

# Recent Trends in Power System Reliability Evaluation: Models, Statistical Methods and Applications

## Overview of the course:

Electricity is a basic commodity that drives the economic productivity and prosperity of a society. Modern electrical power systems have the responsibility of providing a reliable and economic supply of electrical energy to their customers. The economic and social effects of loss of electric service can have significant impacts on both the utility supplying electric energy and the end users of the service. Maintaining a reliable power supply is therefore a very important issue in power system design and operation. Reliability of a power system is generally designated as a measure of the ability of the system to provide customers with adequate supply. It is one of the primary performance criteria of power systems. Major outages can have a significant economic impact on end users as well as power utilities. Power systems have been significantly affected by a wide range of outage events caused by incorrect planning, operational error, equipment failures, environmental conditions, adverse weather effects, and load conditions. Large-scale blackouts are emphasizing the importance of reliability issues. Reliability is one of the major factors for planning, design, operation, and maintenance of electric power systems. Failures in any part of the system can cause interruptions of supply to end users. Reliability has always been in the forefront of power grid design and operation due to the cost of outages to customers. Due to complex nature of power system operations and deregulation policies, it is of greater importance as requirements are emerging to focus research on service automation, service launching and service chaining for effective control of power system operations and maintenance.

<b>Modules</b>	<p><b>This course consists of one module only. 09 October 2017 to 13 October 2017.</b></p>
<b>You Should Attend If You are</b>	<ul style="list-style-type: none"> <li>▪ Students of B.Tech, MTech, Ph.D. research scholars and faculty members of academic institutions and technical institutions.</li> <li>▪ Executives, engineers and researchers from utilities, service and government organizations, including R&amp;D laboratories.</li> </ul>
<b>Registration Fees</b>	<p>The participation fees for attending the course is as follows:  <b>Overseas Participants: US\$ 200</b>  <b>Industry/ Research Organizations: Rs. 3000</b>  <b>Participants from Academic Institutions: Rs. 1000 (Rs. 500 for SC/ST participants)</b>  <b>Research Scholars/Students/Alumni: Rs. 500 (Rs. 250 for SC/ST participants)</b></p> <p>After registration on GIAN portal <a href="http://www.gian.iitkgp.ac.in/GREGN/index">http://www.gian.iitkgp.ac.in/GREGN/index</a>, the candidates are advised to submit the prescribed fee in the form of DD in favor of “Registrar, DTU” payable at Delhi along with printout of online submitted application form to <b>Dr. Priya Mahajan, Course Coordinator (GIAN), Department of Electrical Engineering, Delhi Technological University, Bawana Road, Delhi-110042</b> on or before 30.09.2017. The shortlisted participants will be informed through e-mail.</p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments and laboratory equipment usage charges. <b>The course fee does not include boarding and lodging. The paid hostel/guest house accommodation may be provided on first come first basis with prior request.</b></p>

## Teaching Faculty



Prof. Chanan Singh, FIEEE is a Regents Professor and Irma Runyon Chair Professor in the Department of Electrical and Computer Engineering, Texas A&M University, College Station, Texas. He has also served as a Guest Professor at Tsinghua University, Beijing, China. He is also the Vice President, Associated Power Analysts, Inc., 1980-Present. His research and consulting interests are in the application of probabilistic methods to power systems. He has authored/co-authored around 400 technical papers and three books and has contributed to several books. He has consulted with many major corporations like California ISO; Central Electrical Agency, India; Edmonton Power, Canada; Electric Reliability Council of Texas; Electric Power Research Institute; Eletrobrass, Brazil; ESKOM, South Africa; General Electric Co.; Houston Lighting & Power Co.; Korea Electric Power Co.; Korea Power Systems Reliability Research Center; Ministry of Transportation & Communications, Ontario, Canada etc. He is a Registered Professional Engineer, State of Texas and has completed many funded projects. like Modeling and Analysis of Interdependent CyberPhysical Systems with Applications to Power Grids, Conacyt, \$24,000, 2011-2012, Integration of Storage Devices into Power Systems with Renewable Energy Sources, PSERC, \$240,000, 2010-2012, The Future Grid to Enable Sustainable Energy Systems: An Initiative of the Power Systems Engineering Research Center, Dept of Energy, \$5,512,900, 2011-2013, Reliability Assessment and Modeling of Cyber Enabled Power Systems with Renewable Sources and Energy Storage, PSERC, \$220,000, 2014-2016. He is the editor of many reputed Journals like European Transactions on Electric Power (ETEP), IEEE Transactions on Power Systems, IEEE Power letters etc. For his research contributions, he was awarded a D.Sc. degree by the University of Saskatchewan, Saskatoon, SK, Canada, in 1997. In 2008, he was recognized with the Merit Award by the PMAPS International Society. In 2010, he was the inaugural recipient of the IEEE-PES Roy Billinton Power System Reliability Award.

## Host Faculty



**Dr. Rachana Garg** is the Professor and Associate Head in Electrical Engineering Deptt, DTU. She has received B.E., M.Tech degree in Electrical Engg. from Maulana Azad College of Technology (NIT) Bhopal and Ph.D from Delhi University. She had guided one PhD and is guiding 04 more research scholars in the area of renewable energy and smart grid. She has organised many conferences, workshops and short term courses for faculty members and students and has published about 30 papers in International and National journals and conferences. Her areas of interest are Transmission and distribution systems, Renewable energy systems, Smart grid, artificial intelligent techniques and their application in power systems. She is a senior member of IEEE. She was the member of Nomination Committee of PELS. Presently, she is the Chair, Student Activities Committee of IEEE Delhi Section and of PES-IAS Delhi Chapter. She is the faculty advisor of PES-IAS student chapter, DTU. She is also a life member of ISTE.



**Dr. Priya Mahajan** is currently an Associate Professor in Electrical Engineering Department of Delhi Technological University, Delhi, India. She completed her B.E. in Electrical Engineering from Thapar Institute of Engineering & Technology, Patiala in 1996 and post-graduation in Power System from Punjab Engg. College, Chandigarh in 1998. She has completed her doctorate from Delhi University in Electrical Engg. in 2015. She has been in academics since 1998 and is with Delhi Technological University (Formerly Delhi College of Engineering) from 2000. Her area of research interest includes railway electric traction system and power system.

Course Coordinator's

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For Registration:

<http://www.gian.iitkgp.ac.in/GREGN/index>

# Recent Trends in Power System Reliability Evaluation: Models, Statistical Methods and Applications

Tentative Course Schedule (Oct.9<sup>th</sup> – Oct.13<sup>th</sup>, 2017)

9<sup>th</sup> October 2017

Registration: 9.00 AM to 10:00 AM

Inauguration: 10:00 AM to 11:00 AM

Date	Day	Time	Type of Class	Topic
9 <sup>th</sup> October, 2017	Monday	11.30 AM – 1.30 PM	Lecture-1	Introduction to quantitative reliability and its application in Power Systems
		2.30 PM- 4.30 PM	Lecture-2	Probability concepts and their applications to power system reliability
10 <sup>th</sup> October, 2017	Tuesday	10.00AM – 11.30 AM	Lecture-3	Markov Processes and their applications to reliability analysis
		12.00PM- 1.30PM	Lecture-4	Analytical techniques for reliability analysis
		3.00PM – 4.30 PM	Tutorial 1	Problem solving session on quantitative reliability and Probability concepts and its application in Power Systems.
11 <sup>th</sup> October, 2017	Wednesday	10.00AM – 11.30 AM	Lecture-5	Monte Carlo simulation techniques and reliability analysis
		12.00PM- 1.30PM	Lecture-6	Introduction to power system reliability indices, LOLE, EUE, Frequency and Duration Indices
		2.30PM – 4.30 PM	Laboratory 1	Hands on experience on different simulation techniques used for reliability analysis
12 <sup>th</sup> October, 2017	Thursday	10.00AM – 11.30 AM	Lecture-7	Generation system reliability analysis tools
		12.00PM- 1.30PM	Lecture-8	Composite system reliability analysis, distribution system reliability analysis
		3.00PM – 4.30 PM	Tutorial-2	Problem solving session on different techniques used for reliability analysis
13 <sup>th</sup> October, 2017	Friday	10.00AM – 11.00 AM	Lecture-9	Intelligent system applications to power system reliability analysis
		11.30PM- 12.30PM	Lecture-10	Reliability of RES and Cyber-physical power systems
		12.30 PM- 1.30PM	EXAMINATION	
		2.30 PM- 4.30 PM	DISCUSSIONS AND VALEDICTORY FUNCTION	