

# Curriculum Vitae

**Kuntal Mandal, Ph.D.**

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## Personal Data

Address : Department of Electrical and Electronics Engineering  
National Institute of Technology Sikkim  
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Date of Birth : 11<sup>th</sup> December, 1980

Nationality : Indian

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## Professional Experiences

**February, 2017 – Present** **Assistant Professor (Ad-hoc),**  
Department of Electrical and Electronics Engineering, National  
Institute of Technology Sikkim, Ravangla, South Sikkim, India

**Subjects taught:** Control systems – I, Nonlinear Control, Analog Electronic  
Circuits and Systems, Switched Mode Power Supplies.

**June, 2012 – January, 2017** **Postdoctoral Researcher,**  
Indian Institute of Science Education and Research Kolkata, India  
and The King Abdulaziz University, Jeddah, Saudi Arabia

### June, 2014 – January, 2017

Project's Title : Development of Control Strategies for Power Electronic Systems to  
Avoid Fast-Scale and Slow-Scale Instabilities.

Funded by : The NSTIP strategic technologies program in the Kingdom of Saudi  
Arabia – Project no. 12-ENE3049-03.

### August, 2013 – May, 2014

Project's Title : Ensuring Low Current Ripple in Power Converters for Renewable  
Energy and High Performance Applications.

Funded by : Deanship of Scientific Research (DSR), King Abdulaziz University,  
Jeddah, Saudi Arabia, Grant no. 3-125-1433-HiCi.

### June, 2012 – July, 2013

Project's Title : Investigation into the Stability of Complex Power Electronic  
Converters in Renewable Energy Applications.

Funded by : Deanship of Scientific Research (DSR), King Abdulaziz University,  
Jeddah, Saudi Arabia, Grant No. 5-4-1432/HiCi.

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## Education

**July, 2007 – May, 2013** **Ph. D.,** Department of Electrical Engineering, Indian Institute of  
Technology Kharagpur (IIT-KGP), India

**August, 2004 – July, 2006** **Master of Engineering,** Jadavpur University, Kolkata, India  
– Control System Engineering with **First Class (CGPA- 8.39)**

**August, 1999 – July, 2003** **Bachelor of Engineering,** Jalpaiguri Government Engg. College,  
India – Electrical Engineering with **First Class (77.70%)**

**August, 1997– July, 1999** **Higher Secondary (10+2)** Examination passed with **85.90%** from  
Fatepur Srinath Institution under West Bengal Council of Higher  
Secondary Education (W.B.C.H.S.E.)

**1997** **Secondary (10)** Examination passed with **86.87%** from Sarisha  
Ramkrishna Mission Siksha Mandir under West Bengal Board of  
Secondary Education (W.B.B.S.E.).

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## Teaching Experiences

**August, 2006 – July, 2007** **Lecturer,** Electrical Engineering Department, Future Institute of

July, 2007 – May, 2011

Engineering & Management (FIEM), Kolkata, West Bengal, India.  
Assisted in teaching and laboratory experiments at Indian Institute of Technology Kharagpur, India.

## Professional Services

Member of Institute of Electrical and Electronics Engineers (IEEE- 92270376)

Serving regularly as a reviewer for IEEE Transactions on Circuits and Systems - I, IEEE Transactions on Circuits and Systems - II, IEEE Transactions on Power Electronics, IEEE Transactions on Industrial Electronics, IEE IET Power Electronics, International Journal of Bifurcation and Chaos, IEE IET Control Theory & Applications.

## Publications

### IEEE Transactions

- [1] **K. Mandal** and S. Banerjee, "Synchronization Phenomena in Interconnected Power Electronic Systems", *IEEE Transactions on Circuits and Systems - II*, vol. 3, no. 2, pp. 221-225, February 2016.
- [2] **K. Mandal** and S. Banerjee, "Synchronization Phenomena in Microgrids with Capacitive Coupling," *IEEE Journal on Emerging and Selected Topics in Circuits and Systems*, vol. 5, no. 3, pp. 364-371, September 2015.
- [3] **K. Mandal**, S. Banerjee, and C. Chakraborty, "A New Algorithm for Small-Signal Analysis of DC-DC Converters," *IEEE Transactions on Industrial Informatics*, vol. 10, no.1, pp. 628-636, February 2014.
- [4] **K. Mandal**, S. Banerjee, and C. Chakraborty, "Symmetry-Breaking Bifurcation in Series-Parallel Load Resonant DC-DC Converters," *IEEE Transactions on Circuits and Systems-I*, vol. 60, no. 3, pp. 778-787, March 2013.
- [5] D. Giaouris, S. Banerjee, O. Imrayed, **K. Mandal**, B. Zahawi, V. Pickert, "Complex interaction between tori and onset of 3-frequency quasiperiodicity in a current mode controlled boost converter," *IEEE Transactions on Circuits and Systems-I*, vol. 59, no. 1, pp. 207-213, January 2012.

### Other International Journals

- [6] Y. Al-Turki, A. El Aroudi, **K. Mandal** et al., "Non-averaged Control-Oriented Modeling and Relative Stability Analysis of DC-DC Switching Converters," *International Journal of Circuit Theory and Applications*, vol. 46, no. 3, pp. 565-580, March 2018.
- [7] A. Abusorrah, **K. Mandal** et al., "Avoiding Instabilities in Power Electronic Systems: Toward an On-Chip Implementation," *IEE IET Power Electronic*, vol. 10, no. 13, pp. 1778-1787, October 2017.
- [8] A. El Aroudi, **K. Mandal**, D. Giaouris, and S. Banerjee, "Self-compensation of DC-DC converters under peak current mode control," *IEE IET Electronics Letters*, vol. 53, no. 5, pp. 345-347, March 2017.
- [9] **K. Mandal**, C. Chakraborty, A. Abusorrah, M. M. Al-Hindawi, Y. Al-Turki, and S. Banerjee, "Automated Algorithm for Stability Analysis of Hybrid Dynamical Systems," *The European Physical Journal Special Topics*, vol. 222, pp. 757-768, July, 2013.
- [10] **K. Mandal** et al., "Nonlinear Modeling and Stability Analysis of Resonant DC-DC Converters," *IEE IET Power Electronics*, vol. 8, no. 12, pp. 2492-2503, December 2015.
- [11] D. Giaouris, S. Banerjee, **K. Mandal** et al., "Analysis of Discontinuity Induced Bifurcations in a Dual Input DC-DC Converter," *International Journal of Bifurcation and Chaos*, vol. 25, no. 5, 1550071 (10 pages), May 2015.
- [12] A. El Aroudi, **K. Mandal**, D. Giaouris, S. Banerjee, A. Abusorrah, M. M. Al-Hindawi and Y. Al-Turki, "Fast-Scale Stability Limits of a Two-Stage Boost Power Converter," *International Journal of Circuit Theory and Applications*, vol. 44, pp. 1127-1141, 2016.
- [13] A. El Aroudi, D. Giaouris, **K. Mandal** et al., "Complex Nonlinear Phenomena and Stability Analysis of Interconnected Power Converters Used in Distributed Power Systems," *IEE IET Power Electronic*, vol. 25, no. 5, pp. 855-863, April 2016.
- [14] M. M. Al-Hindawi, A. Abusorrah, Y. Al-Turki, D. Giaouris, **K. Mandal**\* and S. Banerjee, "Nonlinear Dynamics and Bifurcation Analysis of a Boost Converter for Battery Charging in Photovoltaic Applications," *International Journal of Bifurcation and Chaos*, vol. 24, no. 11, 1450142 (12 pages) November 2014.
- [15] A. Abusorrah, M. M. Al-Hindawi, Y. Al-Turki, **K. Mandal**\*, D. Giaouris, S. Banerjee, S. Voutetakis, and S. Papadopoulou, "Stability of the Boost Converter Fed from Photovoltaic Source," *Solar Energy Journal*, vol. 98, Part C, pp. 458-471, November 2013.

### IEEE Conferences

- [1] **K. Mandal** et al., "Control-Oriented Design Guidelines to Extend the Stability Margin of Switching Converters," *IEEE International Symposium on Circuits and Systems (ISCAS2017)*, Baltimore, MD, USA, May 28-31, 2017.
- [2] A. El Aroudi, **K. Mandal**, et al., "A Novel Nonlinear Modulation Technique for Stabilizing DC-DC Switching Converters," *IEEE International Symposium on Circuits and Systems (ISCAS2017)*, Baltimore, MD, USA, May 28-31, 2017.
- [3] **K. Mandal** and S. Banerjee, "A new software for dynamical analysis of nonsmooth systems," *IEEE International Meeting on Analysis and Applications of Nonsmooth Systems (AANS2014)*, September 10-12, Como, Italy, 2014.
- [4] **K. Mandal** et al., "Dynamical Behaviors of Interconnected Converters in Intermediate Bus Architecture," *IEEE International Symposium on Circuits and Systems (ISCAS2014)*, Melbourne, Australia, June 1-5, 2014.
- [5] **K. Mandal** et al., "Dynamical Analysis of Single-Inductor Dual-Output DC-DC Converters," *IEEE International Symposium on Circuits and Systems (ISCAS2013)*, Beijing, China, May 19-23, 2013.
- [6] **K. Mandal** et al., "Bifurcations in Frequency Controlled Load Resonant DC-DC Converters," *IEEE International Symposium on Circuits and Systems (ISCAS2012)*, Seoul, South Korea, May 19-23, 2012.
- [7] **K. Mandal**, S. Banerjee, and C. Chakraborty, "Symmetry-Breaking Bifurcation in Load Resonant DC-DC Converters," *IEEE International Symposium on Circuits and Systems (ISCAS2011)*, Rio de Janeiro, Brazil, May 15-18, 2011.
- [8] **K. Mandal**, S. Banerjee, and C. Chakraborty, "Determination of Stable Region of Controller Parameters for Series-Parallel Resonant Converter with Capacitive Output Filter," *IEEE International Symposium on Industrial Electronics (ISIE)*, Gdansk, Poland, June, 27-30, 2011.
- [9] **K. Mandal**, S. Banerjee, and C. Chakraborty, "Bifurcations in load resonant dc-dc converters," *IEEE International Symposium on Circuits and Systems (ISCAS2010)*, Paris, France, May 30-June 2, 2010.
- [10] **K. Mandal**, S. Banerjee, and C. Chakraborty, "Quasi-Periodic route to Chaos in load resonant dc-dc converters," *IEEE International Conference Industrial Technology (ICIT)*, Valparaiso, Chile, March 14-17, 2010.

## **Other Conferences**

- [11] Suda Narasimha, **K. Mandal** and S. Banerjee, "A New Python based Toolbox for Stability and Bifurcation Analysis of Hybrid Dynamical Systems," *Conference on Nonlinear Systems and Dynamics (CNSD2016)*, Kolkata, India, December 16-18, 2016.
- [12] A. Bandyopadhyay, **K. Mandal** and S. Banerjee, "Analysis of Dynamics and Stability of an Autonomous Voltage Source Inverter," *Conference on Nonlinear Systems and Dynamics (CNSD2016)*, Kolkata, India, December 16-18, 2016.
- [13] A. Bandyopadhyay, **K. Mandal** and S. Banerjee, "Instabilities in a Single-Phase H-Bridge Voltage Source Inverter," *Conference on Nonlinear Systems and Dynamics (CNSD2015)*, Mohali, India, March 13-15, 2015.
- [14] **K. Mandal**, A. Abusorrah, M. M. Al-Hindawi, Y. Al-Turki, and S. Banerjee, "A new software for stability and bifurcation analysis of switched dynamical systems," *2014 International Symposium on Nonlinear Theory and its Applications (NOLTA2014)*, Luzern, Switzerland, September 14-18, 2014.
- [15] **K. Mandal** and S. Banerjee, "Synchronization in Parallel Connected DC-DC Converters," *Dynamics Days Asia-Pacific 08 (DDAP 08)*, Chennai, India, July 21-24, 2014.
- [16] A. El Aroudi, D. Giaouris, **K. Mandal** et al., "Stability Analysis of a High-Step-Up DC Grid-Connected Two-Stage Boost DC-DC Converter," *International Conference on Structural Nonlinear Dynamics and Diagnosis (CSNDD'2014)*, May 19-21, Agadir, Morocco, 2014.
- [17] **K. Mandal** and S. Banerjee, "A Software for Stability Analysis of Switching Electronic Circuits," *National Conference on Nonlinear Systems and Dynamics (NCNSD2012)*, Pune, India, July 12-15, 2012.
- [18] **K. Mandal**, S. Banerjee, and C. Chakraborty, "Complex Behavior in Load Resonant DC-DC Converters," *National Conference on Nonlinear Systems and Dynamics (NCNSD2011)*, Tiruchirappalli, India, January 27-30, 2011.
- [19] **K. Mandal**, S. Banerjee, and C. Chakraborty, "Bifurcation in a phase Shift Modulated Series-Parallel Resonant DC-DC Converter," *National Conference on Nonlinear Systems and Dynamics (NCNSD2009)*, Kolkata, India, March 5-7, 2009.

### **Google-Scholar Page:**

<https://scholar.google.co.in/citations?user=9hDcAygAAAAJ&hl=en>

### **Researchgate Profile:**

<http://www.researcherid.com/rid/R-5273-2016>

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## Notable Highlights

- Developed a **new generalized tool** for time-domain stability and bifurcation analysis as well as frequency-domain small-signal analysis for complex power electronic systems.
- Proposed and experimentally validated control methods for frequency and phase **synchronization of interconnected dc-dc converters**.
- Reported **different pathways to instabilities** from the desired stable behaviour for the first time in power electronic systems. Also proposed **control methods to avoid** or delay the instabilities for extending the stable region.
- Visited **Centre for Research & Technology Hellas**, Thessaloniki, Greece and **Potsdam Institute for Climate Impact Research**, Potsdam, Germany in July 2015 for research discussion and various possible areas of collaboration in future.
- Participated and **presented papers** in IEEE international conferences ISCAS2012 (Seoul, South Korea, May 2012), ISCAS2013 (Beijing, China, May 2013), AANS2014 (Como, Italy, September 2014) and NOLTA2014 (Luzern, Switzerland, September 2014).
- Gave **oral presentation** in national conferences NCNSD2011 (Tiruchirappalli, India, January 2011), NCNSD2012 (Pune, India, July 2012) and poster presentation in NCNSD2009 (Kolkata, India, March 2009).
- Gave **invited talk** in the summer program on “Dynamics of Complex Systems” at International Centre for Theoretical Sciences (ICTS), TIFR, Bengaluru held on 16-25 June, 2018.

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## Research Interests and Experiences

I have developed a computation tool in terms of quantitative (eigenvalues) measure for any power electronic system (e.g., dc-dc converters, resonant converters, inverters, dc motors, induction motors) which can perform time-domain stability and bifurcation analysis as well as frequency-domain small-signal analysis. Thus, this tool will help the designers to choose the stable operating zone with the variation of the parameters (e.g., input voltage, output load resistance). Moreover, once we have an understanding of the pathways by which a power electronic circuit can lose stability, it is possible to use that knowledge to devise methods of avoiding (or delaying) the onset of these instabilities. A controller chip specifically intended to control the slow-timescale and fast-timescale instabilities have been designed.

Using this tool I have analyzed the dynamics and stability issues in many complex power electronic systems. These have been experimentally validated. **Presently I am working on the nonlinear modelling, control, and implementation of small-scale hybrid microgrids and Time-delay control of power electronic systems.**

My research focuses on applying control theory in the specific application area of power electronic circuits. In particular, it involves mathematical modelling, numerical simulation and experimental investigation of the instabilities in complex power electronic circuits and development of advanced controllers.

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I hereby declare that the information given herein is true to the best of my knowledge.

Kuntal Mandal  
(KUNTAL MANDAL)

Place: NIT Sikkim, Ravangla, South Sikkim

Date: 10/12/2018