



National Institute of Technology Silchar
राष्ट्रीय प्रौद्योगिकी संस्थान सिलचर
Electrical Engineering Department



METHODOLOGICAL APPROACH FOR CIRCUIT
ANALYSIS OF MODERN POWER SYSTEMS



Overview

Modern power systems for electrical energy distribution are characterized by an increasing impact of several factors such as nonlinear loads, asymmetrical lines/loads, and interconnection with single phase networks, affecting the power quality of the systems. Standard techniques for circuit analysis of power systems (e.g., the symmetrical components transformation) cannot be used in a straightforward way when the factors mentioned above are not negligible.

In this course, the standard circuit techniques based on matrix transformations are methodologically revisited such that equivalent circuits and the electrical quantities in the transformed domains can be rigorously and consistently derived. The proposed approach provides two main advantages. First, even in the ideal case of linear and symmetrical three-phase systems, a rigorous and compact derivation of equivalent circuits and electrical quantities describing the power system in steady state and in transient conditions is provided. Second, the proposed approach is applied to power systems affected by the power quality issues mentioned above, leading to generalized equivalent circuits in the transformed domains. Such generalized equivalent circuits provide both theoretical insight into the underlying phenomena and a straightforward means for the evaluation of the related power quality indices. To this aim, the basic techniques and some specific applications of signal processing for power quality evaluations will be presented in the course.

Objectives

The primary objectives of the course are as follows:

1. Revisiting the basic circuit techniques for power system analysis under steady state and transient conditions through a methodological and consistent approach,
2. Extending the proposed approach to the case of power systems affected by power quality issues such as asymmetrical lines/loads,
3. Presenting case studies showing the capability of the proposed circuit techniques to analyze issues of practical interest,
4. Discussing the basic signal processing techniques for power quality evaluations.

The course will be conducted over 1 week.

Duration of Course: 8th January – 13th January, 2018

Lecture Class: 10 Hours

Tutorial Class: 10 Hours

Contents will be covered with 10 lecture class and 5 tutorial classes of each 2 hours of duration. Tutorials will be conducted in laboratory.

Brief Topics covered:

1. Three-phase networks. Basic definitions.
2. Symmetrical components transformation. Equivalent circuits. Interconnection between three-phase and single-phase networks.
3. Decoupling a three phase symmetrical and unsymmetrical system using matrix methods.
4. Clarke transformation, Space vectors for steady state analysis, Equivalent circuits.
5. Space vectors for transient analysis.
6. Three-phase networks with asymmetrical lines/loads. Equivalent circuits. Power quality issues.
7. Signal processing for power quality evaluation. Discrete Fourier transform and applications.

Faculty from reputed academic institutions and technical institutions with a background in Electrical, Electronics, Instrumentation and Electrical Power.

Executives, Engineers and Researchers from manufacturing, service and government organizations including R&D laboratories. People from Power Sector are mostly welcome.

Students at all levels (BTech/MSc/MTech/PhD) from reputed academic institutions and technical institutions with Electrical Power as a course in their curriculum.

The applicant are required to get themselves register on GIAN web portal (<http://www.gian.iitkgp.ac.in>) to apply for any number of GIAN courses as and when necessary.

The participation fees (Demand draft drawn in favour of Director, NIT Silchar, payable at Silchar) for taking the course is as follows:

Participants from abroad	: USD 500.00
Industry/ Research Organizations:	Rs. 10000.00
Academic Institutions Faculty	: Rs. 5000.00
External Students	:Rs. 1000.00
Internal PG & PhD Students	: Rs. 500.00
Internal UG Students	:Nil

Note:

- The above fee includes all instructional materials, computer use for tutorials, 24 hr. free internet facility. The participants will be provided with single bedded shared accommodation on payment basis.
- Valid Identity card and bonafide letter is mandatory for the students attending the course from the respective Head of the Institution/ Head of the Department.

Diego Bellan received the M.Sc. and the Ph.D. degrees in Electrical Engineering from the Politecnico di Milano, Milan, Italy, in 1994 and 1999, respectively. From June 1999 to August 2000 he was a Research Assistant with the Department of Electrical Engineering, Politecnico di Milano. He is currently an Assistant Professor of Advanced Circuit Theory with the Department of Electronics, Information and Bioengineering, Politecnico di Milano.



His research interests are in the fields of electromagnetic compatibility (EMC), power quality, and analog-to-digital conversion of signals. He was involved in the staff of several funded research projects, concerning EMC in the space sector (European Space Agency) and in the railway sector (Trenitalia S.p.A.), and projects supported by the Italian Ministry of University and Research. He was also the principal investigator of several funded research activities concerning electromagnetic modelling of electromechanical devices. He serves as reviewer for IEEE Transactions on Electromagnetic Compatibility, Instrumentation and Measurements, Industrial Electronics, and Industry Applications.

Dr. N. B. Dev Choudhury graduated in Electrical Engineering from Assam Engineering College under Gauhati University in the year 1994. Mr Dev Choudhury completed his masters from IIT Kanpur and also completed PhD in 2011 from Jadavpur University, Kolkata, India. Dr. Dev Choudhury was initially worked for a LT and HT electrical power panel design and fabrication unit till March, 1997 as Engineer.



He served as faculty in Royal Bhutan Polytechnic, Bhutan for a period of one and half years and after that joined Regional Engineering College Silchar, Assam in June, 1998. This Institute becomes the National Institute of Technology Silchar and continuing the service as faculty member in the Department of Electrical Engineering and currently served as Associate Professor. His area of research interest is deregulated power system and power system economics including reliability. He is a member of IEEE and reviewer of many Elsevier, IEEE and IET journals.

He has vast experience in teaching for more than 20 years in various subjects of Electrical, Electronics and Instrumentation subjects. He has vast experience in academic and administration spheres in this Institute including Dean (Alumni Relations), Associate Dean (Students Welfare), Warden, Faculty-in-Charge (Training and Placement), Faculty-in-Charge (Purchase), Faculty-in-charge(Security), Members of doctoral committee and others.

Dr. Lalit Chandra Saikia was born in Jorhat, Assam in 1969 and graduated in Electrical Engineering from Dibrugarh University, Assam, in 1993. Dr. Saikia Joined in North Eastern Drilling & Work over Services Company (PVT) Ltd, Digboi, Assam in December 1992 as an Electrical Engineer. In December 1993, he Joined as a Rig Electrical Engineer in ONGCL RECAPICOL, Sibsagar, Assam and worked till 1997.



He started his teaching life as Lecturer (Part Time) in Jorhat Engineering college, Jorhat, Assam in 1997. In 2000, Dr. Saikia joined as a Lecturer in Electrical Engineering Department, NIT Silchar. He received his M.Tech (Power systems) degree from Indian Institute of Technology, Delhi in 2007. He has achieved his PhD in Electrical Engineering in April 2012 from National Institute of Technology Silchar, Assam.

His research interest includes Power system control, Application of soft

computing in Engineering, Power quality, Distributed generation, Power system Deregulation, Flexible AC transmission system, Smart Grid, and Micro grid. He has more than 40 SCI publications and many IEEE conference publications. He is a member of IEEE and reviewer of many Elsevier, IEEE and IET journals.

Course Coordinator

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