**National Workshop on**

**“Power Electronics with Renewable Integration”**

Dated: 20th and 21st of December, 2014

 **WORKSHOP REPORT**  ****

**Organized by**

IEEE IIUI Student Branch &
FET, IIUI in collaboration of PEC and NI

**Sponsored By**

Higher Education Commission

**Guest Speakers**

Prof. Nauman Ahmad Zaffar (LUMS)

Dr. Syed Raza Kazmi (SEECS NUST)

**Chief Guests**

Prof. Dr. Muhammad Amir (HOD FET)

(Inauguration Ceremony)

Prof. Dr. Aqdas Naveed Malik (Dean FET)

(Closing Ceremony)

**Workshop Secretary**

Engr. Tila Muhammad

****

**Objective of Workshop**

Pakistan is passing through a critical period of energy crises due to the unprecedented increase in the energy cost at the international level and the widening gap between the demand and supply of energy at the national level. These crises are eroding the economic growth of the country. At the same time, Pakistan has an ideal geographical location for harnessing the renewable energies like solar, wind and biomass. Hence, these energy crises in Pakistan have become an opportunity for the utilization of the renewable energy resources. To avail the benefit of this geographic location of Pakistan, Power Electronics and latest technology advancements can play an important role.

Power Electronics and its applications have seen tremendous growth in the last decade all over the world. It is an applied area of Electrical Engineering that deals with the efficient Power Processing and has direct applications in many domains of energy sector such as renewables, conventional, power grids and smart grids. Unfortunately, Pakistan itself has organized a small-scale activity in this area due to an outdated curriculum and very little research focus

Power Electronics and its applications have seen tremendous growth in the last decade all over the world. It is an applied area of Electrical Engineering that deals with the efficient Power Processing and has direct applications in many domains of energy sector such as renewables, conventional, power grids and smart grids. Unfortunately, Pakistan itself has organized a small-scale activity in this area due to an outdated curriculum and very little research focus

The main objective of the Workshop was to make the students aware about the scope of Power Electronics and its applications in renewable integration technologies and also develop their interest in this field because of the current situation of power crisis in Pakistan. Nowadays, electric power is the basic requirement due to an extensive involvement of electric machines throughout the world. The core objective of these technological advancements in the field of power generation is to reduce the in-system power losses and provide the quality power to the consumer. These requirements can only be fulfilled by the application of the latest research of power electronics in these areas.

This workshop was conducted to promote research in this field and give a platform to researchers and industrialists. The workshop participants can stay connected via the newly developed websites i.e. **www.ieee-iiui.com**

**Workshop Contents**

This workshop covered the fundamentals of Power Electronic converters. The prime focus was on training the attendees about how to approach this broad area to make tangible links between the various electrical engineering domains with clarity. The workshop was structured to start with the basics of circuit theory with emphasis on linear circuits, circuit elements and the constitutive relationships. Then this workshop covered the basics of magnetics to emphasize the behavior of inductors and transformers as integral magnetic elements of power electronic circuits.

Switching elements and semiconductor power electronic devices were then presented alongwith the deep understanding of the drive conditions and non-ideal behavior of these devices when used as switches. The emphasis then shifted on realization of converters, analysis of converters in equilibrium and periodic steady state analysis in CCM and DCM, isolated converters in equilibrium covered with some understanding of converter dynamics before steady state operation. Circuit averaging and averaged switch modeling were discussed as an approach towards AC small signal modeling of converter circuits.

The design of magnetics including high frequency inductors and transformers including pertinent examples of converters that utilize them for optimum performance was also discussed. Some of the other topics such as power converter filter design and power system harmonics were also mentioned and elaborate. Power Electronics from very basic to the advance level was taught in the workshop.

During the workshop participants learned the following concepts:

* Basic circuit theory & magnetics switching elements
* Semiconductor switches and non-ideal characteristics
* Power Electronics Converters and Switch Realization
* Steady state analysis of non-isolated converter in CCM
* Isolated converters in CCM
* Dynamic AC modeling of Converters in CCM and Circuit Averaging
* Power boards
* Microcontroller and PWM
* Power Inductor and transformer Design
* Gate drive and Hardware implementation of power converter

Time was also allotted to the participants for the group discussions among themselves and with the guest speakers

**Participants**

**Resource Persons**

**Prof. Nauman Ahmad Zaffar (LUMS)**

Director Energy and Power System Clusters

(Lahore University of Management Sciences)

**Dr. Syed Raza Kazmi (SEECS NUST)**

Post Doctorate in Power Converters

Assistant Professor

(National University of Science and Technology).

**Audience**

The workshop was well attended. The participants included the professionals of different strategic industries, defense industries, universities and undergraduate students. There were 250 participants in the workshop while the funding was handed from HEC for 130. The participants had research, teaching and practical experience in Power Electronics and relating fields. The participants from the following institutes and organizations attended the workshop:

1. NDC

2. AWC

3. SNGPL

4. PAEC

5. NUST SEECS

6. UET Taxila

7. UET Peshawar

8. UET Lahore

9. FUUAST Isamabad

10. CASE

11. CIIT Islamabad

12. CIIT Attock

13. CIIT Abotabad

12. Air University

13. Bahriya University

14. Sciflair Research Lab

15. FAST Islamabad

16. CESET

17. CESCOS Peshawar

18. UoL Islamabad

19. NFC Faisalabad

20. PTV

21. NUST EME

22. MAJU Islamabad

23. HITEC Taxila

24. FM Radio

25. WAPDA

26. PMO

27. GHQ

Some engineers from other small private companies also attended the workshop. Out of the total participants, 25% were from IIUI and 20 % were undergraduate students

20% of the particpants were female while th remaining 80% were males. A total of 78 participants were the registered engineers from Pakistan Engineering Council.

**Delivered**Lectures 12 Hours

Tea total 4 times

Lunch total 2 times (Savour Food)

Separate arrangements for lunch and tea of resource persons.

High Tea for organizers, resource persons and chief guest after workshop

Provided Guest House in Jinnah Supper to Resource Person

Provided Transport to Resource Person

Provided guest house facility to participants

Provided transport facility to participants from specific points

Note Pad + Ball Point for each participant

Participants Card

Certificate without CPD for unregistered engineer

Certificate with 1CPD for registered engineer

All certificates were with printed name

Each participant received certificate from chief guest with picture taken

Provided additional security during workshop

Shields + Certificates were distributed among organizers

Souvenir + Shields + Certificates were presented to resource persons

Shields were presented to chief guest

Time was also allotted to the participants for the group discussions among themselves and with the guest speakers

The participants also received their participation certificate as well as their one CPD point certificate while the guest speakers were awarded the shields and souvenirs by the workshop secretary and chief guests respectively.

The shields were distributed along with certificates among organizers and only certificates were issued to the supporting staff.

**Possible Outcomes of this Workshop:**

This was a conceptually dense workshop which covered complex scientific engineering concepts. The workshop had a diverse audience from different organizations and institutes.

It is expected that after the workshop, students will develop their interest in the field of Power Electronics and hopefully, will utilize the technological advancements in order to minimize the energy crisis in the country and also produce the efficient and environment friendly power systems.

**Follow-up Action Plan:**

After this workshop, FET IIUI is hopeful for organizing many other workshops related to Electronic Engineering field and a platform would be provided to stay connected via the website i.e. **www.ieee-iiui.com.**

**Inaugural Session of the workshop on 20th December**

|  |  |  |
| --- | --- | --- |
| **Time** | **Name of speaker/Activity** | **Duration** |
| 8:00- 8:30 am | Reception of Guests and Correction of Registration Data | 30 minutes |
| 8:30-8:35 am | Recitation of Holy Quran | 05 minutes |
| 8:35-8:45 am | Welcome Address by Prof. Dr. Muhammad Amir (Chairman FET) | 10 minutes |
| 8:45-8:55 am | Workshop Introduction: Engr. Tila Muhammad( Workshop Secretary) | 10 minutes |
| 8:55-9:00 am | Photo Session  | 5 min |
| Total Time allotted for Inaugural Session | 30 minutes |
| Technical Session Each Talk : Lecturing +QATotal Technical Session Talks | 90 minutes12 hours |

**Workshop DAY 01 (Technical Session)**

|  |  |  |
| --- | --- | --- |
| **Timings** | **Topics** | **Speaker** |
| 9.00-10:30 | Basic Circuit Theory and Magnetics | Prof. Nauman Ahmad Zafar |
| 10:30-11:00 | Tea Break and Group Discussion |  |
| 11:00-12:30 | Semiconductor Switches and Non-Ideal Characteristics | Prof. Nauman Ahmad Zafar |
| 12:30-1:30 | Lunch Break & Prayer Break / Group Discussion |  |
| 1:30-3:00 | Power Electronics Converter Topologies and Switch Realization | Dr. Raza Kazmi |
| 3:00-3:30 | Tea Break/ Group Discussion |  |
| 3:30-5:00 | Steady State Analysis of Non-Isolated Converter in CCM | Dr. Raza Kazmi |

**Workshop Day 02 (Technical Session)**

|  |  |  |
| --- | --- | --- |
| **Timings** | **Topics** | **Speaker** |
| 9:00-10:30 | Isolated Converters in CCM | Prof. Nauman Ahmad Zafar |
| 10:30-11:00 | Tea Break/ Group Discussion |  |
| 11:00-12:30 | Dynamic AC modeling of Converter in CCM and Circuit Averaging | Dr. Raza Kazmi |
| 12:30-1:30 | Lunch Break and Prayer Break / Group Discussion |  |
| 1:30-3:00 | Power Inductors and Transformer Design | Prof. Nauman Ahmad Zafar |
| 3:00-3:30 | Tea Break/ Group Discussion  |  |
| 3:30-5:00 | Gate Drive and Hardware Implementation of Power Converter  | Dr. Raza Kazmi |

**Closing Ceremony (5:00- 5:30pm)**

The Chief Guest of the closing ceremony was **Dr. Aqdas Naveed Malik (Dean Faculty of Engineering and Technology, IIUI).** He presented shields and souvenirs to the resource persons and also distributed the Certificates among the participants and appreciated Engr. Tila Muhammad and his team for organizing a successful workshop. Certificates were distributed among the participants.

 **Evaluation of Workshop by Participants:**

**Evaluation Questionnaire**

The following questionnaire were given to participants to evaluate the workshop. The responses are given in the table below and are marked out of 10:

1. How was the overall management of the Workshop?
2. How prepared was the presenter?
3. How appropriate were the facilities?
4. If asked to come for another workshop, what will be your reaction?
5. How were the lunch and refreshment arrangements?
6. Did you enjoy these two days of workshop with us?

|  |  |
| --- | --- |
| Q 1 | 10 out of 10 |
| Q 2 | 10 out of 10 |
| Q 3 | 9 out of 10 |
| Q 4 | 10 out of 10 |
| Q 5 | 8 out of 10 |
| Q 6 | 9 out of 10 |

**Feedback of Participants for National Workshop on “Power Electronics with Renewable**

**Integrations” some of the common remarks:**

* The workshop was fantastic but time duration was short next time it should be increased.
* Practical approach should be focused and next time invite people from the power electronics industries side too.
* Next time arrange workshops on solar energy and hybrid systems
* There should be some visual and practical videos
* The facilities provided were fantastic
* We all want to attend the next workshop arranged by IEEE IIU SB and Faculty of Engineering and Technology, IIUI.

 ……………………………………………..The End………………………………………….