial shaded conditions. The main disadvantage of this approach is that the oscillations in PV output power lasts for longer duration.

This thesis work has developed, tested and systematically analyzed a few recently developed optimization algorithm for closed loop operation of maximum power point tracking in PV systems under partial shaded conditions. These optimization methods are:

i. Random search method
ii. Artificial bee colony
iii. Harmony search method
iv. Ant colony optimization and
v. Firefly algorithm

The MPPT in PV systems is framed as an optimization problem with duty ratio of the dc-dc converter taken as single variable. The above mentioned optimization methods are suitably tailored for tracking global maximum power point (GMPP) and tested under different partial shaded conditions. Computer based simulations and experimental results obtained from a prototype PV power generation system are presented. All the proposed methods are shown to guarantee global convergence and are shown to be superior in comparison with the existing MPPT alternatives.

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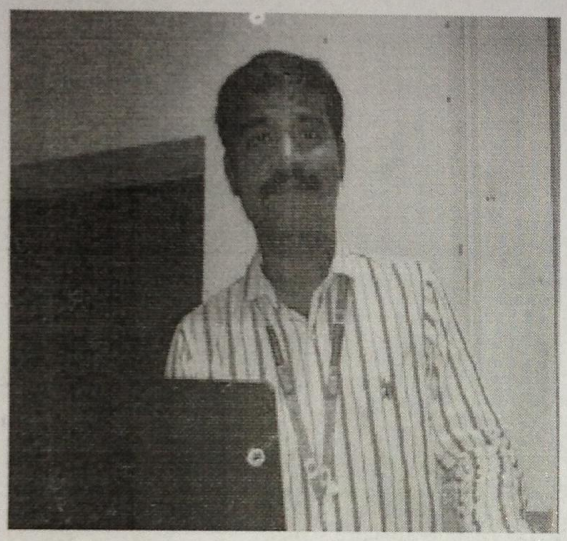
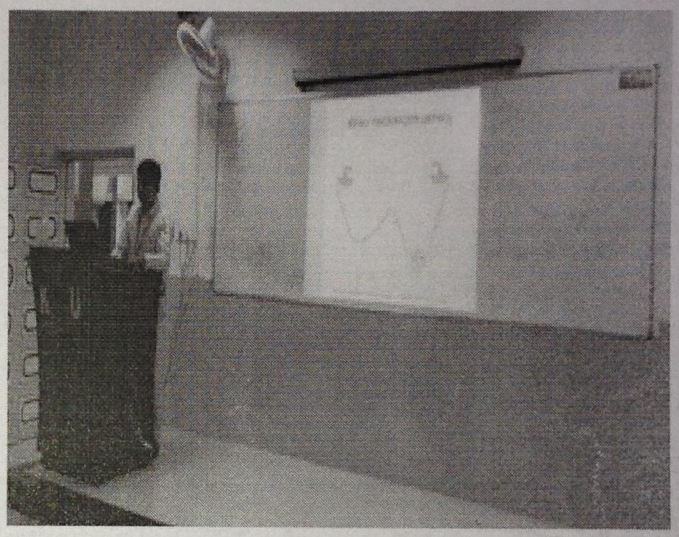
|---|---|
| Name of the Faculty | Dr. V. Joshi Manohar, Associate Professor |
| Venue | E 105 |
| Date | 20-01-2015 |
| Time | 5.30 pm to 7.30pm |
| Topic | FPGA – PSO based implementation of SHE Technique to minimize lower order harmonics in MV Drives |





## ABSTRACT

Multilevel inverters have been receiving greater attention for past few decades in numerous applications like high-power medium voltage (MV) drives, power quality improvement techniques etc. Particularly for the control of multilevel inverters in MV drives at megawatt range, high switching frequency modulation strategies cannot be used because side bands around the carrier frequency appear as low order harmonics, producing high distortion in the output voltage and current waveforms. In addition to that, it leads to high thermal losses which results in poor converter efficiency.

Instead, Selective Harmonic Elimination (SHE) technique has been one of the traditionally preferred modulation schemes at fundamental frequency which produces less switching losses and provides better harmonic profile but the equations formed by SHE technique is highly non linear and transcendental in nature. Hence, there may exist single, multiple or even no solutions at a particular Modulation index. However, in some drive applications, it is required to operate the inverter during whole range of Modulation index ($M_1$). Hence, solving SHE equations during whole range of ($M_1$) has been an active research topic for researchers since several decades.

Seven to eleven level cascade H-bridge inverters have been increasingly used by MV drive manufacturers in the present market. Hence, three-phase cascade H-bridge 11-level inverter has been chosen for case study. The main objective of this work is to present a comparative harmonic analysis of deterministic and stochastic techniques in solving SHE equations and to present an effective, rugged, most efficient algorithm with less computational burden to solve SHE equations during complete range of modulation index from 0 to 1 with an aim of minimizing lower order harmonics such as 5th, 7th, 11th and 13th to comply with IEEE 519-1992 harmonic guidelines.

Proposed way of approach is in four steps, in first step SHE equations are solved by deterministic method like Newton-Raphson (NR) method with any random initial guess. In second step, the limitations observed in NR method are attempted to overcome by using stochastic optimization technique like Continuous-Genetic Algorithm(C-GA). In third step, most of the drawbacks which are observed in previous approaches are attempted to overcome by using another stochastic optimization like Modified Species based Particle Swarm Optimization algorithm (MPSO).

In fourth step, the effectiveness of the proposed MPSO algorithm is validated by considering a low-power prototype of three-phase CHB 11-level inverter and FPGA based Xilinx's SPARTAN-3A DSP controller has been used to generate gating signals to sixty MOSFETs. The results obtained are nearly equal to simulation results during whole range of ($M_1$) from 0 to 1 and the %THDs obtained over major range of ($M_1$) also satisfies IEEE 519-1992 harmonic guidelines.

# Orientation Lecture Report

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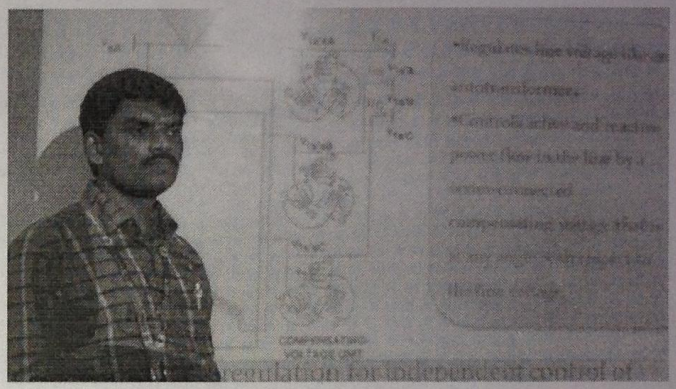
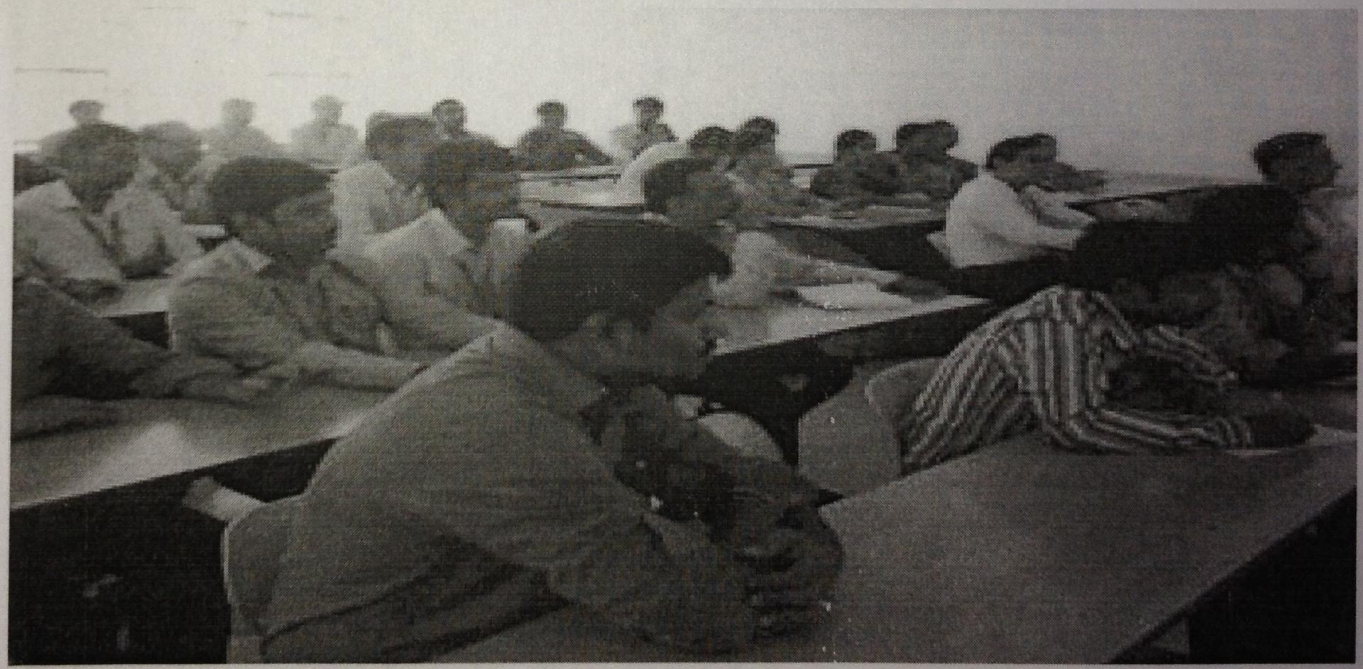
|---|---|
| Name of the Faculty | Mr B. Loveswara Rao , Associate Professor, EEE Department, K L University. |
| Venue | E 105 |
| Date | 31st January 2015 (Saturday) |
| Time | 10.00 am to 11.00pm |
| Topic | SEN TRANSFORMER & APPLICATION |



# "Sen" Transformer

The independent control of active and reactive power flow in a transmission line is necessary for the transfer of bulk power along a desired path in the most economical way. A "Sen" Transformer (ST) uses transformer and tap changers that are traditionally used to build a voltage-regulating transformer (VRT) and a phase angle regulator (PAR). The ST regulates the voltage at a point in the transmission line as a VRT does. Additionally, the ST provides an independent and bidirectional active and reactive power ( and ) flow control in the transmission line as a voltage-sourced converter (VSC)-based unified power flow controller (UPFC) does. Although both the ST and the PAR use a comparable number of components, the ST provides an area of controllability in the - plane similar to a UPFC, while the PAR provides a linear - characteristic. The technology of transformer and tap changer is proven to be reliable and cost-effective when compared with the emerging technology of VSC. The new ST is adequate to provide independent control of active and reactive power flow in most utility applications.

# K L University
## Department of Electrical & Electronics Engineering
# Orientation Lecture Report

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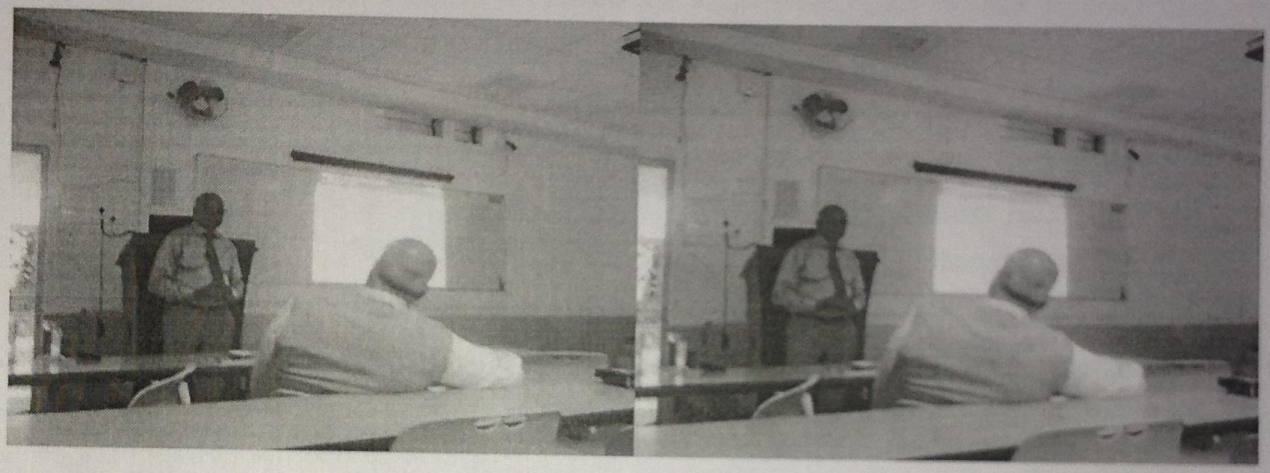
|---|---|
| Name of the Faculty | Dr. Ramaiah Divi, Professor |
| Venue | E 105 |
| Date | 17-01-2015 |
| Time | 3.30 pm to 4.30pm |
| Topic | An Overview of Alberta's Power Sector (Transmission System Planning) |



**Introduction to Resource Person: Dr. Ramaiah Divi**, P. Eng. Lead Engineer, System Planning, Mr. D. Ramaiah, did B.Tech from S V University, Tirupathi (A.P), M.Tech. from IIT Khargpur and Ph.D from Canada. Presently he is a lead engineer, System Planning Division, Alberta's Power Sector (Transmission System Planning), Canada.

**Orientation lecture details:** Ramaiah Divi, started the lecture by introducing geographical conditions, population and industrial growth & economics of Canada. Then moved to different states in Canada and explained the details of power sector & the total production of power per annum. Dr D Ramaiah was talking about the importance of load forecasting to asses the requirement of power in near feature so that distribution requirement is met. D. Ramaiah sir is working in Alberta Power Sector. He was talking about the various /different companies engaged in production of Electrical Power in Alberta. In his lecture he said that in Alberta state 60 % of power is produced by Gas based plants and in near eature though coal availability is more in Alberto, thermal power stations are likely to be replaced by Gas based plants. He said wind proved to be costly in Alberto. He was talking about the long term planning, software to be used & alternatives. The lecture was attended by all the EEE faculty members. The lecture started at 3.30 p.m. and ended at 4.40 p.m.

# K L University
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# Orientation Lecture Report

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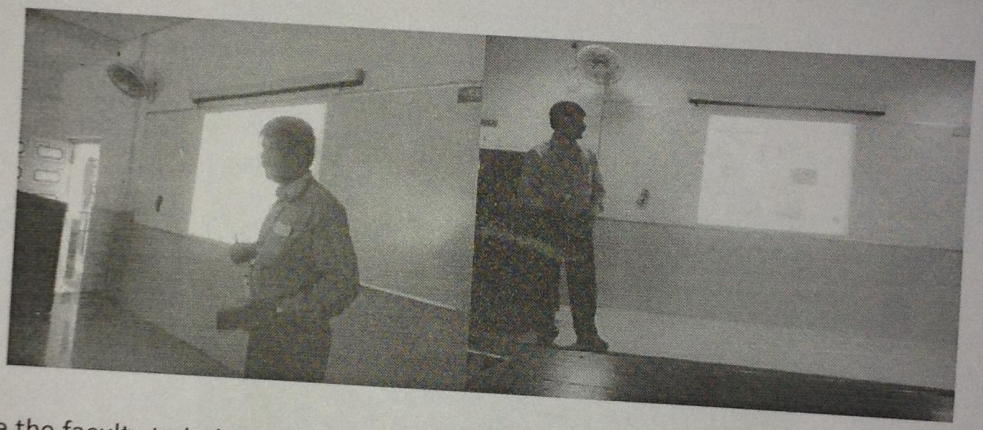
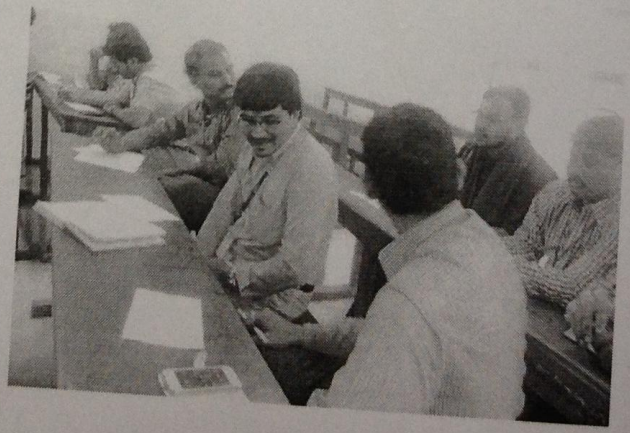
|---|---|
| Name of the Faculty | **Dr. Y. P. Obulasu,** Professor, EEE Department, K L University. |
| Venue | E 105 |
| Date | 29 November 2014 (Saturday) |
| Time | 2.00 pm to 4.00pm |
| Topic | Cirriculumn Design & Outcome based Learning |

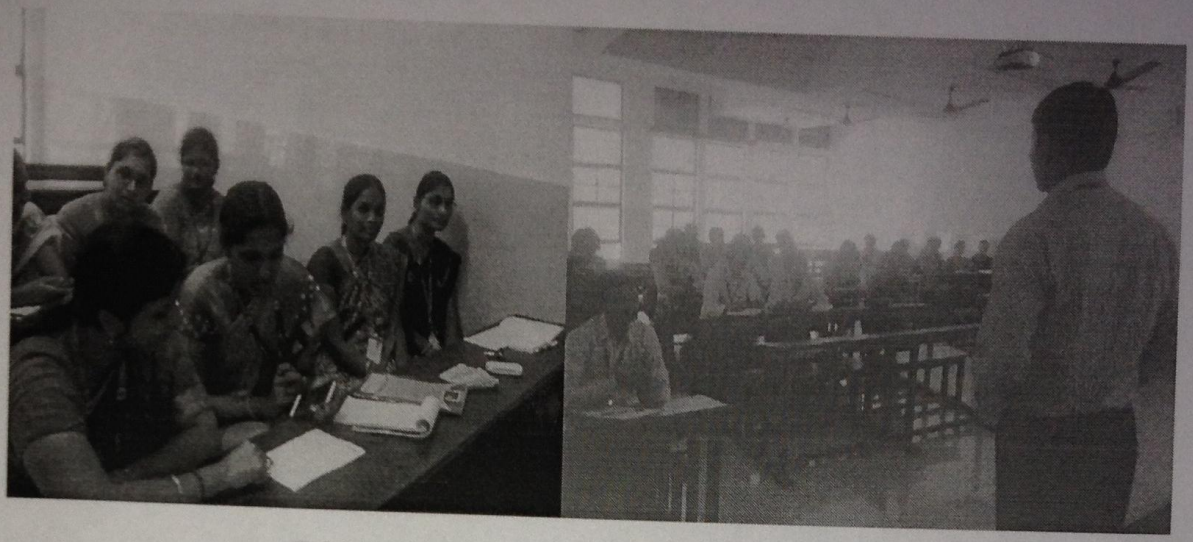
**Dr Y P Obulesu** emphasized the need of Curriculum Development for the coming graduates. He covered on various topics like KNOWLEDGE levels , the importance of ARTS in the Curriculum with SCIENCE and Engineering. He explained the difference between the Program Objectives and Program Outcomes and also how goals are need to be set for the upcoming graduates.

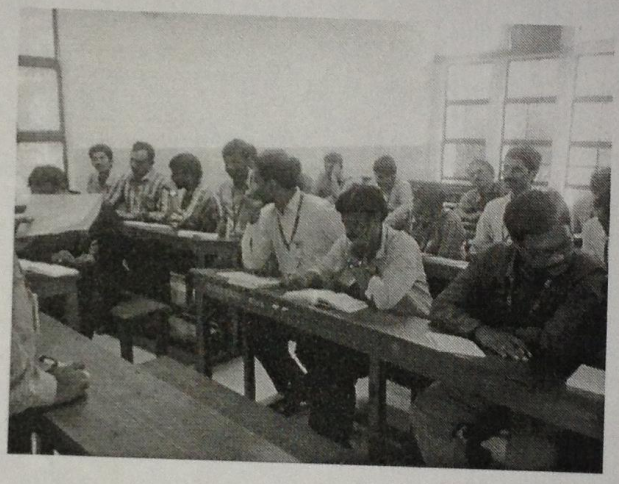


He also made the faculty to judge the student knowledge of recollecting the concepts dealt in the classroom immediately after going homes.



The faculty members of Department of Electrical & Electronics engineering participated very actively sharing their views and clearing their doubts. Activity is done on Session/ Lecture Plan by the faculty members.





All EEE faculty members have attended the program. List of faculty who attended the program is attached.

# K L University
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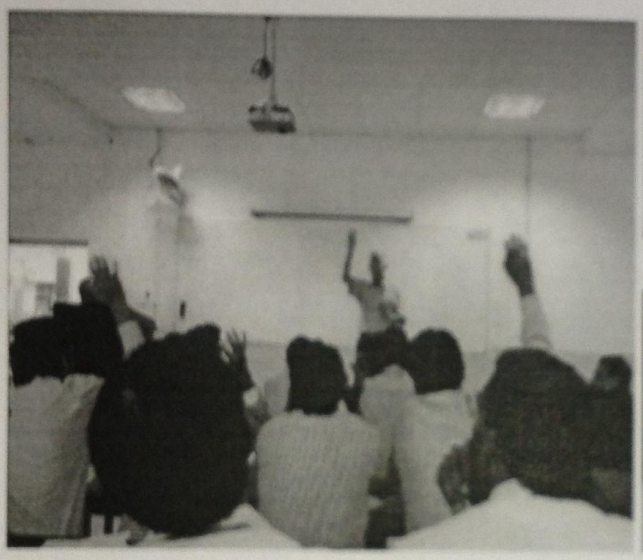
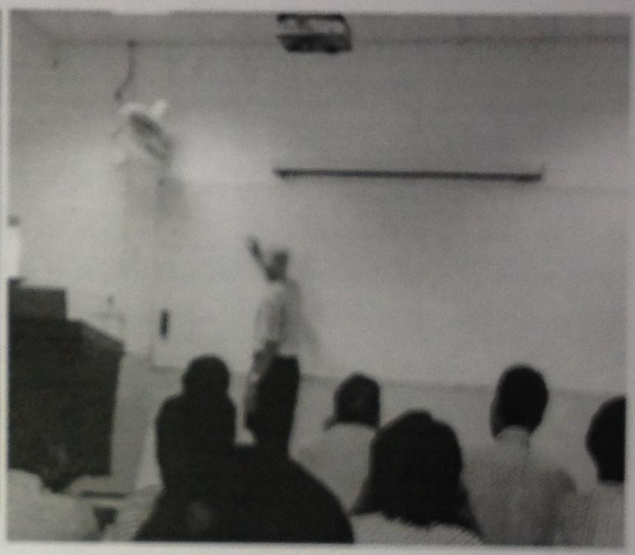
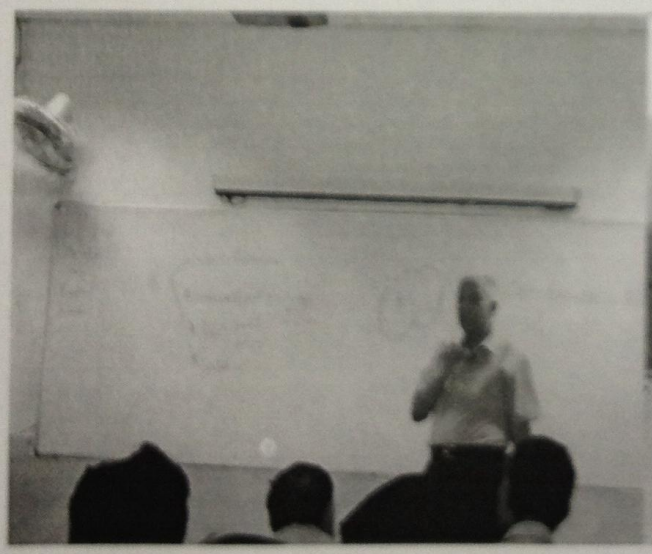
|---|---|
| Name of the Faculty | Dr. A S R Murthy, Professor, EEE Department, K L University. |
| Venue | E 105 |
| Date | 26 & 27/11/2014 |
| Time | 3.00 pm to 4.00pm |
| Topic | RELIABILITY ENGINEERING |







**Prof. A S R Murthy, Ph.D.**

**Introduction to Resource Person: B.Tech from Andhra University, M.Tech and Ph.D., from IIT Khargpur. He worked as** Professor in Mechanical Engineering, Reliability Engineering Centre and Industrial Engineering Departments, Indian Institute of Technology, Kharagpur.

Prof. A S R Murthy started the lecture with a simple questions on Reliability i.e., with some initial thoughts of reliability importance and definitions with examples. Then spoke about reliability importance warranty claims. He was talking about product reliability and sales. He defined clearly 'what is a failure rate, prediction of failure. He was talking about human reliability and software reliability. He has focused even on non-repairable systems & their failure rate. It was attended by faculty members and M.Tech Students (Power systems and Power electronics)

**Reliability Engineering** is engineering that emphasizes dependability in the lifecycle management of a product. Dependability or reliability, describes the ability of a system or component to function under stated conditions for a specified period of **time**. Reliability engineering represents a sub-discipline within systems engineering. Reliability is *theoretically* defined as the probability of success (Reliability=1-Probability of Failure), as the frequency of failures, or in terms of availability,as a probability derived from reliability and maintainability. Maintainability and maintenance is often defined as a part of "reliability engineering" in Reliability Programs. Reliability plays a key role in the cost-effectiveness of systems.

# Orientation Lecture Report

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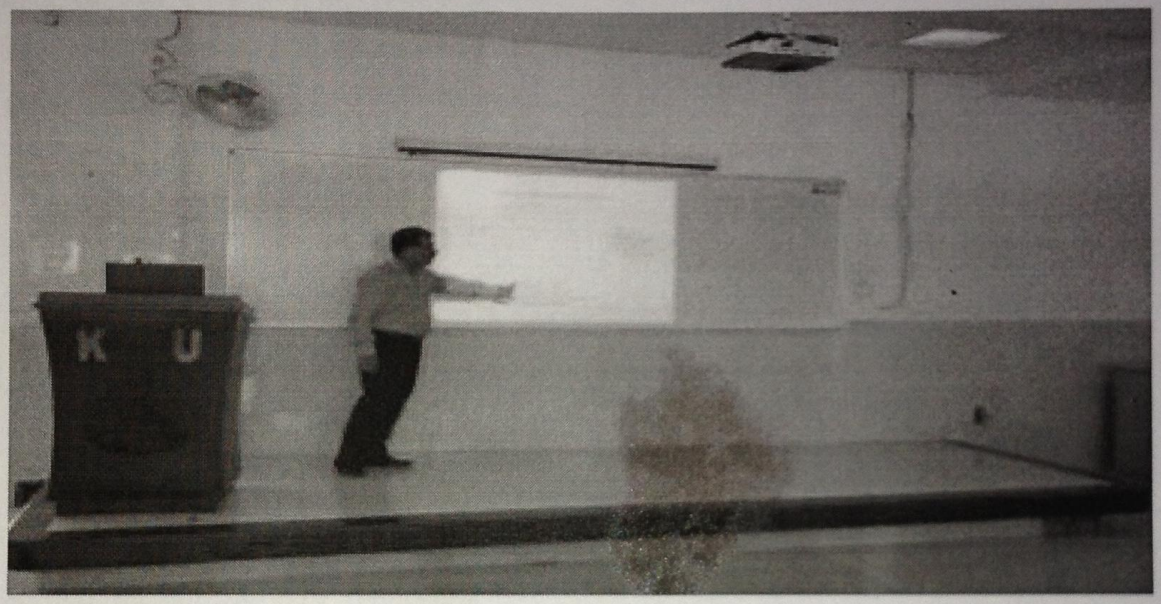
|---|---|
| Name of the Faculty | **Dr. O Chandra Sekhar**, Professor, EEE Department, K L University. |
| Venue | E 105 |
| Date | 18th September 2014 (Saturday) |
| Time | 11.00 am to 12.00pm |
| Topic | MODULATION AND CONTROL OF MULTI-LEVEL INVERTERS FOR DIRECT TORQUE CONTROL INDUCTION MOTOR DRIVE |




**Title :- MODULATION AND CONTROL OF MULTI-LEVEL INVERTERS FOR DIRECT TORQUE CONTROL INDUCTION MOTOR DRIVE**

## ABSTRACT

Multilevel power converter circuit configurations have comprehensively been recommended in the current history outstanding to their quality merits such as aptitude to function from high voltage DC-bus and low harmonic contented of the output with low switching frequencies. In light of this fact, this thesis presents a survey of the various topologies of diode-clamped multilevel inverter, and their control schemes for Direct Torque Control (DTC) of Induction Motor (IM).

The idea of this thesis is to investigate a novel multilevel inverter fed DTC for IM drive. In this, a multilevel inverter based DTC fed induction motor drive using space vector modulation (SVM) is presented. Both the electromagnetic torque and stator flux can be managed by the proposed DTC IM drive with a very low ripple but with a high degree of ease. As the quantity of levels growing, the %THD in the motor line voltage decrease. Besides, as the number of levels increased the torque undulation is reduced to least amount and the stator flux ripple is also minimized. This thesis, proposes high dynamic performance, good stability and precision in a multi-level inverter fed DTC IM drive.

The multilevel inverters considered in the proposed research work are of 3-level, 5-level, 7-level and 9-level. The switching tables are drawn after the analysis of all the equations from those connecting the applied voltage vectors in connection with those of torque and flux variations in correspondence.

The pole voltages, phase voltages, phase currents, stator flux trajectory(D-Q axis currents), torque response, speed response and harmonics distortions are presented for the multilevel inverter topologies so considered. The motor phase voltage waveform is very smooth and closed to sinusoidal. Control analysis and simulation studies using MATLAB/Simulink software, Fuzzy Logic Control (FLC) and space vector modulation for an induction motor with direct torque control are presented to show the effectiveness of the multilevel inverters.

This eventually improves dynamic performance of a multilevel inverter DTC IM drive with reduced balanced condition ripples and low harmonic deformation accomplished. The results are presented and compared.

# Orientation Lecture Report

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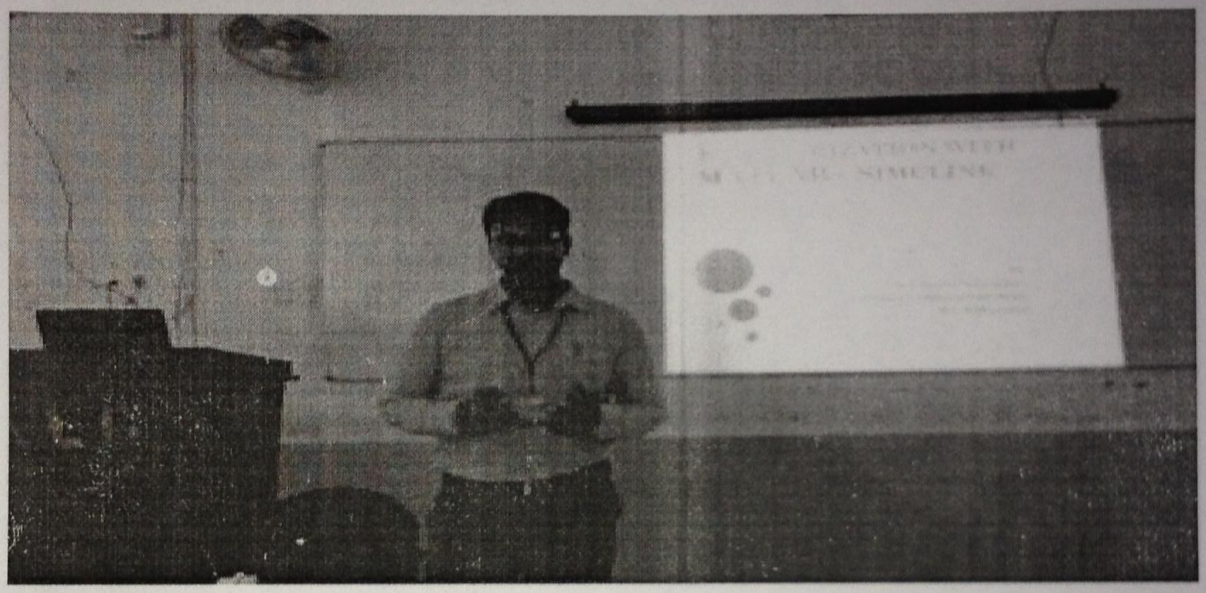
|---|---|
| Name of the Faculty | Mr K Narasimha Raju, Associate Professor, EEE Department, K L University. |
| Venue | E 005 |
| Date | 23rd August 2014 (Saturday) |
| Time | 11.00 am to 12.00pm |
| Topic | Matlab Revisited |



# MATLAB REVISITED

Abstract:

The colloquia was about the role of simulation software's in solving electrical engineering problems and were does MATLAB stand in this regard. In electrical there are various analysis like nonlinear circuit analysis, complex linear circuit analysis, Transient analysis, nonlinear transient analysis, AC analysis digital circuit analysis and various other noise and sensitivity analysis were manual computation falters. Due to increased processing speed and memory in the past decade all these problems can be solved effectively using Computer simulation software's. MATLAB is a high-level technical computing language and interactive environment for algorithm development, data visualization, data analysis, and numerical computation. In this colloquia the application of MATLAB in simulation of nonlinear circuit like an inverter is presented in Square, Bipolar PWM and Unipolar PWM modes .Their Harmonic analysis was made and compared. This analysis hitherto would have been very tedious task for manual computation.

Presented by

K.Narasimha Raju
Associate Professor
EEE Dept.
K.L.University

# Orientation Lecture Report

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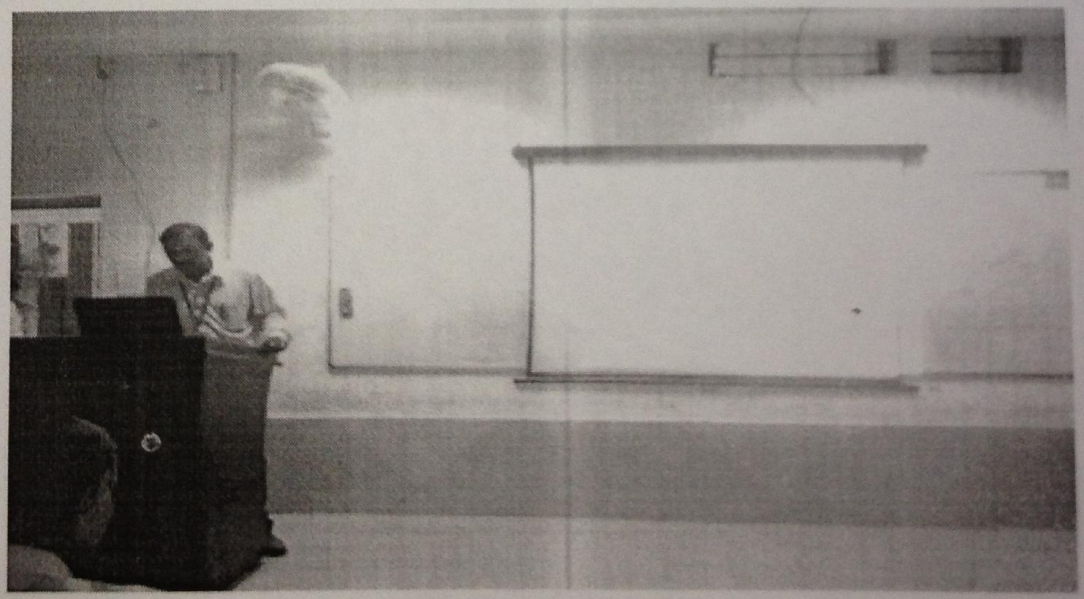
|---|---|
| Name of the Faculty | Mr D. Ravi Kishore, Associate Professor, EEE Department, K L University. |
| Venue | E 005 |
| Date | 16th August 2014 (Saturday) |
| Time | 11.00 am to 12.00pm |
| Topic | Modeling and Analysis of DFIG |



# Orientation Lecture Report

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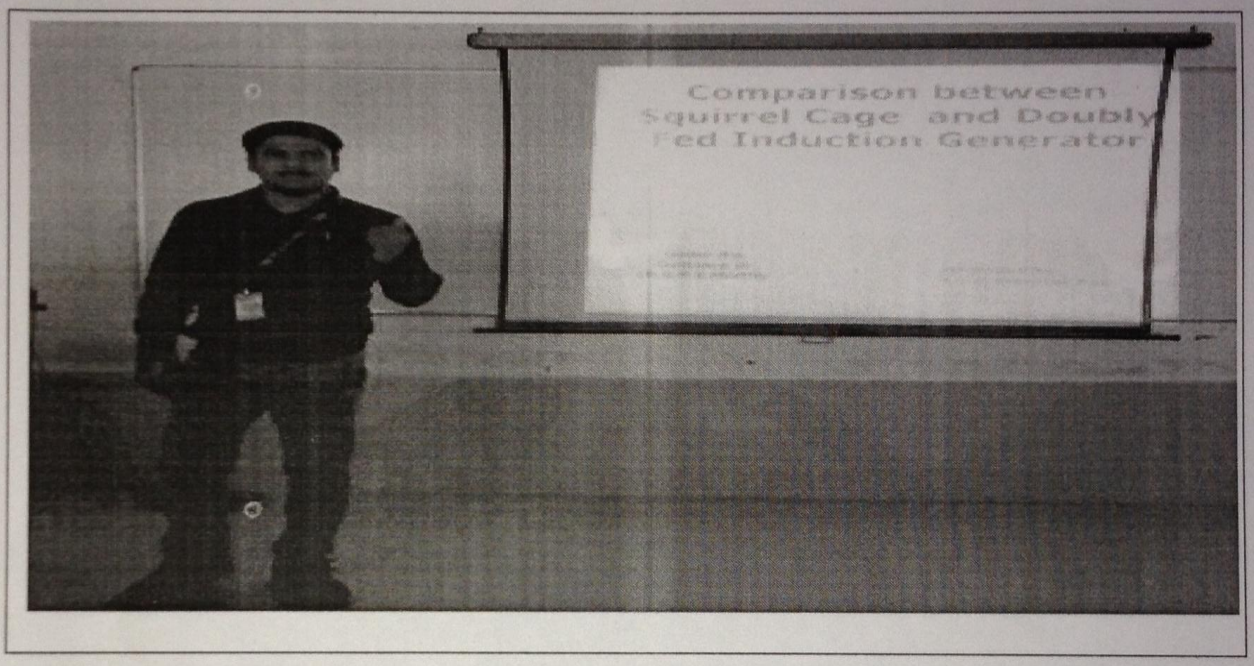
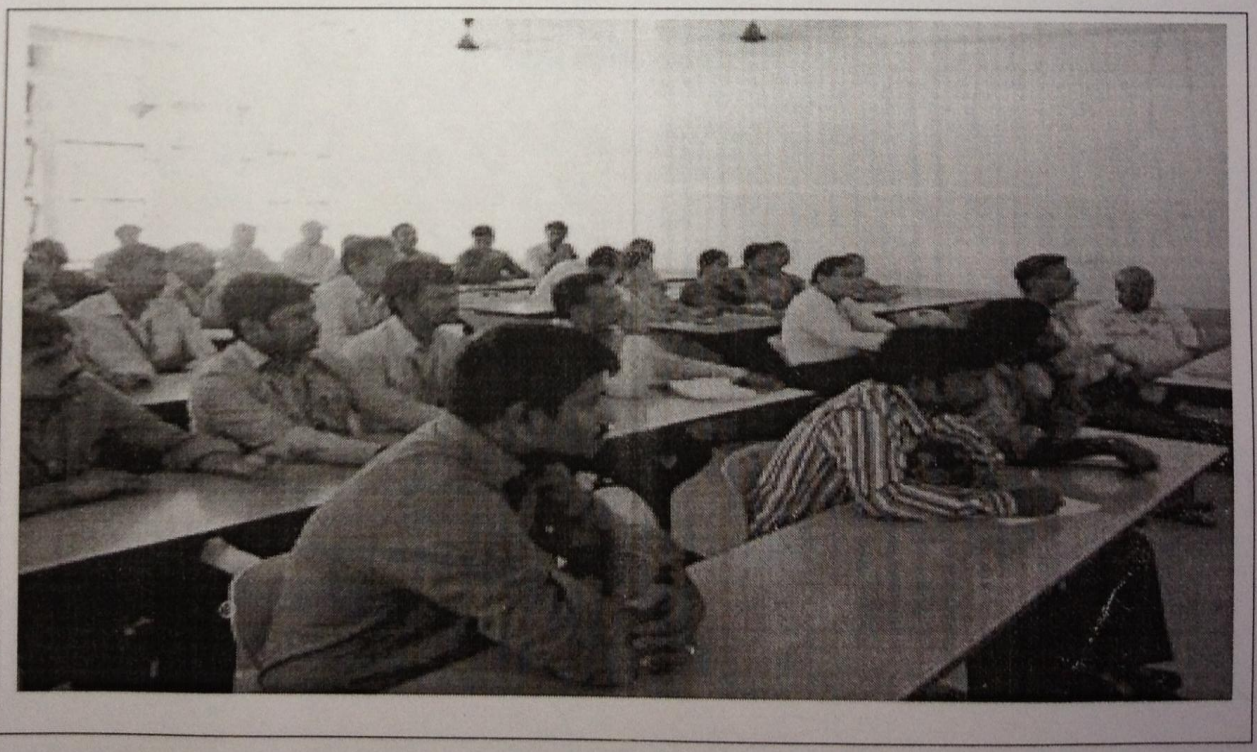
|---|---|
| Name of the Faculty | Mr K. V. N. Srinivasa Rao , Assistant Professor, EEE Department, K L University. |
| Venue | E 005 |
| Date | 9th August 2014 (Saturday) |
| Time | 11.00 am to 12.00pm |
| Topic | **DFIG Vs Cage Ind. Motor as Wind form Resource** |



**K L University**

**Department of Electrical & Electronics Engineering**

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|---|---|
| **Speaker** | : Mr. K. P. Prasad Rao (2274). |
| **Designation** | : Assistant Professor. |
| **Topic** | : Multiphase Power Transmission System (Five Phase System), Ph.D. Topic. |
| **Date** | : 02/08/2014. |
| **Time** | : 11:00AM – 12:00 Noon. |
| **Venue** | : E005, EEE Block. |
| **Area of Research** | : Power System. |

Multiphase (more than three phase) systems are the focus of research recently due to their inherent advantages compared to their three phase systems. The applicability of multiphase systems is explored in electric power generation, transmission & utilization. Multiphase motor drives are concerned, the first proposal was given by Ward and Harrer way back in 1969 and since then the research was slow and steady.

The research on multiphase drive systems has gained momentum at the start of this century due to the availability of cheap ratable semiconductor devices and digital signal processors. It is to be emphasized here that the multiphase motors are invariably supplied by ac/dc/ac converters. Thus, the focus of the research on the multiphase electric drive is limited to the modeling and controlling of the supply systems. Little effort is made to develop any static transformation system to change the phase number from three to n- phase. Here the phase sequence is n>3 and odd because six phase transmission lines can be smaller, more complex in tower construction compared to a standard double circuit three phase line.

The research on multiphase generators has started recently and only a few references are available. Phase transformation system which converts an available three-phase supply & DC supply to an output five-phase supply. Multiphase, especially a 6-phase and 12-phase system is found to produce less ripple with a higher frequency of ripple in an ac–dc rectifier system. Thus, 6- and 12-phase transformers are designed to feed a multipulse rectifier system and the technology has matured. Recently, a 24-phase and 36-phase transformer system had been proposed for supplying a multipulse rectifier system. The reason for choosing a 6-, 12-, or 24-phase system is that these numbers are multiples of three and designing this type of system is simple and straightforward. However, increasing the number of phases certainly enhances the complexity of the system. None of these designs are available for an odd number of phases, such as 5, 7, 11, etc.