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<b>Current Position</b>	Assistant Professor Department of Electronics and Communication Engineering Cooch Behar Government Engineering College October 2018 – present
<b>Education</b>	<p><b><u>Ph.D., Advanced Technology Development Centre</u></b> <b>Indian Institute of Technology Kharagpur, India, August 2015</b> Advisor: Prof. Dhruves Biswas Thesis title: Modeling, Realization and Characterization of Compositionally Graded AlGa<sub>N</sub>/Ga<sub>N</sub> Heterostructures for Electronic Applications (To download the thesis please click on the URL: <a href="http://www.idr.iitkgp.ac.in/xmlui/handle/123456789/5520">http://www.idr.iitkgp.ac.in/xmlui/handle/123456789/5520</a>)</p> <p><b><u>Master of Science, Electronics and Electrical Communication Engineering</u></b> <b>Indian Institute of Technology Kharagpur, India, January 2010</b> Thesis title: Barrier Engineering in Gallium Nitride based High Electron Mobility Transistor for Optimized Carrier Concentration in Ku Band High Power Applications CGPA: 9.5</p> <p><b><u>B.Tech, Electronics and Communication Engineering</u></b> <b>Kalyani Govt. Engineering College, West Bengal, August 2003</b> Percentage: 83.70%</p> <p><b><u>Higher Secondary (Science)</u></b> <b>West Bengal Council of Higher Secondary Education, West Bengal, India, 1999</b> Percentage: 80.60%</p> <p><b><u>Secondary</u></b> <b>West Bengal Board of Secondary Education, West Bengal, India, 1997</b> Percentage: 80.25%</p>
<b>Research Interests</b>	<ul style="list-style-type: none"><li>• Gallium Nitride compound semiconductor based High Electron Mobility Transistors</li><li>• Epitaxial growth of GaN and related materials in Molecular Beam Epitaxy technique</li><li>• High Resolution X-Ray Diffraction of thin films with GaN and related materials</li><li>• Ideation of new device structures</li><li>• Simulation and Modeling</li><li>• Simulation tool development using Visual Basic 6</li><li>• Automated measurement instrument development with embedded hardware and Visual Basic based software</li></ul>
<b>Research Guidance</b>	One Ph.D. scholar Mr. Diganta Das, registered under Biju Pattnaik University of Technology, Rourkela, Odisha. Proposed thesis title : InGa <sub>N</sub> /Ga <sub>N</sub> QW based Gated Optical Transmitter Receiver for Intra Device Communication Applications

**Research Experience****Research Scholar, MBE and MOCVD lab, ATDC, IIT Kharagpur**

February 2010 – August 2014

- Ideation, analysis and growth of a novel graded barrier AlGa<sub>N</sub>/Ga<sub>N</sub> heterostructure to achieve high carrier concentration, high mobility and low gate leakage possibilities
- Growth of AlGa<sub>N</sub>/Ga<sub>N</sub> heterostructures in MBE
- Structural (TEM, HRXRD), optical (PL, UV reflectance) and electrical characterization (HALL, I-V, C-V)
- Analytical modeling of composite barrier AlGa<sub>N</sub>/Ga<sub>N</sub> HEMT heterostructures
- Software development for electrical characterization simulation of AlGa<sub>N</sub>/Ga<sub>N</sub> HEMT
- Computation software development for HRXRD analysis through Jordan Valley D1 XRD
- Laboratory setup for MBE, MOCVD, epitaxial infrastructure and Hall, XRD characterizations
- Planning of the facilities like power, closed loop chilled water circulation system, compressed air delivery units, gas manifold systems, toxic gas detection and automation
- Development of an automatic monitoring and operating system in the laboratory

**Senior Project Assistant, Advanced VLSI lab, IIT Kharagpur**

January 2007 – January 2010

- Simulation of AlGa<sub>N</sub>/Ga<sub>N</sub> heterostructures based electronic devices
- Simulation of InGa<sub>N</sub>/Ga<sub>N</sub> MQW heterostructures for Phosphor free white LEDs
- Growth of AlGaAs/GaAs heterostructures in MBE
- Infrastructure setup installation for GaAs MBE system including power, water, cryogenic subsystems

**Teaching Experience****Assistant Professor, National Institute of Science and Technology, Berhampur**

September 2014 – September 2018

- Teaching Basic Electronics and Basic Electrical Engineering for UG 1<sup>st</sup> Year, Analog Electronic Circuits for UG 2<sup>nd</sup> Year, 8051 Microcontroller for UG 3<sup>rd</sup> Year, Embedded Systems for UG 4<sup>th</sup> Year along with concerned laboratory experiments and VLSI Fabrication Technology for PG 1<sup>st</sup> Year
- Development of VB based software to demonstrate basic semiconductor equations in alignment to E-learning for UG 2<sup>nd</sup> Year students
- Guiding 2<sup>nd</sup> and 3<sup>rd</sup> Year students for embedded system projects
- Guiding final year UG students for B.Tech projects
- Currently guiding one M.Tech student
- Development of a new hands-on laboratory on 8051 microcontroller
- Development of a new Advanced Analog Electronics laboratory
- Instructor for a summer course on semiconductor device fabrication technologies
- Summer internship mentor (one student from ISM Dhanbad and one from NIT Allahabad have been mentored in 2015 and 2016 respectively)
- Departmental GATE coaching coordinator
- Electronics Hobby Club coordinator
- Semiconductor process and characterization laboratory setup responsibilities
- Student counseling services
- Proposal writing

**Industrial Training**

- Hands on training on MBE machine and Gallium Nitride growth in MBE at SVT Associates, Minneapolis, Minnesota, USA in May 2012
- Hands on training on MOCVD machine at Agnitron, Minneapolis, Minnesota, USA in May 2012

**Industry Experience**

September 2003 to December 2006

Electrical / Telecommunication Industries

- Hands on experience in electrical circuit designs with ACB, SFU, MCB, MCCB, O/L Relay, contactors, timers, limit switches, level switches
- Design, Installation and commissioning of electrical control panel like MCC, PCC, soft starter, interlocking system in high current ACBs
- Troubleshooting GSM transceivers

**Patent**

1. "A System For Customized Universal DC Circuit Emulation and A Method Thereof", Palash Das, Aishwarya Singh, Satya Sopan Mahato, Sandipan Mallik, Mrinal Kanti Mandal, Applicant: IIT Kharagpur  
Application No. 201831035787 (India)  
Date of filing: 24<sup>th</sup> September 2018
2. "Solar Augmenter", Palash Das, Dhruves Biswas, Applicant: Magnolia Optical Technologies, Inc.  
Application No.: 62556019 (USA)  
Date of filing: 8<sup>th</sup> September 2017
3. "A system and a method for auto responsive intelligent remote monitoring and operating MCC, PDB, LDB panels used in steel, sponge iron, power plants", Palash Das, Applicant: IIT Kharagpur  
Application No.: 1079/KOL/2013 (India)  
Date of filing: 18<sup>th</sup> September 2013
4. "Double Quantum Well Nitride High Electron Mobility Transistor (HEMT)", Ankush Bag, Palash Das, Rahul Kumar, Partha Mukhopadhyay, Dhruves Biswas, Applicant: IIT Kharagpur  
Application No.: 277/KOL/2015 (India)  
Date of filing: 13<sup>th</sup> March 2015

**Publications: Journals**

1. "An alternative X-Ray Diffraction analysis for comprehensive determination of structural properties in compositionally graded strained AlGa<sub>N</sub> epilayers", Palash Das, S. Jana, N. N. Halder, S. Mallik, S. S. Mahato, A. K. Panda, P. Chow, D. Biswas, *Electron. Mater. Lett.*, <https://doi.org/10.1007/s13391-018-0074-6>, 2018.
2. "An Empirical Approach towards Photovoltaic Parameter Extraction and Optimization", Subha Prakash Mallick, D. P. Dash, S. Mallik, Rakesh Roshan, Shrabani Mahato, Palash Das, S. S. Mahato, *Solar Energy*, vol. 153, pp. 360-365, 2017.
3. "Reverse bias leakage current mechanism of AlGa<sub>N</sub>/InGa<sub>N</sub>/Ga<sub>N</sub> heterostructure", Apurba Chakraborty, Saptarsi Ghosh, Partha Mukhopadhyay, Sanjay K. Jana, Syed Mukulika Dinara, Ankush Bag, Mihir K. Mahata, Rahul Kumar, Subhashis Das, Palash Das, Dhruves Biswas, *Electron. Mater. Lett.*, vol. 12, pp. 232-236, 2015
4. "2DEG modulation in double quantum well enhancement mode nitride HEMT", Ankush Bag, Palash Das, Rahul Kumarm, Partha Mukhopadhyay, Shubhankar Majumdar, Sanjib Kabi, Dhruves Biswas, *Physica E*, vol. 74, pp. 59-64, 2015.

5. "Fowler–Nordheim Tunnelling Contribution in AlGa<sub>N</sub>/Ga<sub>N</sub> on Si (111) Schottky Current", Ankush Bag, Palash Das, Saptarsi Ghosh, Partha Mukhopadhyay, Syed Mukulika Dinara, Rahul Kumar, Apurba Chakraborty, Dhruves Biswas, IETE Technical Review, vol. 33, pp. 7-10, 2015
6. "Confined Energy State Based Hypothetical Observations about Device Parameters of AlGa<sub>N</sub> / Ga<sub>N</sub> HEMT", Palash Das, Dhruves Biswas, J. Nano- Electron. Phys., vol. 7, pp. 01006-1-01006-3, 2015.
7. "Graded Barrier AlGa<sub>N</sub>/Al<sub>N</sub>/Ga<sub>N</sub> Heterostructure for Improved 2DEG Carrier Concentration and Mobility", P. Das, N. N. Halder, R. Kumar, S. Jana, S. Kabi, B. Borisov, A. Dabiran, P. Chow, D. Biswas, Electron. Mater. Lett., vol. 10, pp. 1087-1092, 2014.
8. "Quantitative assessment of the effects of strain on future III-V digital applications", U. P. Gomes, K. Ranjan, S. Chowdhury, P. Das, S. Rathi and D. Biswas, Journal of Microelectronics and Electronic Packaging, vol. 9, p. 37, 2012.
9. "A Strategic Review of Reduction of Dislocation Density at the Heterogeneous Junction of GaN Epilayer on Foreign Substrate", S. Das Bhattacharyya, P. Mukhopadhyay, P. Das, D. Biswas, J. Nano- Electron. Phys., vol. 3, no. 1, pp. 67 (2011)
10. "Gate leakage current reduction with advancement of graded barrier AlGa<sub>N</sub>/Ga<sub>N</sub> HEMT", P. Das, D. Biswas, J. Nano- Electron. Phys., vol. 3, pp. 972-978, 2011.

#### **Publications: Conferences**

1. "Insulated Gate MQW based Three Terminal LED for Low Cost Display Applications", P. P. Pancham, R. D. Sahu, S. Mallik, S. S. Mahato, Palash Das, Proc. of 4<sup>th</sup> NCDC, 2018, (ISBN: 978-93-83060-16-0) Berhampur, India
2. "Design and Testing of Low Cost DC Two Port Current-Voltage Characterization Setup", Palash Das, S. Mallik, S. S. Mahato, Abhijeet Mishra, Amit Bikram Sahu, Anupam R. Tripathy, Arbind Kumar Mahto, Kabita Mahato, Proc. of 4<sup>th</sup> NCDC, 2018, (ISBN: 978-93-83060-16-0) Berhampur, India
3. "Realization of Higher Cut off Frequency Dependency on BJT Biasing", Palash Das, S. Mallik, S. S. Mahato, Anwesh Patro, V. Rahul Kumar, Rohit Kumar, Bhanu Pratap Singh, Sudip Kundu, Arbind Kumar Mahto, Kabita Mahato, Proc. of 4<sup>th</sup> NCDC, 2018, (ISBN: 978-93-83060-16-0) Berhampur, India
4. "Ultra-Stabilized PID Controlled Biasing of BJT", Palash Das, S. Mallik, S. S. Mahato, Rohit Kumar, Bhanu Pratap Singh, Arbind Kumar Mahto, Kabita Mahato, Proc. of 4<sup>th</sup> NCDC, 2018, (ISBN: 978-93-83060-16-0) Berhampur, India
5. "Design of a Macro Model for Bio-MEMS Smart Drug Delivery System", Akanksha Garodia, Sonali Sahu, Abhisek Negi, S. Sachin Kumar, Sandipan Mallik, Satya Sopan Mahato and Palash Das, Proc. of 3<sup>rd</sup> NCDC, 2017, (ISBN: 978-93-83060-18-4) Berhampur, India
6. "Low Cost DC Current-Voltage Characterization Setup", S. Sachin Kumar, Akanksha Garodia, Abhisek Negi, Abhijeet Mishra, Amit Bikram Sahu, Kavita Mahato, Sandipan Mallik, Satya Sopan Mahato and Palash Das, Proc. of 3<sup>rd</sup> NCDC 2017, (ISBN: 978-93-83060-18-4) Berhampur, India
7. "Impact of post metal annealing on gate work function engineering for advanced MOS applications", S. Sachin Kumar, Amitesh Prasad, Amrita Sinha, Pratikhya Raut, Palash Das, S. S. Mahato, and S. Mallik, AIP Conf. Proc., vol. 1728, pp. 020218, 2016
8. "Molar fraction and Well count tuned InGa<sub>N</sub>/Ga<sub>N</sub> Multiple Quantum Well based Heterostructure for Phosphor Free White LED Applications", Nikhil Kothari,

- SatyaSopan Mahato, Sandipan Mallik, Debashis Panda, Palash Das, IWPSD 2015
9. "The Effect of AlN Nucleation and GaN Layer in Indium Incorporation of InGaN Grown by PA-MBE", Apurba Chakraborty, Partha Mukhopadhyay, Saptarsi Ghosh, Ankush Bag, Mihir K Mahata, Rahul Kumar, Subhashis Das, Palash Das, Sanjay K Jana, Dhruves Biswas, IWPSD 2015
  10. "Effect of Different Metal Modulation Scheme and Growth Temperature in InGaN Growth", Apurba Chakraborty, Partha Mukhopadhyay, Saptarsi Ghosh, Ankush Bag, Sanjay Jana, Syed Mukulika Dinara, Mihir Mahata, Rahul Kumar, Subhashis Das, Shubhankar Majumdar, Palash Das, Dhruves Biswas, International Conference on Microwave and Photonics (ICMAP-2015), ISM Dhanbad, 2015
  11. "Effect of Vertical and Longitudinal Electric Field on 2DEG of AlGaIn/GaN HEMT on Silicon: A Qualitative Reliability Study", Ankush Bag, Partha Mukhopadhyay, Saptarsi Ghosh, Palash Das, Rahul Kumar, Sanjay K Jana, Sanjib Kabi, Dhruves Biswas, IWPSD 2014
  12. "Simplified 2DEG Carrier Concentration Model for Composite Barrier AlGaIn/GaN HEMT", P. Das, D. Biswas, AIP Conf. Proc., vol. 1591, pp. 1449-1451, 2014. DOI: 10.1063/1.4872992
  13. "Analytical and Simulative Viewpoint of Graded Barrier AlGaIn/GaN HEMT for High Input Impedance, Breakdown Voltage and Channel Mobility", P. Das, P. Banerji, D. Biswas, CS Mantech, Boston, USA, April 2012.
  14. "Reduction of Negative Differential Conductivity Effect of AlGaIn/GaN HEMTs using Gate Scaling," S. Kundu, P. Das, S. Pathak, P. Mukhopadhyay, J. Reddy, Edward Y. Chang and D. Biswas, Proc. Of 10th IEEE International Conference on Nanotechnology, Kintext, Seoul, Korea, 17th-20th August 2010.
  15. "Simulation of AlGaIn/GaN HEMT on 4H-SiC substrate including self-heating effect for high power amplifier at Ka band applications," S. Kundu, P. Das, S. Pathak, P. Mukhopadhyay, J. Reddy, Edward Y. Chang and D. Biswas, International Conference on Nano Science and Technology 2010, Bombay.
  16. "Optimized Bandgap Engineered AlGaIn/GaN HEMT for High Power Amplifier at Ku Band Applications," S. Kundu, P. Das, S. Pathak, P. Mukhopadhyay, J. Reddy, Edward Y. Chang and D. Biswas, IWPSD 2009, Delhi.
  17. "Novel Ideation of Phosphor free InGaIn/GaN Multiple Quantum Well based white LED," P. Das, S. Kundu, J. Reddy, S. Pathak, P. Mukhopadhyay, Edward Y. Chang and D. Biswas, IWPSD 2009, Delhi.
  18. "Optimization of Bandgap Engineered AlGaIn / GaN HEMT for High Power RF Amplifier Application," P. Das, S. Kundu, S. Pathak, P. Mukhopadhyay, Harikrishnan A.I., Edward Y. Chang and D. Biswas, National Conference on Recent Advances in Communication Technology, January 30th – February 1st 2009, Rourkela, India.
  19. "Strategic Review of Gallium Nitride Growth on Silicon with Heteroepitaxial Nucleation and Substrate Orientation Technique," P. Das, S. Kundu, S. Pathak, P. Mukhopadhyay, R. Anthony, E. Chang, D. Biswas, ICPS'08 (International Conference on Physics on Semiconductor), Rio de-Janeiro, Brazil, July 27th – 1st August 2008.

## Talks

1. "IP Protection : An academician's View" at National Institute of Science and Technology Berhampur, Odisha, 27<sup>th</sup> September 2018
2. "e-Breadboard: A General Purpose DC Emulator" at National Institute of Science and Technology Berhampur, Odisha, 5<sup>th</sup> January 2017
3. "Why Do I Need a Teacher When I've got Google : Chapter 13 and 14" at National

Institute of Science and Technology Berhampur, Odisha, 17<sup>th</sup> March 2016

4. “III-V Compound Semiconductor based High Electron Mobility Transistors” at Centurion University, Parlakhemundi, Odisha, India, 11<sup>th</sup> September 2015
5. “Compositionally Graded AlGaIn/GaN Compound Semiconductor Heterostructures for HEMT Applications : Concept and Analogy” at National Institute of Science and Technology Berhampur, Odisha, 18<sup>th</sup> December 2014

## Software developed

- **IV-I-III**  
A DC IV characterization software to automatically perform voltage variation across a two terminal device, measure current through the device and plot the current-voltage graph
- **K-Y-PSCD**  
A VB based software to demonstrate basic semiconductor equations in alignment to E-learning for UG 2nd Year students
- **SpectCol**  
An analytical software to predict the color of light from the spectral distribution
- **GXRD**  
Structural characterization simulation software to analyze X-Ray Diffraction peaks of AlGaIn/GaN heterostructures
- **GYAN**  
Electrical characterization simulation software to predict carrier concentration, energy levels inside the quantum well, drain saturation current ( $I_{ds} - V_{ds}$ ), gate voltage response on carrier concentration and drain current vs. drain voltage extractor
- **CritThick**  
Critical thickness calculation software for different semiconductor heterostructures based on Mathews-Blakeslee model

## Embedded system design projects

- Automated circuit emulation: design and measurement
- Automated two port DC current voltage measurement and plotting instrument
- Automated dress cutting machine with advancement in measurement procedure
- Human machine interaction software through VB6 for monitoring and operating remotely located electrical appliances
- SMS based automated response generator database query through VB6 for JEE 2011
- Addition to an existing blood pressure diagnosis system for automated transfer of measured data to a web server database
- Intelligent fault diagnosis in switching applications and sending information as SMS
- SMS based switching of remote appliances
- SMS and software program based monitoring and operation of remote appliances
- Switch matrix operations through LAN
- Digital lock for laboratory with data saving, administrative monitoring options
- Microcontroller based custom designed overload relay
- Realization of a PID controller using 51 series microcontroller for the application at a tunneling accelerometer MEMS device

**References**

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