

# **CURRICULUM OF ELECTRICAL ENGINEERING**

**B.Sc./BE/BS  
&  
M.Sc./ME/MS**

(Revised 2012)



**HIGHER EDUCATION COMMISSION  
ISLAMABAD**

**CURRICULUM DIVISION, HEC**

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## PREFACE

The curriculum of subject is described as a throbbing pulse of a nation. By viewing curriculum one can judge the stage of development and its pace of socio-economic development of a nation. With the advent of new technology, the world has turned into a global village. In view of tremendous research taking place world over new ideas and information pours in like of a stream of fresh water, making it imperative to update the curricula after regular intervals, for introducing latest development and innovation in the relevant field of knowledge.

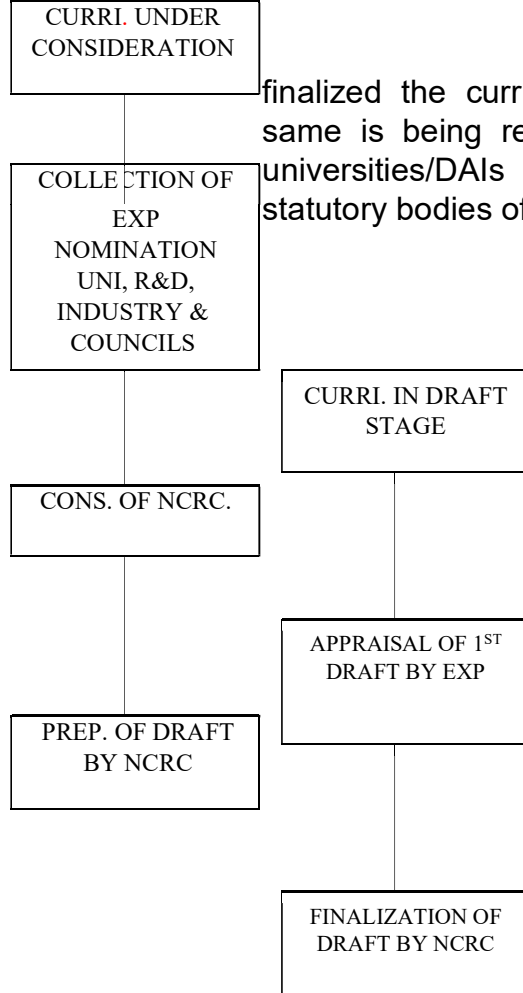
In exercise of the powers conferred under Section 3 Sub-Section 2 (ii) of Act of Parliament No. X of 1976 titled “**Supervision of Curricula and Textbooks and Maintenance of Standard of Education**” the erstwhile University Grants Commission was designated as competent authority to develop, review and revise curricula beyond Class-XII. With the repeal of UGC Act, the same function was assigned to the Higher Education Commission under its Ordinance of 2002, Section 10, Sub-Section 1 (v).

In compliance with the above provisions, the HEC undertakes revamping and refurbishing of curricula after regular intervals in a democratic manner involving universities/DAs, research and development institutions and local Chamber of Commerce and Industry. The intellectual inputs by expatriate Pakistanis working in universities and R&D institutions of technically advanced countries are also invited to contribute and their views are incorporated where considered appropriate by the National Curriculum Revision Committee (NCRC).

A committee of experts comprising of conveners from the National Curriculum Revision Committees of HEC in the disciplines of Basic, Applied, Social Sciences, Agriculture and Engineering met in 2007 & 2009 and developed the unified templates to standardize degree programmes in the country so as to bring the national curriculum at par with international standards, and to fulfill the national needs. It also aimed to give a basic, broad based knowledge to the students to ensure the quality of education.

In line with above, NCRC comprising senior university faculty and experts from various stakeholders and the respective accreditation councils has

The finalized the curriculum for Electrical Engineering. same is being recommended for adoption by the universities/DAls channelizing through relevant statutory bodies of the universities.

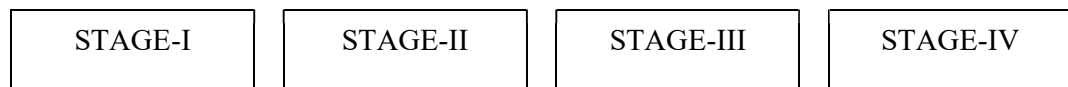


**MUHAMMAD JAVED KHAN**

**April, 2012**

**Adviser (Academics)**

## CURRICULUM DEVELOPMENT



Abbreviations Used:

NCRC. National Curriculum Revision Committee

VCC. Vice-Chancellor’s Committee

EXP. Experts

COL. Colleges

UNI. Universities

PREP. Preparation

REC. Recommendations

LI Learning Innovation

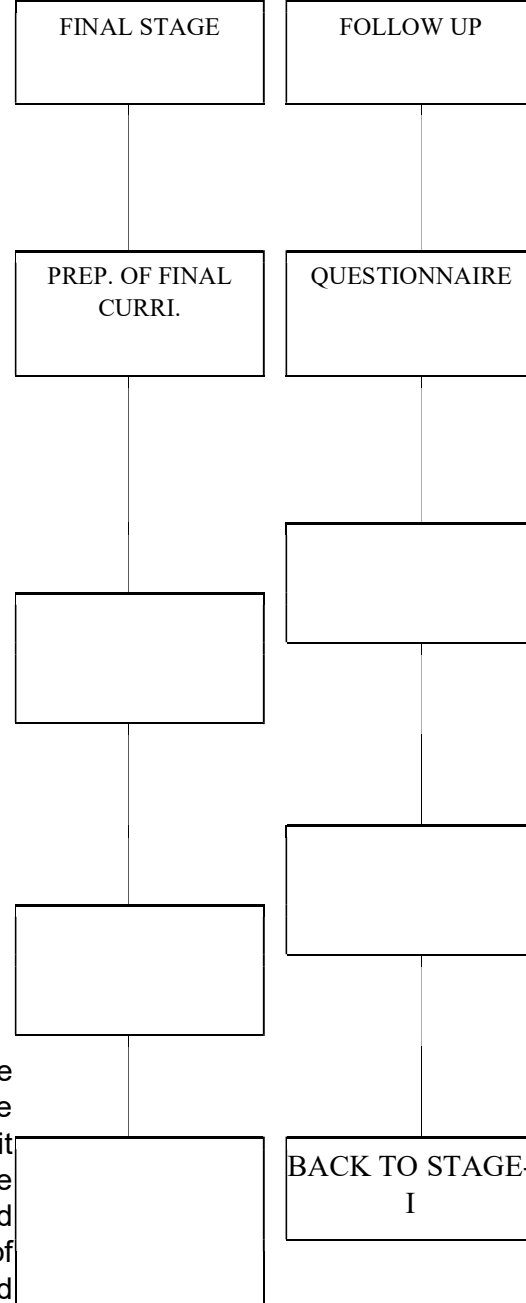
R&D Research & Development Organization

HEC Higher Education Commission

## INTRODUCTION

The role of science and engineering in the economic development of a nation and the prosperity of its people is very important and it is imperative for a nation to train its workforce in contemporary disciplines of science and engineering. At the same time, body of scientific knowledge is expanding rapidly and new technologies are emerging at a fast pace setting new standards of academic learning and learning outcomes. In order to stay at par with international standards, it is essential to periodically review and update science and engineering curricula being taught in Pakistani universities. The Higher Education Commission (HEC) has devised a mechanism that ensures periodic review and updating of curricula being offered at the universities in Pakistan through the National Curriculum Revision Committees (NCRC). NCRC is constituted from amongst the faculty members of both public and private sector universities and industry professionals in the subject area under review. Similarly HEC constituted NCRC in 2011 for revision of Electrical Engineering curricula and its variants being taught in Pakistani universities.

The NCRC that was constituted comprised of faculty members and industry professionals in Electrical Engineering who because of job requirements or nomenclature used in their respective departments could broadly be categorized as: (i) Power (Systems) Engineers; (ii) Electronics Engineers; (iii) Communication/Telecommunication Engineers and (iv) Computer (Systems) Engineers. Despite being under the umbrella of Electrical Engineering, the



categorization in association with a specific variant of Electrical Engineering also reflected the trends in Pakistani institutions. Some offer Electrical Engineering degrees as such, and some by nomenclature of its variants such as (i) Power (Systems) Engineering; (ii) Electronic Engineering; (iii) Communication/ Telecommunication Engineering and (iv) Computer (Systems) Engineering. The degrees offered by the names of variants of Electrical Engineering reflect the content of the curriculum to a certain extent. However, there is no uniformity in the context understood by the nomenclature of Electrical Engineering. For example, Electrical Engineering degree offered by NED UET, Karachi and MUET, Jamshoro, imply Power (Systems) Engineering only, whereas the degree offered with the same nomenclature at UET, Lahore, UET Peshawar and NUCES (FAST) imply Electronics & Communication Engineering as well as Power (Systems) Engineering. However, it is a general consensus that the four variants enumerated above are specialized streams of the original Electrical Engineering discipline. The same can be verified by inspection of curricula of major Pakistani universities in the discipline of Electrical Engineering or in the disciplines of any of its four variants. In view of this fact, it was but natural to constitute a NCRC that represents Electrical Engineering and its above mentioned four variants.

The objectives of the committee were:

- i. To devise a curriculum that provides a unified framework (guidelines) to institutions offering degrees under the title of Electrical Engineering or under the title of the aforementioned four variants.
- ii. To incorporate latest reading & writing material against each course.
- iii. To bring uniformity and develop minimum baseline content in each and every course of study.
- iv. To make recommendation, if any, for promotion/development of the discipline.

The committee held its first meeting in October 2011 at the HEC Regional Center at Lahore. The first draft was prepared and it was then dispatched to local and foreign experts for review. On receipt of the review report, final meeting of the committee was held in February 2012. The outcome of the final meeting is the curriculum that is described in the remaining document.

### **Proceeding of the 1<sup>st</sup> meeting of NCRC held in October 2011:**

The mandate communicated to the committee by Mr. Muhammad Javed Khan, Adviser (Academics), HEC, Islamabad at the start of the meeting, was to come up with a uniform curriculum of Electrical Engineering that should encompass the need of all four areas whether currently being offered as separate disciplines or as specializations of Electrical engineering.

The curriculum committee used the HEC Curriculum template as the fundamental working document for engineering discipline. This template is also mandated by Pakistan Engineering Council (PEC). It breaks up the curriculum into engineering content and non-engineering content with the former covering between 65 - 70% of the curriculum and the later covering 35 - 30% of the remaining curriculum. Mathematics with the exception of Probability and Statistics has been included in the non-engineering content. The engineering content is further broken up into Interdisciplinary engineering electives (IDEE), Computing essentials, Foundation, Breadth (Core) and Depth (Core and Electives).

The committee decided that since a uniform curriculum is being developed with a nomenclature of Electrical Engineering, the non-engineering content, Computing essentials, IDEE and the Foundation would be identical. There was a discussion on IDEE because institutions offering each area as a separate degree under a separate department counted IDEE as being subjects of other areas. For example Electronics department would count subjects of Telecommunication as IDEE and vice versa. However, institutions offering Electrical Engineering degrees with specializations counted IDEE as subjects from other disciplines meaning Mechanical, Civil Engineering etc. However, it was decided by the committee to classify IDEE as subjects from other non-electrical engineering disciplines.

Since each area of Electrical engineering has progressed, the committee felt that Breadth and Depth might be different for each area under consideration while remaining under the common platform of Electrical Engineering.

Also, it was decided that the credit hours in the proposed curriculum scheme would remain within the limits of 130 - 136 as decided by HEC for undergraduate curriculum.

The committee recommends that a reasonable departure in contents from the contents of proposed curriculum may be expected by accrediting bodies like Pakistan Engineering Council. The term reasonable may be decided by the Visitation team on merit and experience in consultation with the concerned university's officials. The committee also noted that the titles of a certain set of contents (subjects) offered by universities may differ from the titles proposed by this committee. Universities may break up contents or combine portions of contents as per their own peculiar requirements. The purpose of this proposed curriculum is to provide a uniform guideline to universities and institutions in Pakistan while developing their curriculum with an effort to have uniformity of standards in their programs.

### **Minutes of HEC National Curriculum Revision Committee Final Meeting in Electrical Engineering, held from February 14-16, 2012.**

The final meeting of National Curriculum Revision Committee in the discipline of Electrical Engineering and its four variants/ specializations, namely; Power (Systems), Electronics, Communication/Telecommunication and Computer (Systems) Engineering was held at HEC Regional Center Lahore from February 14-16, 2012. The following members attended the meeting:-

1. Prof. Dr. Muhammad Ali Maud, Convener  
Chairman, Department of Computer Science and Engineering,  
University of Engineering & Technology, Lahore.
2. Prof. Dr. Muhammad Inayatullah Babar, Secretary  
Professor, Department of Electrical Engineering,  
University of Engineering & Technology, Peshawar.
3. Prof. Dr. Shahzad A Malik, Member

Chairman, Department of Electrical Engineering,  
COMSATS Institute of Information Technology,  
Park Road, Chak Shahzad, Islamabad.

4. Dr. Haroon-ur-Rashid, Member  
Associate Professor and Head,  
Department of Electrical Engineering,  
Pakistani Institute of Engineering and Applied Sciences  
(PIEAS), Nilore, Islamabad.
5. Dr. Intesar Ahmed, Member  
Head of Department, Electrical Engineering  
Lahore College for Women University, Lahore.
6. Dr. Engr. Muhammad Khan Burdi, Member  
Professor, Department of Electrical Engg,  
College of Engg. & Tech,  
Islamia University, Bahawalpur.
7. Engr. Dr. Bilal A. Alvi, Member  
Head of Electrical Engineering Department,  
College of Engineering & Sciences,  
Institute of Business Management,  
Korangi Creek Road, Karachi.
8. Engr. Dr. Syed Saad Azhar Ali, Member  
Associate Professor,  
Department of Engineering Science & Technology, Iqra  
University, Defence View, Shaheed-e-Millat Road  
(Ext.), Karachi-7500.
9. Dr. Saad Ahmed Qazi, Member  
Professor & Chairman, Department of Electrical  
Engineering,  
NED University of Engineering & Technology,  
University Road, Karachi-75270
10. Dr. Syed Muhammad Atif Saleem, Member  
Assistant Professor, Department of Electrical Engineering,  
FAST –National University,  
ST-4, sector 17-D, Shah Latif Town, National Highway,  
Karachi-75030
11. Dr. S. M. Ghazanfar Monir, Member  
Associate Professor, Department of Electronics,  
PAF-Karachi Institute of Economics and Technology  
(PAF-KIET),  
Korangi Creek, Karachi – 75190.
12. Mr. Faizan Farid, Member  
Manager, Instrumentation Division,  
Pakistani Space & Upper Atmosphere Research



Commission  
SUPARCO HQ, Off University Road, Karachi.

13. Dr. Zahoor Ahmad, Member  
Associate Professor, Faculty of Engineering, Balochistan  
University of Engineering and Technology (BUET),  
Khuzdar.
14. Dr. Shoaib Zaidi, Member  
Professor & Chairman,  
Department of Electronic & Telecomm Engineering,  
NED University of Engineering & Technology,  
University Road, Karachi 75270.
15. Dr. Syed Afaq Husain, Member  
Faculty of Computing, Riphah International University, Haji  
Camp, I-14, Islamabad.
16. Dr. Arshad Hussain, Member  
Professor, Department of Electrical Engineering,  
National University of Computer & Emerging Sciences  
(NUCES),  
Lahore Campus, Block B, Faisal Town, Lahore.
17. Dr. Shahid Masud, Member  
Associate Professor, Department of Electrical Engineering,  
Lahore University of Management Sciences,  
Sector U, DHA, Lahore Cantt.
18. Engr. Muhammad Aamir, Member  
Assistant Professor & Lab Coordinator,  
Department of Electronic Engineering,  
Sir Syed University of Engineering & Technology, Karachi
19. Prof. Dr. Syed Madad Ali Shah, Member  
Professor & Chairman,  
Department of Electrical Engineering,  
Institute of Business Administration (IBA), Sukkur.
20. Dr. Anjum Ali, Member  
Prof. & Head of Department Electrical Engineering,  
National University of Computer & Emerging Sciences, B-Block,  
Faisal Town, Lahore
21. Dr. Asim Loan, Member  
Professor, Sultan Qaboos IT Chair,  
Department of Electrical Engineering,  
University of Engineering Technology, Lahore.

22. Dr. Bilal Shams, Member  
Assistant Professor,  
Department of Electrical & Computer Engineering,  
Kohat University of Science & Technology, Kohat  
– 26000.
23. Vice Chancellor and Prof. Naib Hussain, Member  
Department of Electrical Engineering,  
Department of Computer Systems Engineering, Mirpur  
University of Science and Technology (MUST),  
Mirpur.
24. Engr. Prof. Dr. Iftikhar A. Khan, Member  
Professor, Electrical Engineering Department, KPK  
University of Engineering & Technology, Peshawar.
25. Prof. Dr. Abdul Fattah Chandio, Member  
Professor, Department of Electronic Engineering, Quaid-e-Awam  
University of Engg, Science & Technology (QUEST),  
Nawabshah.
26. Prof. Dr. A. H. S Bukhari, Member  
Professor / Dean, Department of Electronic Engineering,  
Balochistan University of Information  
Technology, Engineering & Management  
Sciences, Quetta.
27. Prof. Dr. Muhammad Akram Shaikh, Member  
Professor,  
Department of Computer Systems and Software  
Engineering,  
Mehran University of Engineering & Technology, Jamshoro.
28. Engr. Prof. Dr. Muhammad Yunus Javed, Member  
Nominee Pakistan Engineering Council (PEC),  
College of Electrical & Mechanical Engineering,  
NUST, Islamabad.
29. Prof. Dr. Jameel Ahmed, Member  
Professor and Chairman, Department of Electrical  
Engineering,  
HITEC University, Taxila Cantt.
30. Prof. Dr. Tahir Izhar, Member  
Electrical Engineering Department,  
University of Engineering & Technology,  
Lahore
31. Dr. Muhammad Bilal Malik, Member