ASHISH KIRANBHAI PANCHAL

Contact

Professor & Head
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Education

Ph.D. (Solar Photovoltaics), IIT Bombay, 2010.
M. Tech. (Energy Systems Engineering), IIT Bombay, 2003.
B.E. (Electrical), S V Regional College of Engineering & Technology-Surat, 1996.

Honors and Awards

- Award for Excellence in Ph.D. thesis work at 48th Convocation of IIT Bombay on 6th August 2010.
- Best paper presentation award at 18th International Photovoltaic Solar Energy Conference-2009 (PVSEC-2009) held by Jadhavpur University, Kolkata.
- QIP scholarship during M. Tech. Studies at IIT Bombay for 18 months.
- Gold medal for securing highest marks in Electrical Power Systems Subjects at BE IV (Electrical) examination conducted by South Gujarat University, Surat.

Area of interest

Photovoltaic System modelling and simulation, Photovoltaic power converters and control, Novel photovoltaic maximum power point tracking algorithms, PV power applications for battery charging and grid interface, Standalone PV-Battery charging systems with advance battery charging algorithms, PV to EV- photovoltaic energy for electric vehicles, PV third generation Silicon thin film deposition and characterizations, Novel algorithms for power flow analysis and power system stability.

Appointments

- Head of the Department of Electrical Engineering, SVNIT-Surat, 16 December 2021 to 15 December 2023.
- Professor in Electrical Engineering Department, SVNIT-Surat, January-2019 to till date
- Associate Professor in Electrical Engineering Department, SVNIT-Surat, January-2011 to January-2019
- Assistant Professor in Electrical Engineering Department, SVNIT-Surat, January-2007 to December-2010
- Lecturer in Electrical Engineering Department, SVNIT-Surat, January-1998 to January-2006
- Lecturer in Electrical Engineering Department, SCET-Surat, June-1997 to December-1997
- Lecturer in Electrical Engineering Department, SVRCET-Surat, September-1996 to June-1997

Courses taught

Electrical Technology, Electrical Machines, Electrical Power Systems, Solar Photovoltaic Fundamentals and Technologies, Solar and Wind Energy Conversion, Numerical Methods for Electrical Engineering, Renewable Energy Sources

Departmental Activities

- Head of the Department of Electrical Engineering, SVNIT-Surat, 16 December 2021 to 15 December 2023.
- PG in-charge for M. Tech. (Power System) students since July-2018 to July-2020.
- Laboratory in-charge for Computer lab, Electrical Machines Lab and Renewable Energy Lab

Sponsored research projects

- Growth parameters optimization of multilayer silicon structure for thin film solar cells, Principal Investigator Funded by Internal Nanoelectronics Users Programme (INUP) IIT Bombay and MHRD, Govt. of India, May-2013 to October-2013.
- Deposition and characterization of silicon multilayer structures for solar photovoltaic applications, Principal Investigator Funded by Internal Nanoelectronics Users Programme (INUP) IIT Bombay and MHRD, Govt. of India, April-2012 to June-2012.
- Fabrication and characterization of porous silicon structures for optical biosensor application, Co-Principal Investigator, Funded by Internal Nanoelectronics Users Programme (INUP) IIT Bombay and MHRD, Govt. of India, December-2011 to May-2012.

Consultancy projects

- Consultancy service regarding structural proof checking and electrical checking for solar PV system above SMC road in BRTS Y-section on Dumas road up-to VNSGU Gate, Surat. role as Co-PI. (Client-Surat Municipal Corporation)
- Consultancy services for feasibility study of solar power plant installation on two routes in Surat., role as PI. (Client-Surat Municipal Corporation)
- Consultancy services for tender preparation, bids evaluation and recommendation for appropriate bidder for 4 MW solar power plants in Surat BRTS route, role as PI. (Client-Surat Municipal Corporation)
- Third party inspection for SITC of 50 Nos. of public electrical vehicle public charging stations at various locations in Surat city. (Client-Surat Municipal Corporation)
- Consultancy services to provide comparative analysis between half cut poly-silicon panel versus full poly-silicon panel, role as PI. (Client-Computer Shop, Nanpura-Surat)

Short term training programs organized

- *Sustainable Development and Recent Advances in Electrical Engineering* (*SDRAEE*), 26-30 September 2022, SVNIT-Surat. (Coordinator)
- *Analytics of Power Systems,* a self-sponsored STTP, 29 November-3 December 2021, SVNIT-Surat. (Coordinator)
- *Hands on: Mathematical Molding and Software Simulation for Power Systems and Electrical Machines* (*HOMSMP*), sponsored by TEQIP-III, 10-20 June 2019, SVNIT-Surat. (Coordinator)
- *Solar Photovoltaics: Fundamentals to Fabrication (SPFF),* Finishing school sponsored by TEQIP-II, 11-12-18-19 March 2017, SVNIT-Surat. (Coordinator)
- *Solar Photovoltaic Energy: Contemporary Technologies and Recent Advances* (*SPECTRA-2016*), sponsored by TEQIP-II, 8-12 October 2016, SVNIT-Surat. (Coordinator)
- *Renewable Energy Systems*, sponsored by TEQIP-II, 7-11 July, 2014, SVNIT-Surat. (Coordinator)
- *Solar Photovoltaics: Fundamentals, Technologies and Applications,* sponsored by ISTE and conducted by IIT Bombay, 12-22 December, 2011, SVNIT-Surat. (Remote Workshop Coordinator)

Reviewer

- A web-course reviewer on "Solar Photovoltaics" prepared by Prof. C.S. Solanki IIT Bombay
- Review a book Chapters "Non-Conventional Energy Sources" publisher Pearson Education, India, 2010
- Reviewer for the International Journal of *Lighting and Research Technologies* (Sage Publications), the national *Journal of Alternative Energy Sources and Technologies*, *Progress in Photovoltaics: Research and Applications* (Wiley International Publications), *Material Science and Engineering-B* (Elsevier Publication), *International Journal on Green Energy* (Taylor and Francis Publication), *Journal of Applied Physics* (AIP Publications), *International Nano Letters* (Springer Publications), *IEEE Journal of Photovoltaics* (IEEE), *Solar Energy* (Elsevier Publications), *IET Renewable Power Generation* (IET), *International Journal of Emerging Electric Power Systems* (De Gruyter), *IEEE Transaction on Industrial Applications* (IEEE), *Sustainable Energy Technologies and Assessments* (Elsevier Publications), *Materials for Renewable and Sustainable Energy* (Springer Publications), *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects* (Taylor and Francis Publication), *Journal of Solar Energy Research Updates* (Synergy Publishers), *Engineering and Applied Science Research* (ThaiJO Publishers), *Materials Science in Semiconductor Processing* (Elsevier Publications).
- A Meta Reviewer for IEEE International Conference on Power Electronics, Drives and Energy Systems (PEDES) December-2022.

Ph.D./PG Students supervision

- Piyush N. Patel (Ph.D. completed in January 2014) on *Nano scale porous silicon photonic bandgap optical sensor devices* (co-supervisor)
- Shabbir Saleh Bohra (Ph.D. completed in March 2015) on *Theoretical modeling and analysis of silicon based multi-junction and quantum dot thin film solar cells developed on MATLAB platform* (supervisor)
- Sampat G Deshmukh (Ph.D. completed in October 2018) on *Development of Cu_3BiS_3 based thin film solar PV* (co-supervisor)
- Ashok Babulal Kherodia (Ph.D. completed in March 2019) on *a-Si:H/nC-Si:H multilayer thin films for third generation solar photovoltaics* (supervisor)
- Hitesh K. Mehta (Ph.D. Completed in February 2020) on *Photovoltaic parameters estimation using area under current-voltage curve and maximum power point tracking using three-point-model* (supervisor)
- Linta Eliya Mathew (Ph.D. under supervision) on *Isolated photovoltaic-battery system and its control by various advanced charging control algorithms* (supervisor)
- 33 M. Tech. (Completed) and 2 M. Tech. (under supervision)

Past students' achievements

- S. S. Bohra (Ph.D.) was funded by AICTE and SVNIT-Surat for presenting his research paper at *27 EU PVSECE Conference* at Frankfurt, Germany, September-2012.
- Gaurav Kumar (B. Tech.) was funded by INAE and SVNIT for presenting his research paper at *28 EU PVSECE Conference* at Paris, France, September-October 2013.
- Gaurav Kumar (B. Tech.) was funded by DST for presenting his research paper at *40th IEEE PVSC Conference* at Denver, Colorado, USA, June 2014.
- Rahul Singh (B. Tech.) was funded by Mitacs Canada for summer internship at Winnipeg University, May-July 2016.
- Nukala Tejeswar (M. Tech.) was awarded Graduate Student Assistantship at the *44th IEEE PVSC conference* USA, June 2017.
- Several B. Tech. students completed their SVNIT summer research fellowships under my supervision.

Activity outside the Institute

- M. Tech. and Ph.D. Thesis Examiner in Gujarat Technical University (GTU), Andhra University (AP), NIT Trichy, Nirma Institute of Technology Ahmedabad, Savitribai Phule University Pune, Shri Vaishnav Vidhyapeeeth Vishwavidhyalaya Indore.
- Stake holder for Solar Power Plant and other solar activities at Surat Municipal Corporation, Surat.
- Cochairman for Energy and Renewable Energy Committee at SGCCI, Surat.

Publications in international journals

- K. K. Dewangan, A. K. Panchal, "Power flow analysis using successive approximations and adomain decomposition methods with a new power flow formulation", *Electrical Power System Research 211 (2022), 108190*.
- Linta Eliya Mathew, **A. K. Panchal**, "An exact and explicit PV panel curve computation assisted by two 2-port networks", *Solar Energy 240 (2022), 280-289*.
- Hitesh K. Mehta, **A. K. Panchal**, "PV Panel Performance Evaluation via Accurate *V-I* polynomial with Efficient Computation", *IEEE Journal of Photovoltaics 11(6) (2021), 1519-1527*.
- Linta Eliya Mathew, **A. K. Panchal**, "A complete numerical investigation on implicit and explicit single-diode-models for PV using *I*- and *V*-approaches" *IEEE Journal of Photovoltaics* (*2021*), *827-837*.
- Mehta, Hitesh K., and **A. K. Panchal**, "A Novel Exponent I–V Relation Based Maximum Power Point Algorithm for Photovoltaic Panel." *Renewable Energy Focus 36 (2020*), *56-64*.
- **A. K. Panchal**, "A per-unit-single-diode-model parameter extraction algorithm: A high-quality solution without reduced-dimensions search." *Solar Energy 207 (2020), 1070-1077*.
- **A. K. Panchal**, "I–V Data Operated High-Quality Photovoltaic Solution through Per-Unit Single-Diode Model", *IEEE Journal of Photovoltaics, 10(4) (2020), 1175-1184*.
- Hitesh K. Mehta, Himanshu Warke, Kaushik Kukadiya, **A. K. Panchal,** "Accurate expressions for single-diode-model solar cell parameterization", IEEE *Journal of Photovoltaics 9(3) (2019), 803-810*.
- Hitesh K. Mehta, Nukala Tejeswar, **A. K. Panchal**, "A fast computing three-point model for PV system in uniform and non-uniform conditions", *Journal of Renewable and Sustainable Energy 10 (2018) 065501*.
- Ashok Kherodia, **A. K. Panchal**, "Effects of hydrogen dilution on opto-structural properties of hot-wire CVD grown a-Si:H/nc-Si:H multilayer for photovoltaics", *Silicon 10 (4), (2018), 1475-1485*.
- Ashok Kherodia, **A. K. Panchal,** "Poole-Frenkel emission and defect density in a-Si:H/nc-Si:H multilayer films for "all silicon" third generation photovoltaics", *Thin Solid Films (2017) 654,16-22*.
- Ashok Kherodia, **A. K. Panchal,** "Analysis of thickness-dependent optical parameters of a-Si:H/nc-Si:H multilayer thin films", *Materials for Renewable and Sustainable Energy (2017) 23, 1-6*.
- Sanjay J. Patel, Gaurav Kumar, **A.K. Panchal**, Vipul Kheraj, "Maximum power computation using current-voltage data from the open circuit and short-circuit regions of photovoltaic module: A teaching learning based optimization approach", *Journal of Renewable and Sustainable Energy 7 (2015) 043112*.
- Gaurav Kumar, **A. K. Panchal**, "Innovative and precise MPP estimation using P-V curve geometry for photovoltaics" *Applied Energy 138 (2015) 640-647*.
- S.S. Bohra, **A. K. Panchal**, "Investigation on current collection from a silicon quantum dot solar cell by varying dot size and insulating barrier layer thickness", *Journal of Nanosystems and Nanoengineering (2014) doi:10.1177/1740349914541646.*
- Sanjay J. Patel, **A. K. Panchal**, Vipul Kheraj, "Extraction of solar cell parameters from a single current–voltage characteristic using teaching–learning based optimization technique", *Applied Energy 119 (2014) 384-393*.
- Gaurav Kumar, **A. K. Panchal**, "Geometrical prediction of maximum power point for photovoltaics", *Applied Energy 119 (2014) 237-245*.

- Gaurav Kumar, **A. K. Panchal**, "A non-iterative technique for determination of solar cell parameters from light generated I-V characteristic", *Journal of Applied Physics 114 (2013) 084904*.
- **A. K. Panchal**, Vivek Beladiya, Vipul Kheraj, "Structural and optical properties of silicon thin-films deposited by hot-wire chemical vapor deposition: the effects of silane concentration", *Thin Solid Films 542(2) (2013) 139-143*.
- S.S. Bohra, **A. K. Panchal**, "Modeling of silicon quantum dot solar cell", *Journal of Nano- and Electronics Physics 5 (2) (2013) 2006.*
- Shubham Raj, Ankit Kumar Sinha, **A. K. Panchal**, "Solar cell parameters estimation from illuminated I-V characteristic using linear slope equations and Newton-Raphson technique", *Journal of Renewable and Sustainable Energy 5 (2013) 033105.*
- S.S. Bohra, **A. K. Panchal**, "Optimization of absorber layers' thickness in a Si micromorph solar cell for current matching with intermediate ZnO reflector", *Journal of Renewable and Sustainable Energy 5 (2013) 023121*.
- **A. K. Panchal**, D.K. Rai, C.S. Solanki, "Red emission from nano-silicon nitride multilayer films prepared using hot-wire chemical vapor deposition", *Journal of Nanosystems and Nanoengineering 227 (2) (2013) 101-104.*
- C.A.Majithia, A.V.Desai, **A. K. Panchal**, "Harmonic analysis of some light sources used for domestic lighting", *Journal of Lighting Research and Technology 43(3)(2011) 371-380.*
- **A. K. Panchal**, D.K.Rai, M.Mathew, C.S.Solanki**,** "a-Si/SiN_x multilayered light absorber for solar cell", *Journal of Nanoparticle Research 13(6) (2011) 2467-2473*.
- **A. K. Panchal,** D. K. Rai, C.S.Solanki, "Annealing effects of capacitance-voltage characteristics of a-Si/SiN_x multilayer prepared using hot-wire chemical vapour deposition", *Journal of Nanoscience and Nanotechnology 11 (2011) 3414-3417*.
- **A. K. Panchal**, D.K.Rai, M.Mathew, C.S.Solanki**,** "Silicon quantum dots in silicon nitride dielectric- A review", *Nano Brief Reports and Reviews 4(5) (2009) 265-279*.
- **A. K. Panchal**, C.S.Solanki, "Fabrication of silicon quantum dots in SiN_x multilayer using hot-wire CVD", *Journal of Crystal Growth 311(9) (2009) 2659-2663*.
- **A. K. Panchal,** C.S.Solanki, "Post deposition annealing temperature effect on silicon quantum dots embedded in silicon nitride dielectric multilayer prepared by hot-wire chemical vapor deposition", *Thin Solid Films 517(12) (2009) 3488-3491*.

Publications in chapters in book

- Deshmukh, S.G., Deshmukh, R.S., **Panchal, A.K.** and Kheraj, V., 2021. Successive Ionic Layer Adsorption and Reaction Deposited ZnS-ZnO Thin Film Characterization. In *Electrical and Electronic Devices, Circuits and Materials* (pp. 315-328). CRC Press.
- Mulla M. A. and **Panchal A. K.**, 2021. Innovative Approach for Real-time PV Curve Identification: Design-to-Application, *Artificial Intelligence, Internet of Things (IoT) and Smart Materials for Energy Applications*. CRC Press.

Publications in international conferences

- Hitesh K. Mehta, **A. K. Panchal**, "A novel maximum power point estimation algorithm for PV system using real-time short circuit current calculation" *IEEE 1st International Conference on Energy, Systems and Information Processing (ICESIP 2019)* at IIITD&M Kancheepuram, Chennai, July-2019.
- Tejeswar Nukala, **A. K. Panchal**, "Maximum power point tracking of PV module based on new explicit *I-V* relation" *44th IEEE Photovoltaic Specialists Conference (PVSC)* at Washington DC, USA, June-2017.
- Hitesh K. Mehta, **A. K. Panchal**, "A direct maximum power point search using current-voltage based power-law relation for photovoltaic system under uniform irradiance" *44th IEEE Photovoltaic Specialists Conference (PVSC)* at Washington DC, USA, June-2017.
- Rahul Singh, Parth S. Shah, **A. K. Panchal**, "Explicit current-voltage models for solar photovoltaics" *40th IEEE Photovoltaic Specialists Conference (PVSC)* at Portland, USA, June-2016.
- Gaurav Kumar, **A. K. Panchal**, "An advance geometrical maximum power point targeting technique for solar photovoltaics using current – voltage curve" *40th IEEE Photovoltaic Specialists Conference (PVSC)* at Denver, USA, June-2014.
- Gaurav Kumar, **A. K. Panchal**, "A procedure for finding solar cell parameters at different temperatures", *4th International Conference on Advances in Energy Research (ICAER 2013)* held at IIT Bombay, December-2013.
- Gaurav Kumar, **A. K. Panchal**, "Direct determination of solar cell parameters with different illumination levels", *28th European Photovoltaic Solar Energy Conference and Exhibition (28 EU PVSECE)* at Paris, France, September-October-2013.
- S.S.Bohra, **A. K. Panchal**, "Modeling of silicon quantum dot solar cell", *Second International Symposium on Semiconductor Materials and Devices (ISSMD-2)* at Jammu, India, February-2013.
- S.S.Bohra, **A. K. Panchal**, "Absorber layer thickness optimization a-Si:H/a-SiGe:H/μC-Si:H solar cell with intermediate ZnO layer", *27th European Photovoltaic Solar Energy Conference and Exhibition (27 EU PVSECE)* at Frankfurt, Germany, September-2012.
- D.K.Rai, N.R.Mavilla, **A. K. Panchal**, C.S. Solanki, "Improvement in short circuit current of p-i-n solar cell with silicon quantum dot superlattice structure by optimizing SiN_x thickness", *37th IEEE Photovoltaic Specialists Conference (PVSC)* at Texas-Austin, USA, June-2012, pg.810-814.

- **A. K. Panchal**, D.K.Rai, M.Mathew, C.S.Solanki, "Photovoltaic devices with silicon quantum wells and dots structures in silicon nitride dielectrics", *26th European Photovoltaic Solar Energy Conference and Exhibition (26 EU PVSECE)* at Hamburg, Germany, September-2011.
- **A. K. Panchal**, D.K.Rai, M.Mathew, C.S.Solanki, "Co-relation between capacitance-voltage, conductance-voltage and photoconductive properties of as-deposited and annealed a-Si/SiN_x multilayer films prepared using hot-wire CVD", *35th IEEE Photovoltaic Specialists Conference (PVSC)* at Hawaii, USA, June-2010.
- **A. K. Panchal**, D.K.Rai, M.Mathew, C.S.Solanki, "Effects of substrate temperature and SiH_4 cracking time on a-Si/SiN_x multilayer prepared using HWCVD" *International Workshop on Physics of Semiconductor Devices (IWPSD-2009)* at Jamia Melia Islamia, New Delhi, December-2009.
- **A. K. Panchal**, D.K.Rai, C.S.Solanki, "Electrical characterization of Si-QD/SiN_x multilayer prepared using HWCVD" *PVSEC18 International Conference Kolkata*, January-2009. **This paper won the best poster presentation award**.
- **A. K. Panchal,** C.S.Solanki, "Post deposition annealing temperature effect on silicon quantum dots embedded in silicon nitride dielectric multilayer prepared by hot-wire chemical vapor deposition *5th International Conference on Hot-Wire Chemical Vapor Deposition (HWCVD5)* held at MIT USA, August-2008.
- Antisen A.M., **A. K. Panchal**, C.S.Solanki, "Precipitation of Si nanocrystals in Si-rich Silicon nitride layers deposited using HWCVD" *5th International Conference on Hot-Wire Chemical Vapor Deposition (HWCVD5)* held at MIT USA, August-2008.
- **A. K. Panchal**, C.S.Solanki, S.N.Ghosh, "Energy analysis of thin film crystalline silicon solar cell technologies" poster presented at *European Materials Research Society (EMRS) 2007 Symposia* held at Strasbourg, France, May-June 2007.
- **A. K. Panchal**, "Voltage stability of a large grid" paper presented at the *7th International Power Engineering Conference (IPEC-2005)* held at Singapore, December 2005.