SSE

SCHOOL OF SOLAR ENERGY

PANDIT DEENDAYAL PETROLEUM UNIVERSITY • A RESERVOIR OF KNOWLEDGE •

PDPU

PANDIT DEENDAYAL PETROLEUM UNIVERSITY

VISION

To be an internationally renowned and respected institution imparting excellent education and training based upon the foundation of futuristic research and innovations.

MISSION

Undertake unique obligation for Education in Energy Engineering & Management with special responsibilities in domain specific aspects of Energy & Infrastructure.

Seek to nurture students of extra-ordinary motivation and ability and prepare them for life-long learning and leadership in an increasingly knowledge driven world.

Envisage to establish Institutes of Excellence in Education, competitive edge in Research and Real-time relevance with futuristic thrusts in offering of programs and undertaking of activities and projects.

Board of Governors

Academic Council

President's Message

Dr. Mukesh Ambani
President
Pandit Deendayal Petroleum University

With Pandit Deendayal Petroleum University, we envisioned the creation of a world-class university and to be one of the front-runners in imparting education in the field of energy & infrastructure, humanities, engineering, management, and liberal arts. Also I am enthused to announce that Pandit Deendayal Petroleum University (PDPU) is now one of the leading universities of India aspiring for global standards of excellence. In a short span of seven years, PDPU has reached a tipping point and is set to pace the major transformations taking place in the world economy. PDPU is now old enough to create young professionals who impart significant contributions to the economic and the social landscape of India.

Today, the corporate world seeks a generation of young people who are not only academically sound, but are also capable of thinking innovatively. I feel proud to see the holistic education system of PDPU has successfully brought the best out of the students. I'd like to reiterate my whole-hearted support for PDPU and wish them all the very best for their future endeavors and accomplishments.

All the Best!

Chairman's Message

Shri D. J. Pandian, IAS

Additional Chief Secretary, Industries & Mines Department &
Chairman, Standing Committee, Pandit Deendayal Petroleum University

I feel a great privilege in presenting the post graduates in the field of Solar Engineering who are looking forward to contribute in the development of this vitally important sector. The School of Solar Energy takes pride in creating a pool of engineering post graduates and researchers who can dynamically adapt to an ever changing world and work towards harnessing solar energy, the foremost source of renewable energy. We are confident that the exposure imparted to them on campus will be functionally relevant in the corporate world. As professionals who can lend value, these young post graduates have also been indoctrinated with humility and integrity as priceless personality attributes.

Gujarat has been a power surplus state after the success of its 'Jyotigram Yojna' and it also produces two-third of the solar power of India. In the decade or two to come, solar power in India will be the biggest renewable energy resource and I believe the young and enthusiastic post graduates from School of Energy will lead the way, for they are engaged in rigorous, collaborative and a transformational journey during these two years. To note the fact that India has already managed to bring down the cost of solar energy from Rs. 15 per unit to less than Rs. 6.50 per unit. In the years to come, the learning of these post graduates with fine tuned theories and hands on experience will be of utmost importance to bring the prices down at grid parity. We look forward to see these students driving the solar industry, contributing actively in research and bring about continuous development in the solar energy sector.

Director General's Message

Dr. H. B. Raghavendra
I/C Director General
Pandit Deendayal Petroleum University

Greetings from Gandhinagar, the capital city of the state of Gujarat and a hearty welcome to our university, Pandit Deendayal Petroleum University (PDPU)!

PDPU aspires to provide globally relevant holistic education and has on its anvil cutting edge research, development an innovation both in fundamental and professional streams of knowledge focused in the areas of Energy, General engineering, Management and Humanities. We hope to be a world class university and firmly believe our graduates will make substantial contributions in time to come in their respective areas of specialization.

PDPU, which was established in 2007, is growing remarkably well in a vibrant campus currently spread over an area of approximately 100 acres on a lush green river bank with a beautiful rural setting. The campus has a state of the art feel with modern academic and residential buildings, internet and Wi-Fi, good laboratories and computational facilities, excellent cafeteria, wellness center sports facilities, etc. The campus is well located and can be reached conveniently.

At this university, you expect to achieve professional education of world-class standard, excellent and encouraging faculty support and a very inspiring learning ambience.

PDPU would like to introduce you to the class of solar students of 2013-15. We believe that you will be impressed by their enthusiasm and interest in the field of solar engineering. We are sure that the energy sector will benefit immensely by utilizing the rich knowledge and relevant exposure acquired by our post graduates, who are not just effective employees of today; they are strategic and dynamic professionals of the future.

I, on behalf of SSE welcome you to participate in our Campus Recruitment Program.

HOD's Message

Dr. Indrajit Mukhopadhyay
Head, Solar Research Development Centre
Pandit Deendayal Petroleum University

It gives me immense pleasure to represent one of the fast growing schools, School of Solar Energy in Pandit Deendayal Petroleum University, Gandhinagar Gujarat. Looking at the projected rate of growth of the nation in the solar energy front, the importance of education and research in the field of Solar Photovoltaic and Solar Thermal Energy technologies have gained tremendous importance in recent time. However, the obvious question that echoes our mind is the required quality of such education and research that can make immediate impact to the national mission.

The School of Solar Energy provides a platform to the students to nurture their thought and ideas on the solar energy technologies by a well-balanced curriculum which is enriched both theoretically and experimentally at the M.Tech and Ph.D. level. In order to accomplish its target in the research front, the school of solar energy has established nine laboratories for synthesis, characterization and fabrication of various solar energy conversion devices. The focused area of research includes both fundamental material aspects and ultra-modern device fabrication techniques. The research output of the last couple of years from the school of solar energy has attracted tremendous international attention signifying both the level and quality. I cordially invite all the valued channel partners to be a part of the excellence of education and research of the School of Solar Energy and utilize its enormous resource for making the solar energy initiative of the individual and the nation, as a whole a grant success!

About the University

Located in Gandhinagar, the capital of Gujarat, PDPU is spread over an impressive campus of about 100 acres and offers necessary infrastructure of a world-class institute.

Pandit Deendayal Petroleum University, Gandhinagar, is a domain specific university in the field of energy education and research. The University is recognized by UGC.

PDPU addresses the need for trained and specialized human resource predominantly for Oil & Gas, Solar and Nuclear sector worldwide. It intends to expand the opportunities for students and professionals to develop intellectual knowledge-base with leadership skills to compete in the global arena.

This objective is being addressed through a number of specialized and well-planned undergraduate and postgraduate energy education programmes and intensive research initiatives.

SSE

SCHOOL OF SOLAR ENERGY

The School of Solar Energy (SSE) at Pandit Deendayal Petroleum University (PDPU) aims to impart education, training and services; perform cutting-edge research and development; and enable discrete, as well as interdisciplinary technologies; to accelerate the deployment of renewable energy for a sustainable growth; foster a clean environment to enhance human standards of living and develop a skilled workforce and empower a young generation of leaders.

The School of Solar Energy (SSE) at PDPU conducts teaching and research in the technologies needed to harness and supply solar energy efficiently, on an economically sound basis. SSE operates in close collaboration with Solar Energy research wing of GERMI Research, Innovation & Incubation Centre (GRIIC) as well as other national and international institutes/labs such as IIT Bombay, IIT Delhi, IIT Jodhpur, IIT Gandhinagar, SP University, CHARUSAT, SVNIT Surat, NIRMA University, CSMCRI Bhavnagar, NPL, ISCT Hyderabad, University of Toronto, Nagoya Institute of Technology, University of Saskatchewan and many others.

Objectives

Research

- → Develop world-class R & D facility for comprehensive solar energy research
- → Contribute to fundamental and applied reseach

Industrial

- → Commercialization of developed technologies
- → Strong industrial-institutional relationship

Services

- → Bechmark Consultaion
- → Administrative advisory
- → Community/ Social outreach

Education

- → Higher education: Ph. D. & M. Tech
- → Skilled workforce training
- → Online (multiversity) courses in solar energy, conservation and storages
- → Certificate courses for professionals

VISION & MISSION

- Perform cutting-edge research and development
- Enable discrete, as well as interdisciplinary technologies, and
- Extend administrative services, training, and education

... TO ...

- Accelerate the deployment of solar and related energy for a sustainable growth,
- Foster a clean environment to enhance human standards of living, as well as
- Develop a skilled workforce and empower a young generation of leaders

Admissions

Admission to M.Tech Program is based on GATE score as well as a written test followed by a personal interview conducted in the campus to select the most deserving candidates for its programme. The minimum eligibility criteria is B.E. / B.Tech or equivalent in Electronics Engineering/Electronics & Communication Engineering / Electrical Engineering / Instrumentation & Control Engineering /Mechanical Engineering / Semiconductor Technology / Energy Science & Engineering or M. Sc. or equivalent degree in Physics /Applied Physics / Electronics / Optoelectronics; with a minimum CPI of 6.5 on a 10 point scale or equivalent (60% of aggregate marks).

Admission to PhD Programme happens twice a year – one during May-April and the other during November-December

(i) Master Degree in Engineering/Technology or equivalent in an appropriate area with a minimum CPI of 6.5 or 60% of marks.
OR
(ii) Master Degree in Science or equivalent in an appropriate area with first class or a minimum CPI of 6.5 or 60% of marks, where class is not awarded.

Pedagogy

The University facilitates a holistic learning environment based upon the principles of academic freedom, self-monitored standards of excellence and an open and incessant process of assessment and feedback from the students.

SUMMER INTERNSHIPS

Summer Internship is a major component of the learning process at SSE, PDPU. With completion of second semester, every student of SSE has to undergo a minimum of 6 weeks long summer internship which is mandatory; of which paid internship are prioritized. Companies and organizations namely BERGEN, Adani Power, TopSun, Madhav Solar Group, Waaree, Welspun Energy Pvt. Ltd., GenSol and GERMI have been closely associated with SSE and have helped out students in their rigorous learning process providing them with high quality industry training during the tenure.On successful completion of the training, a student is required to give a presentation and also submit a written report for evaluation. The formal assessment and feedback of the industry guides are also taken into consideration for overall evaluation of final projects.

TEACHING ASSISTANT

To hone the talented aptitude of M. Tech students, the university engages them in academic work. They assist faculty members in laboratory sessions and tutorial sessions of undergraduate students and they also help faculties in framing problems. Active participation during these sessions improves their quality of deliberation for scientific/technical presentation viz. improves their knowledge base of scientific fundamentals. By actively participating in these academic activities students cultivate leadership skills and better communication approach. This also strengthens their overall personality for their professional and social life.

BEYOND THE CLASSROOM

SSE offers a dynamic campus with outstanding study, research and instrumentation facilities. It also offers students extraordinary opportunities for professional growth through participation in various cultural and academic activities such as field trip, academic seminars, discussions, etc. Domain specific workshops and conclaves are also organized periodically to strengthen teaching and learning process. Also Students are always motivated to carry out technical activities on campus to spread the word 'Solar' enhancing their abilities to event management and at the same time spreading the knowledge and awareness.

SALIENT FEATURES

Imparting world class education both on research and industry front	State-of-the-art laboratories to perform material and fabrication research for solar cells	A mandatory summer industry internship programme to bridge the research and the industry	Empowering generation of young leaders in Solar Industry and Research

Course Structure

M.Tech Solar Energy

Semester I

CORE COURSES

- Mathematical Techniques
- Quantum Mechanics & Semiconductors
- Thermodynamics & Heat Transfer
- Vacuum Science & Thin Film Technology
- Renewable Energy & Energy Management

ELECTIVE

- Semiconductor & Optoelectronic Devices
- Nano-structured Materials for Energy Devices
- Heat Ventilation &Air Conditioning

LABORATORY WORK/ ENERGY LAB-1

- To study various renewable energy source options (PV, Wind etc.) installed at PDPU campus
- To study various techniques and characterization of thin film.

Semester II

CORE COURSES

- Photovoltaic Science & Engineering
- Solar Thermal Engineering
- Semiconductor Processing & Characterization
- Modelling & Simulation
- Galvanic Energy Storage
- Research Methodology

ELECTIVE

- Applied Photovoltaics
- Solid and Surfaces
- Photovoltaic Power Plant Engineering
- Advance Heat transfer

LABORATORY WORK/ ENERGY LAB-2

- To perform kit based experiments of PV modules that will identify various parameters and characteristics of solar PV system.
- To study complete cell characterization.
- To study of various inverter systems for renewable energy sources.
- Study of PV Emulator and Grid Tied PV Simulator.

Semester III

- Project Dissertation-I
- Project Seminar-I
- Evaluation of Industrial Training

Semester IV

- Project Dissertation-II
- Project Work

Project Seminar –II (Presentation of the complete project work)

Faculty Details

Core Faculty

Dr. Indrajit Mukhopadhyay
Head, Solar Research & Development Centre
Ph. D. (Photoelectrochemical Solar Cell, IIT Bombay)

Dr. Abhijit Ray
Assistant Professor & Academic Co-ordinator
Ph. D. (IIT Kharagpur)

Dr. Manoj Kumar
Assistant Professor
Ph. D. (IIT Delhi)

Mr. Brijesh Tripathi
Lecturer
M. Sc. (CSJM University, Kanpur)

Dr. Balamurali Mayya
Assistant Professor
Ph. D. (Physical Research Laboratory, Ahmedabad)

Dr. Nanji Hadia
Assistant Professor
Post Doc., NTNU, Norway

Prof. Nitin Prajapati
Lecturer
M. E. (Applied Instrumentation)

Prof. Anurag Mudgal
Associate Professor
Ph. D. (IIT Delhi)

Visiting Faculty

Dr. Omkar Jani
Principal Research Scientist,
Solar Research Wing, GERMI
Ph. D. (Georgia Institute of Technology)

Prof. Laltu Chandra
Assistant Professor, IIT Jodhpur
Ph. D. (ForschungszentrumKarisruhe GmbH & University of Karisruhe, Germany)

Dr. Deepak Gadhia
Founder Trustee,
Muni Seva Ashram

Dr. T K Chaudhuri
Professor & Head,
Dr. K C Patel Research & Development Centre (KRADLE)
Ph. D. (IIT Kharagpur)

Prof. K D Patel
Associate Professor, Sardar Patel University
Ph. D.

Lab Facilities

Empirical experiences are pre-requisites for scientific and engineering education. The School has created a number of sector relevant engineering laboratories which are well equipped to facilitate the pedagogic and research process. State of the art equipment in these labs provides the students with an opportunity to gain hands on experience of the instruments which are used in industry.

With exposure to such great facilities, the students gain invaluable practical knowledge enabling them to meet the human talent requirements of industry as well as in research field.

Some of the functioning Laboratories and their equipments are:

MATERIALS PROCESSING LAB

In this lab, new materials for solar cells, electrodes and energy storage devices are processed by vacuum (Thermal Evaporation, Sputtering etc.) and non-vacuum technique (Spray, Spin, CBD, Electrodeposition etc.). The lab is equipped with CVD and Rapid thermal furnaces as well.

SEM LAB

SEM Lab is equipped with a Zeiss ULTRA FE-SEM system. High quality field emission scanning electron microscope imaging and energy dispersive X-ray studies are carried out in this lab.

XRD LAB

XRD Lab is equipped with a PANalytical powder-pro XRD system. High precision X-Ray diffraction spectroscopy of bulk and thin film specimen are carried out in this lab.

TEST & MEASUREMENT (TM) LAB

TM Lab houses electrical measurement systems for DC, AC and log signal measurements. Low temperature cryogenic cooling facility will be introduced shortly.

COMPUTATION LAB

Computation lab has R&D and professional computing facility such as, three workstation with quad-core processors. PDF-2 database, VASP-Abinitio Codes, ICSD database, Pearson database, Interface builder.

PHOTO-CHARACTERIZATION (PHC) LAB

PhC Lab is dedicated to test the developed solar cells and some specific thin films under artificial sunlight condition (AM 1.5G). This lab has UV-Vis spectrophotometer for optical characterization of thin films. Soon, this lab will be equipped with Photoluminescence spectrometer and Quantum Efficiency Measurement Systems.

ELECTROCHEMICAL CHARACTERIZATION LAB

This lab is dedicated to electrochemical and photo-electrochemical measurements for solar cells and supercapacitors. State of the art battery testing system is being used in the development of novel secondary battery electrodes.

PV SYSTEM AND DATA LOGGING LAB

The system lab has two important systems: PV emulator and Grid tied PV system trainer modules for real time data analysis form small (some hundreds of watts) and medium (few kW) size PV systems.

ORSP

The Office of Research and Sponsored Programs (ORSP) provides, to entire PDPU fraternity, support for the free and responsible conduct of investigative, scholarly and creative activities at Pandit Deendayal Petroleum University, Gandhinagar. The Office of Research & Sponsored Programs offers support from the initial stages of proposal development to grants management, publication and the transfer of technology. We provide internally funded grants, pre-award and post-award support for externally funded grants and offer education and support information on grant compliance and the responsible conduct of research.

SRDC

In addition to the establishment of research laboratories, the school of solar energy also established a center of excellence, the solar research development center (SRDC) for applied research in solar energy technologies with a view to interface the industrial need through academic excellence. The research areas include Silicon Photovoltaics, Multi junction materials and devices, New materials devices, Performance and Validation of quality with standard testing procedures. Also there are research projects undertaken in the area of Concentrated Solar Thermal, Concentrated Solar Photovoltaics and Balance of Systems for off-grid and distributed solar. With tremendous efforts in R & D at module level, field data validation, R & D in CSP, Energy policy and analysis, SRDC aims to be one of the strongest and best centres for doing advanced research and providing suitable solutions for harnessing cheaper solar energy.

SSE offers state-of-art facilities to the research students. The Laboratory can be divided into two broad areas – Device Fabrication Lab and Device Characterization Lab.

Device Fabrication Lab:

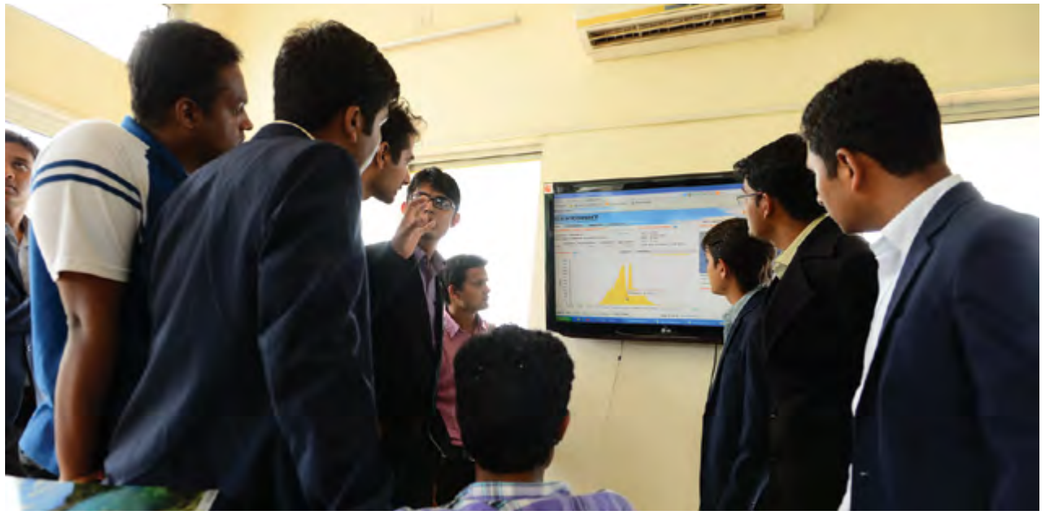
- DC sputtering - thin film coating
- RF Co-sputtering- oxide and metal film coating
- PVD system-metal coating by evaporation
- Spray Pyrolysis- oxide semiconductor deposition
- Spin Coater
- Deposition by cyclic voltammeter
- Hydrothermal method
- Temperature controlled vacuum furnace
- Open end tubular furnace for oxidation
- Glove Box
- PV modules with data logging facility
- LCPV system with tracker

Device Characterization Lab:

- X-ray Diffraction – Phase analysis
- FESEM- microstructure analysis
- Class AAA Solar Simulator;
- IV- Measurement System;
- Sunshine Recorder, Infrared Thermometer, Oscilloscope (15 MHz), Digital Oscilloscope (50 MHz);
- C-FIV (impedance) Measurement (30 MHz LCR);
- UV-visible spectrophotometer
- CH and Autolab Cyclic voltammeter
- Complete Solar Cell & Module characterization kits;
- lock-in amplifier;
- Solar simulating software
- VASP, TCAD, SCAPS

OIR

Office of International Relations (OIR)'s mission is to develop global professionals by providing international, educational exchange to the university students and to create visibility of the university in the global education scenario by collaborating with other reputed institutes and student exchange program



Gujarat Solar Park Visit

The purpose of industrial visit is to enhance the knowledge of students in practical field making them aware about the available technology, the progress industry has made and the problems that are arising in the technology applied. Being Masters students, this exposure and awareness would lead them to improvise the technology on a higher level and can have a better knowledge of the course they are studying and also provide an opportunity to identify the futuristic research requirement. With this broader objective a visit to Asia's largest Solar Park hub and world's first multi developer, multi facility, multi technology and multi beneficiary Solar Park located in 2,000-hectare (4,900-acre) plot of land near Charanka village in Patan district, northern Gujarat was organized. This is a dream project of Honorable Prime Minister of India Shri Narendra Modi.

The visit to Gujarat Solar Park has been extremely fruitful towards practical learning and knowing the current status of the market and available technologies. It also helped students to think inventively towards the demanding futuristic technologies and shape the progress of the solar sector. Interaction with the experts that are presently employed in the park also added to the smallest essential practical detail that one can miss out in 'only academics'. The morale and enthusiasm of students after the visit are surely high and they are inspired to innovate more in the field of Solar.

Student Activities/Achievements

1. Mr. Sanjay Behura selected for GSEP-Canada Commonwealth Scholarship (2011-12). Under this scholarship, he got an opportunity to work on 'Development of Graphene by CVD' in the group of Prof. Qioqin Yang during October 1, 2011 to June 30, 2012.
2. Ms. Khusbu Chauhan was invited to the University of Saskatchewan, Canada for the period September 1, 2012 to February 28, 2013 as a visiting scholar to carry out her research work and was International Student Representative of University of Saskatchewan.
3. Mr. Dipal Patel received best paper presentation at the ICRSI - 2013, Ahmedabad Gujarat.
4. Ms. Kavita Pandey was awarded INSPIRE fellowship sponsored by Department of Science and Technology.
5. Mr. Abhimanyu Yadav won Poster Competition - ICAER at IIT, Bombay.
6. Mr. Abhishek Kumar received best paper award for the contribution in ICMLEME '14, Dubai held on 8 - 9 January, 2014
7. Mr. Ankit Bhatt, Mr. Aditya Vyas & Mr. Abhisht Yadav stood runners-up in Research, Innovation, Incubation, Development & Entrepreneur - RIIDE, A poster competition held in PDPU in September 2013.
8. Students of M. Tech 2013-15 batch celebrated National Solar Shout Out Day on 21 January 2014 led by Mr. Vivek Tiwari.
9. Mr. Suhag Patel stood 3rd in poster competition at World Renewable Energy Technological Congress (WRETC) held in August, 2014.
10. Dr. Sanjay Behura was selected for 1 week summer school on 'Challenges in 2D materials' and 'CARBONHAGEN 2014' at Technical University of Denmark. This was supported by Department of Science and Technology, Govt. of India and Gujarat Energy Research and Management Institute, Gandhinagar.

Conclave/Symposium

BRIC SOLAR 2014

The maiden Conclave from School of Solar Energy was held on 18th February 2014. Delegates from various leading industries, organizations and universities were invited and the conclave was a huge success. As the name suggests 'Bridging Research and Industry Conclave on Solar' was an initiative to find a cusp between two completely different domains and as a result converge in healthy collaborations. High level delegates from industry shone light on students in various aspects and provided motivation for directions for research where industry seems to be lagging in current scenario. Ace academicians inspired students to carry out extensive research and provided the knowledge of how important the 'tools of thoughts' can be in field of research. School of Solar Energy believes such conclaves can be a milestone event for students that may redefine ones perspective on industry and research.

Research Accomplishments (Maiden research results and world record invention) between 1st April - 4th September, 2014

- Development of thin film photocathode for water splitting with ~ 100% faradic efficiency
- Tunable band gap Zinc Oxide/ Sulfide thin film for universal buffer layer to solar cells
- Electrodeposition of Nano-structured CdTe from IL at 80 oC
- Redox active IL: insight of the mechanism.
- Dynamic properties of Si solar cell: insight from Impedance measurements.
- Dynamic properties of DSSC: insight from Impedance Measurements.
- Perovskite solar cell from cheap and economic back contact at ambient condition
- New cheap and efficient back contact material based on PANI for perovskite solar cell

Research papers published in SCI impact factor journals from SSE between 1st April - 4th September, 2014

Sr. No.	Title	Name of Journals	2013 Impact Factor	Authors	Citation
1	Sputtered Cu doped sprayed SnS thin film for enhanced photo electrochemical and photovoltaic response	RSC Advances	4.7	M. Patel &Abhijit Ray	4 (2014) 39343
2	Evaluation of back contact in SnS solar cells by impedance spectroscopy	ACS Applied Materials and Interface	5.5	M. Patel &Abhijit Ray	6 (2014) 10099
3	GaN/InxGa1-xN/GaN P-I-N Solar Cell with Indium Compositional Grading	Optical and Quantum Electronics	0.98	P. Mahala, S. K. Behura, A. Ray, C. Dhanavantri and O. Jani	In-press
4.	Molar optimization of spray pyrolyzedSnS thin films for photo electrochemical applications	Journal of Alloys and Compounds	2.8	M. Patel, I. Mukhopadhyay and A. Ray	In-press
5.	Revealing the charge transport mechanism of a photo electrochemical cell: Analysis using AC voltage perturbation	PCCP	4.2	D. Patel, K. Chauhan and I. Mukhopadhyay	DoI: 10.1039/ C4CP01734J
6.	Unrevealing the photo electrochemical properties using ionic liquids: Cognizance of partially reversible redox activity	PCCP	4.2	D. Patel, K. Chauhan and I. Mukhopadhyay	DoI: 10.1039/ C4CP02683G
7.	On the electrical and interfacial properties of nano structured CdTeschottky diodes electrodeposited from an ionic liquid medium	J. Appl. Phys.	2.7	K. Chauhan and I. Mukhopadhyay	115 (2014) 224506

Project defended by faculty members during 1st April - 4th September, 2014:

Project title & cost	Funding agency	Presented by	Status
Development of metal nanowire based transparent conducting electrodes	DST-SERI	Dr. Abhijit Ray	Result awaited
Development of Active Negative Electrode Material…High Energy Density Li ion Battery	DST-SERI	Dr. Indrajit Mukhopadhyay	Result awaited

Project Details

1	Design & Development of Cost Effective Concentrator Photovoltaic (CPV) System (April 2010..till date)	PI: Dr. M. Kumar Co-PI: Mr. B. Tripathi
2	Fabrication and Characterization of TiO2 Nano-rod Based Dye Sensitized Solar Cells (DSSC) (April 2011…)	PI: Dr. M. Kumar Co-PI: Mr. B. Tripathi
3	Investigation of key factors to efficiency improvement in low cost Kesterite (CZTS) thin-film solar cells. (Sept. 2011..till date..)	PI: Dr. Abijit Ray Co PI: Prof. T. K. Chaudhuri (Other Uni.)
4	Development of CZTS solar cells and modules on glass and metallic substrates by non-vacuum processes. (Feb 2013…..)	PI: Dr. Abhijit Ray Co PI: Dr. I.Mukhopadhyay
5	Studies on the Electro deposition of Si and Ge at room temperature using less viscous ionic liquid (Dec 2011….)	PI: Dr. I.Mukhopadhyay
6	Development of New Anode Material for next Generation Li ion Batteries by Electro deposition of Si on the inner-surface of Nanospace carbon."	PI: Dr. I.Mukhopadhyay Co PI: Dr. Abhijit Ray

1 MW Solar PV Project installed at PDPU Gandhinagar, Gujarat

PDPU got a State-of-the-art 1 MW multi technology Photovoltaic grid-connected power plant installed in its campus in 2010. EverSun Energy Private Limited executed the turnkey EPC work of 1 MW Solar Photovoltaic Power Plant, through SunEdison Energy India Private Limited. This 1 MW project has encompassed in its design, for the first time in India and Asia, different technologies in a demonstration basis.

The project has got crystalline silicon panels of 230Wp, Thin Film micro crystalline amorphous panels of 140Wp, both on fixed axis mounting, Concentrating PV panels of 220Wp with Tracker based system, string inverters, central inverters apart from variety of protection features and systems, evacuating to a 11 KV Grid. The project was completed on 31st December, 2010, and after initial trials started regular generation from 5th January, 2011. The execution from start to finish was completed in a landmark timeline of 90 days and overall project time of 106 days.

The benefits’ accruing to Gujarat include generation annually of minimum 1.5 million units of electricity, enables 1500 All Electric Homes to be powered, reduces Carbon Dioxide to the extent of 1500 tons annually and help protect the environment. The students also get a great practical exposure by studying the different working system of the plant on its campus.

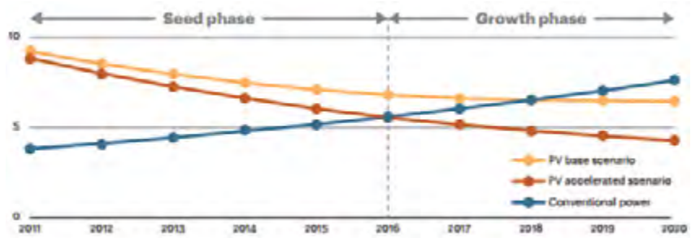
Solar Energy Potential in India

Among the various renewable energy resources, solar energy potential is the highest in India. In most parts of India, clear sunny weather is experienced 250 to 300 days a year. The annual radiation varies from 1600 to 2200 kWh/m2, which is comparable with radiation received in the tropical and sub-tropical regions. The equivalent energy potential is about 6,000 million GWh of energy per year.

The National Action Plan on Climate Change also points out: “India is a tropical country, where sunshine is available for longer hours per day and in great intensity. Solar energy, therefore, has great potential as future energy source. It also has the advantage of permitting the decentralized distribution of energy, thereby empowering people at the grassroots level”.

With the objective to establish India as a global leader in solar energy, Central and State Governments and various agencies are putting great efforts for promoting solar energy helping various stakeholders to understand the challenges and opportunities in the development of solar power and nurture the solar industry and provide the stimulus it needs to provide energy security to the nation.

Cost of Energy through Solar and conventional ways:



Energy Cost (Rupees per KWh)
NOTE: PV base scenario is a 6 % yearly cost decrease and the accelerated scenario is 8%. Conventional Price assumes 8%yearly increase.

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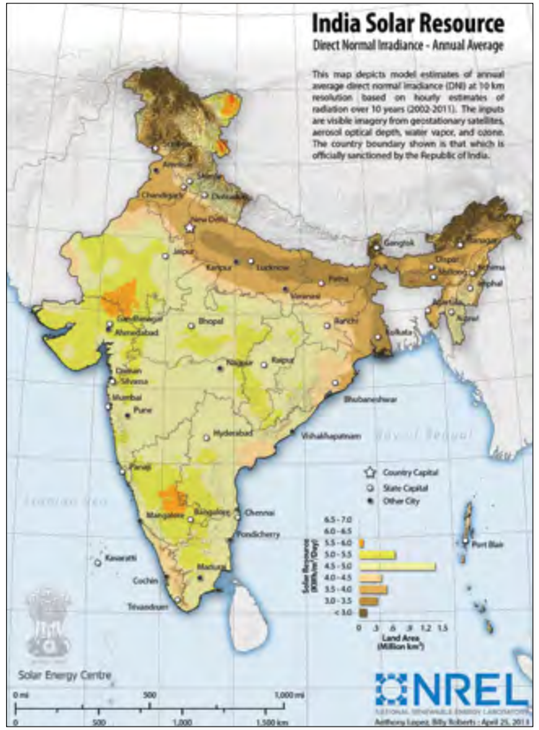


STUDENT PROFILE M.TECH 2013-15

ABHISHT YADAV

Age	:	24
E-Mail	:	abhisht.ymt13@sse.pdpu.ac.in
Summer Internship	:	Gujarat Energy Research Management Institution (GERMI)
Qualification	:	B.Tech (Applied Electronics and Instrumentation), Uttar Pradesh Technical University
Work Experience	:	Fresher

Areas of Interest : Smart Grid & Micro Grid, Concentrated Photo Voltaics, Rural Electrification, PV System Designing and Automation, EPC

Aspirations : I aspire to work in the area of micro grid and mini grid integrating Solar PV. Also would like to work on Concentrated Photo-voltaic System, Photo-voltaic system design, Tracking Automation, Engineering, Procurement and Commissioning of hybrid renewable power plants (such as bio-gas and solar PV) for Rural Electrification

ADITYA VYAS

Age	:	23
E-Mail	:	aditya.vmt13@sse.pdpu.ac.in
Summer Internship	:	Gujarat Energy Research Management Institution (GERMI)
Qualification	:	B.Tech (Electrical Engineering), Rajasthan Technical University
Work Experience	:	Fresher

Areas of Interest : PV System Design, EPC, Load Management, Renewable Integration, Smart Grid, Battery

Aspirations : Having career focus on Engineering, Procurement, Commissioning and Maintenance of MW scale Solar Photo voltaic Plant, Smart Grid which includes Load Management, Smart Metering, Automation, Renewable Integration and procedural analysis of grid, also Rooftop Solar PV, Energy Storage Devices and their Management.

SHAIL BAJPAI

Age	:	22
E-Mail	:	shail.bmt13@sse.pdpu.ac.in
Summer Internship	:	Gensol Engineering Pvt. Ltd.
Qualification	:	B.E (Electrical Engineering), Gujarat Technological University
Work Experience	:	Fresher

Areas of Interest : EPC of Solar PV Power plant, Smart grid, Photovoltaic Science and Technology, Hybrid Energy Systems, Energy storage technology.

Aspirations : My vision is to grow along with the growth of organization and to combine my passion for engineering, with the ability to generate innovative ideas so as to achieve organizational goals effectively and efficiently.

ANKIT BHATT

Age	:	23
E-Mail	:	ankit.bmt13@sse.pdpu.ac.in
Summer Internship	:	Gujarat Energy Research Management Institution (GERMI)
Qualification	:	B.E (Electrical Engineering), Gujarat Technological University
Work Experience	:	Visiting Lecturer at Govt. Girls Polytechnic (8 months)

Areas of Interest : Solar PV system Design, Nano Photonics, Load Management System

Aspirations : I believe in INFINITY - 'The Infinite Potential of Sun'. It only motivates me to believe in my own infinite potential and with this belief I want to apply my knowledge and skills in developing the mesmerizing technology of solar energy and thus play my part for a greener, better world. I am motivated to accomplish the challenges in designing a PV plant and also providing solutions for micro grid and smart grid systems. I am efficiently involved in research projects of characterizing solar cell using enhancement of Plasmon Resonance effect too.

CHANDNI SHAH

Age	:	24
E-Mail	:	chandni.smt13@sse.pdpu.ac.in
Summer Internship	:	Solar Reseach & Development Center (SRDC), PDPU
Qualification	:	B.Tech (Electronics & Instrumentation), Gautam Buddha Technical University
Work Experience	:	Shri Onkar Paper and Board Mills Pvt Ltd. (18 months)

Areas of Interest : R &D (Thin Film Deposition), Photovoltaics, PV Plant Engineering

Aspirations : Pursue a career in Solar Engineering which utilizes and harness fundamental engineering and problem solving concepts, and complements strong communication and teamwork skills with a clear goal offacilitating a positive, ambitious, and productive culture in the solar industry as much as possible while enjoying my field of interests. These include R & D in Thin film material, Characterisation and Photovoltaics, Supercapacitors and PV plant engineering

ALPESH DESAI

Age	:	24
E-Mail	:	alpesh.dmt13@sse.pdpu.ac.in
Summer Internship	:	Topsun Energy Ltd.
Qualification	:	B.E (Electrical & Electronics), Gujarat University
Work Experience	:	22 Months in Prasad GwkCooltech Pvt. Ltd. (Electical & Electronics Engineer)

Areas of Interest : PV Plant viz. Design, R & D, Production, Installation and generation in the field of Solar energy, Smart Grid Technology and policy implementation of renewable energy.

Aspirations : To develop a professional career at Renewable energy field, where I can apply the knowledge, talents and ideas that I have for the company that offers me the opportunity to work, showing my integrity, honesty, commitment and excellence; participating actively that promote the continuous success.

HEEMA JOSHI

Age : 23
E-Mail : heema.jmt13@sse.pdpu.ac.in
Summer Internship : Gujarat Energy Research Management Institution (GERMI)
Qualification : B.E (Instrumentation and Control), Saurashtra University
Work Experience : 12 months as a maintenance engineer in Reliance Industries Ltd., Jamnagar and 12 Months as a lecturer in Christ Polytechnic, Rajkot

Areas of Interest : EPC, smart grid, communication of Smart Grid and solar power Generation and maintenance and automation.

Aspirations : Aim to work in the field of power management system (smart grid) especially Distribution-Automation, Communication Infrastructure and Procedural Analysis, also would like to work on energy storage system's automation and management. Installation, Commissioning and Maintenance of MW scale photovoltaic plant as well as Rooftop solar power plant.

VARUN JOSHI

Age : 22
E-Mail : varun.jmt13@sse.pdpu.ac.in
Summer Internship : Bergen Solar Power & Energy Ltd.
Qualification : B.E (Mechanical Engineering), Gujarat Technical University, Diploma (Mechanical Engineering) Nirma University, Ahmedabad
Work Experience : Fresher

Areas of Interest : Concentrating Solar Power Technologies, Solar Thermal Engineering, Heat Transfer &Thermo fluid systems, Photovoltaic devices and Galvanic Energy Storage. Characterization & Testing of semiconductors.

Aspirations : To utilize my skills as a Mechanical Engineer, coupled towards a challenging career in a growth oriented and leading edge Energy Organization that recognizes and values individual contribution and which will provide opportunities for contributing growth and advancement.

KAUSHIK NATARAJAN

Age : 22
E-Mail : kaushik.nmt13@sse.pdpu.ac.in
Summer Internship : Fuel Cell Materials and Catalysis section, Chemistry Division, Bhabha Atomic Research Centre, Mumbai
Qualification : B.E (Electronics Engineering), University of Mumbai
Work Experience : Fresher

Areas of Interest : Electronic and Optoelectronic Devices, Photovoltaic devices and technology, Galvanic Energy Conversion and Storage, Surface Science and Engineering, Characterization & Testing of semiconductors, Instrumentation.

Aspirations : To pursue R&D and/or managerial activities within the PV and Energy storage industries in a challenging and stimulating environment, which will allow me to learn and contribute to the maximum possible extent within the organization and to grow alongside of it.

AMANDEEP SINGH MAKHIJA

Age : 22
E-Mail : amandeep.mmt13@sse.pdpu.ac.in
Summer Internship : Gensol Engineering Pvt. Ltd.
Qualification : B.Tech (Electrical engineering), CHARUSAT University
Work Experience : Fresher

Areas of Interest : EPC, Inverter manufacturing, PV power Plant designing, Smart Grid

Aspirations : I aspire to work in the broad spectrum of Opportunities within photovoltaic power plants including technical and financial aspects as well as smaller-scale, more direct applications of solar power as in panel installation. Over time, I expect to be able to enhance my knowledge level as well as make useful contribution to the enhancement of personal and professional skills.

SIDDHARTH MARTHAK

Age : 21
E-Mail : siddharth.mtmt13@sse.pdpu.ac.in
Summer Internship : Topsun Energy Ltd.
Qualification : B.E (Electronics & Communication), Gujarat Technological University
Work Experience : Fresher

Areas of Interest : Solar EPC, Solar Tracking Systems, Battery / load management and control

Aspirations : I would like to work in the field of Solar Photovoltaics where I may be able to provide the benefit of my knowledge and skills of Electronics as well as Embedded Systems while learning the standard operating procedures. My area of interest lies in providing Solar Energy as a cost effective Renewable Energy to the society, making efficient stand-alone systems and EPC of Solar Photovoltaic Power plants.

URVI MEHTA

Age : 24
E-Mail : urvi.mmt13@sse.pdpu.ac.in
Summer Internship : Gujarat Energy Research & Management Institute (GERMI)
Qualification : B.E (Instrumentation and Control), Saurashtra University
Work Experience : 13 Months, Lecturer, Atmiya Institute Of Technology & Science

Areas of Interest : Smart Grid, Micro Grid, Advanced Metering Infrastructure, EPC, Smart Automation of Plant

Aspirations : Green Energy is today's talk of the world and being a student of Solar my prime motive lies in developing this technology to the extent that we can give the world and it's beings a better environment to reside in. My main focus lies in developing a solar technology which is completely or partially automatic which also include hybrid systems. I also aspire to work on Smart Grid incorporating Micro Grids, Automation using PLC, SCADA etc. for data enhancement & monitoring and on Smart Meters which leads to Net Metering. My interest also lies in Engineering, Procurement and Commissioning of the plant.

MAYURKUMAR PATEL

Age : 26
E-Mail : mayur.pmt13@sse.pdpu.ac.in
Summer Internship : Topsun Energy Ltd.
Qualification : B.Tech (Electronics & Telecommunication), AMIETE
Work Experience : 12 Months experience as Service Engineer in automation industries in Alteem Instruments

Areas of Interest : EPC, electrical controlling equipment &designing of inverter, charge controller, MPPT, policy implementation for solar energy

Aspirations : To develop a professional career at Renewable energy field, where I can apply my knowledge, talents and ideas which will be helpful for our nation. To apply the tools acquired throughout my professional studies and automation field experience for the improvement and the continuous learning, with the purpose of contribute with the growth of the company and the society in the areas of Marketing, Production, Quality, Planning, Administration, Purchasing and Logistic.

SANKET PATEL

Age : 22
E-Mail : sanket.pmt13@sse.pdpu.ac.in
Summer Internship : Gujarat Energy Research & Management Institute (GERMI)
Qualification : B.Tech (Electrical Engineering), Charotar University of Science & Technology (CHARUSAT)
Work Experience : Fresher

Areas of Interest : Smart Grid,Engineering, Procurement and Commissioning of solar rooftop as well as solar plant& Electrical Transmission & Distribution involving Renewable Integration.

Aspirations : I have worked in developing the MATLAB SIMULATION on STATIC COMPENSATOR (STATCOM) and its characteristics analysis of REACTIVE POWER. My main area of interest would be in the field of Solar Energy, Engineering, Procurement and Commissioning of SOLAR POWER PLANT as well as solar ROOFTOP. Beside this I am working in the field topic of RENEWABLE INTEGRATION encompassing in SMART GRID project

SUHAG PATEL

Age : 22
E-Mail : suhag.pmt13@sse.pdpu.ac.in
Summer Internship : Gujarat Energy Research & Management Institute (GERMI)
Qualification : B.E (Electrical Engineering), Gujarat Technological University
Work Experience : Fresher

Areas of Interest : Smart Grid & Micro Grid, Concentrated Photovoltaic, , Automation, EPC, Power Electronics, Solar cell Manufacturing, Integration of Renewable Energy.

Aspirations : As a Student of Energy sector, I aspire to work in the area of Engineering Procurement and Commissioning of Integrated renewable power plants and I would like to work in making a Power electronics Devices used for harnessing of Renewable Energy (such as Inverter, MPPT, Battery Charger, etc.) Also I would like to on Concentrated Photo-voltaic System, Smart Grid, Micro Grid and Manufacturing of solar cell.

TARANG SHAH

Age : 22
E-Mail : tarang.smt13@sse.pdpu.ac.in
Summer Internship : Bergen Solar Power & Energy Ltd.
Qualification : B.E (Mechanical Engineering), Ganpat University
Work Experience : Fresher

Areas of Interest : Solar Thermal, Low Concentrated PV, Combined Heat and Power Systems.

Aspirations : To become a successful person in the field of Solar Energy. To work in an innovative and challenging environment. With my hard work and passion I want to provide maximum success to organization and contribute my part in energy independence.

SHAMIK DASADHIKARI

Age : 23
E-Mail : shamik.dmt13@sse.pdpu.ac.in
Summer Internship : West Bengal Renewable Energy Development Agency
Qualification : B.Tech (Electrical Engineering), West Bengal University Of Technology
Work Experience : Fresher

Areas of Interest : EPC of Solar PVTechnology, Electrical Systems and Policy about Implementation of Renewable Energy

Aspirations : Enthusiasm to develop my professional career in energy field. An Engineering position it's critical due provides support to the production team, continuously researching new processes and/or modifications on them, in order to reach organizational goals. Communication, teamwork, availability & constancy are the required skills to get every single objective, always maintaining a continuous improvement behavior.

ANKURKUMAR SUTHAR

Age : 23
E-Mail : ankur.smt13@sse.pdpu.ac.in
Summer Internship : Topsun Energy Ltd.
Qualification : B.E (Electrical Engineering), Gujarat Technological University
Work Experience : 5 month as a lecturer in Government Polytechnics, Bhuj

Areas of Interest : EPC of Solar power plant, policy making, Protection of Solar Power Plant

Aspirations : To develop me at professional level in a position that demands the abilities and knowledge of Energy Systems and Technology(focused on solar) Engineering. To apply the tools acquired throughout my professional studies and labor experience for the improvement and the continuous learning, with the purpose of contribute with the growth of the company and the society in the areas of Marketing, Production, Quality, Planning, Administration, Purchasing and Logistic.

VIVEK TIWARI

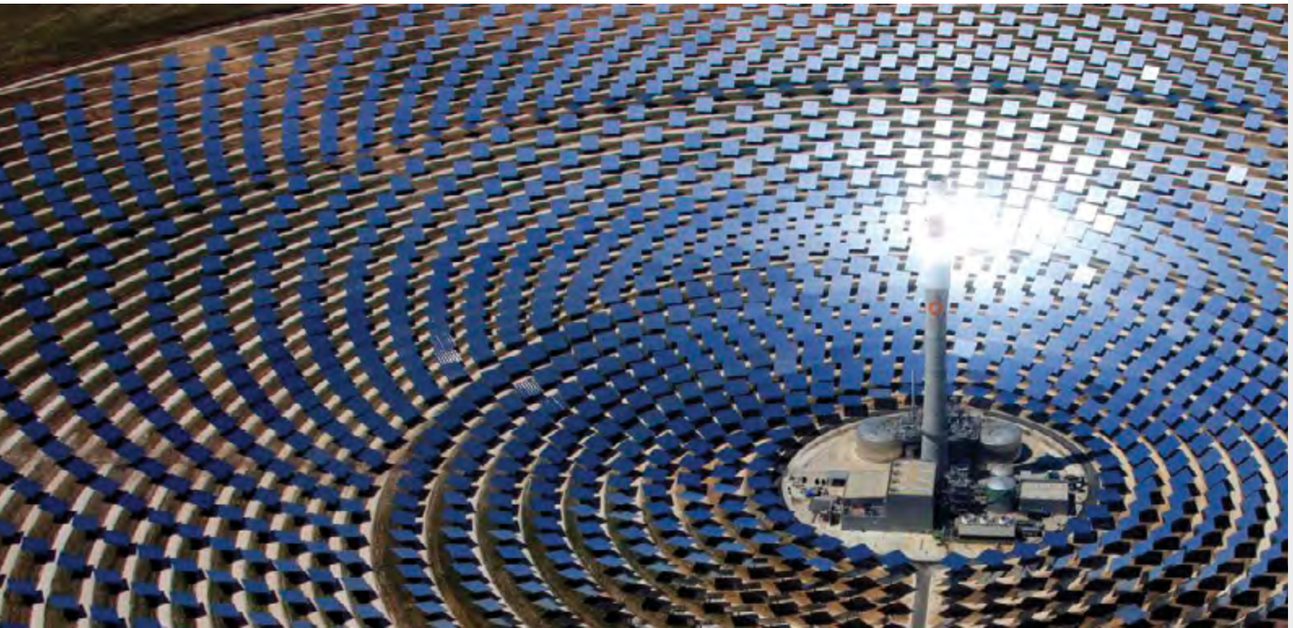
Age : 23
E-Mail : vivek.tmt13@sse.pdpu.ac.in
Summer Internship : Bergen Solar Power & Energy Ltd.
Qualification : B.E (Mechanical Engineering), Nagpur University
Work Experience : Fresher

Areas of Interest : Solar Thermal heating and cooling, Concentrated Solar Power, Phase-Change Materials & thermal storage, Engineering Procurement & Commissioning

Aspirations : To pursue a challenging career in the field of solar Engineering and creative renewable technologies in a progressive way that gives me scope to update my knowledge & skills and to be a part of the team that excel in work towards the development of the organization and gives me satisfaction thereof.

ALUMNI

NAME	CURRENT AFFILIATION
Neha Bansal	CGPIT
Sushma Mara	Nuevosol Energy Pvt. Ltd.
Siddharth Rathod	Mahindra & Mahindra Ltd.
Jaymin Gajjar	ADS Projects & Systems Pvt. Ltd.
Abhay Kumar	IIT Kharagpur
Abhishek Kumar	Bergen Solar Power & Energy Ltd.
Prashant Mishra	Bergen Solar Power & Energy Ltd.
Priyanka Marathey	Institute of Plasma Research
Hardik Bhatt	Harsha Abakus Solar
Rajesh Yadav	Shankersinh Vaghela Bapu University of Technology



STUDENTS ADMITTED IN M. TECH BATCH (2014-16)

BHESANIYA HARDIK DILIP
Age : 23 Years
B.E Electrical Engineering - Gujarat Technological University
Gate Score : 386

BHUTKA JIGNASHABEN KANJIBHAI
Age : 22 Years
B. Tech. Renewable Energy & Environmental Engg. - Sardarkrushinagar Dantiwada Agricultural University

CHAUHAN KAJAL RAJENRABHAI
Age : 21 Years
B.E. Electronics & Communication Engineering-Gujarat Technological University

JAYDEEP A SHARMA
Age : 22 Years
B.E Electrical Engineering - Gujarat Technological University
Gate Score : 340

JOSHI JIGAR HITENBHAI
Age : 22 Years
B.E Electrical Engineering - Gujarat Technological University

JOSHI SAUMYA SANJAYBHAI
Age : 22 Years
B.E Electronics & Communication Engineering-Gujarat Technological University

KORDE ABHISHEK SUJIT
Age : 22 Years
B.E Electronics & Communication Engineering-Gujarat Technological University

MAKAVANA AJAY PRAVINBHAI
Age : 21 Years
B.E Electronics & Communication Engineering-Gujarat Technological University

NISHANT VERMA
Age : 25 Years
B.E Electrical & Electronics Engineering- Chhattisgarh Swami Vivekananda Technical University
Gate Score : 396

PANDYA DIPKKUMAR MAHASHANKAR
Age : 22 Years
B.E Mechanical Engineering-Gujarat Technological University
Gate Score : 421

PARNAV BARGOTRA
Age : 22 Years
B.Tech Mechanical Engineering- Punjab Technical University
Experience: Trainee Design Engineer-Nilkamal Bito Storage Systems Pvt. Ltd.: 5 Months

PATEL NIYATI PARESHBHAI
Age : 21 Years
B.E Electronics & Communication Engineering-Gujarat Technological University

PATEL PARAG BHARATBHAI
Age : 23 Years
B.E Electronics & Communication Engineering-Gujarat Technological University
Gate Score : 428

PATEL ROSHANI NAVNEETKUMAR
Age : 21 Years
B.E Electronics & Communication Engineering-Gujarat Technological University
Gate Score : 354

PATEL URVESHKUMAR ASHWINBHAI
Age : 27 Years
B.E Electronics And Communication Engineering
Experience : 6 Year Teaching Experience in Gujarat Technological University
Gate Score : 364

RACHCHH RAVI SATISHBHAI
Age : 23 Years
B.E. Electronics and Communication Engineering, Gujarat Technological University
Experience : Ad-hoc Lecturer, 6 months in Gujarat Technological University
Gate Score : 416

RATHOD VISHAL MANSUKHBHAI
Age : 22 years
B.E Electrical Engineering - Gujarat Technological University
Gate Score : 485

RITIKA KATYAL
Age : 23 Years
B.E. Electronics and Communication Engineering, Punjab Technical University

VANPARIYA HARDIK ARVINDBHAI
Age : 22 Years
B.E. Electronics and Communication Engineering,Gujarat Technological University
Gate Score : 406

VYAS ARJUN KIRITBHAI
Age : 24 Years
B.E Mechanical Engineering, Sardar Patel University
Experience : Executive Engineer, L&T Ltd: 2 Years
Lecturer at SVNIT, Surat: 11 Months
Gate Score : 487

PH.D. STUDENTS

NAME	YEAR	RESEARCH TOPIC	DEGREE STATUS	SUPERVISOR / CO-SUPERVISOR
Malkeshkumar Patel	2009-2014	Spray deposited low cost CZTS and SnS based solar cells	Awarded - Aug 2014	Dr. Abhijit Ray / Dr. Indrajit Mukhopadhyay
Sanjay Kumar Behura	2009-2014	Graphene based solar cells	Awarded - Aug 2014	Dr. Omkar Jani / Dr. Indrajit Mukhopadhyay
Pramila Mahala	2009-2014 (expected)	InGaN based solar cells	Writing thesis	Dr. Omkar Jani / Dr. Abhijit Ray
Abhimanyu Yadav	2009-Persuing	Renewable DC sources integration	Synopsis to be submitted shortly	Dr. Makarand Lokhande / Dr. Abhijit Ray
Brijesh Tripathi	2010-1011	Dye sensitized solar cells	Awarded - Aug 2014	Dr. Manoj Kumar / Dr. Abhijit Ray
Dipal Patel	2010-2014 (expected)	PbO based photo electrochemical cells and interface physics	Synopsis to be submitted shortly	Dr. Indrajit Mukhopadhyay
Khushbu Chauhan	2010-2014 (expected)	Electrodeposited CdTe based solar cells	Writing thesis	Dr. Indrajit Mukhopadhyay
Pankaj Yadav	2011-Pursuing	Low concentrating photovoltaic systems	work in progress	Dr. Manoj Kumar
Cliff Kant	2011-Pursuing	Theoretical aspects of quantum confinements in improving solar cell efficiencies	work in progress	Dr. Balamurali K Mayya
Kavita Pandey	2012-Pursuing	Super capacitors	work in progress	Dr. Indrajit Mukhopadhyay
Nisarg Shah	2013-Pursuing	Electro deposition of Silicon	work in progress	Dr. Indrajit Mukhopadhyay
Dhyey Rawal	2013-Pursuing	TiO2 for solid state devices	work in progress	Dr. Abhijit Ray / Dr. Manoj Kumar
Margi Jani	2013-Pursuing	Catioinc and anionic doping in band engineered TCOs	work in progress	Dr. Abhijit Ray / Dr. Indrajit Mukhopadhyay
Parth Bhatt	2013-Pursuing	Perovskite based solar cells	work in progress	Dr. Manoj Kumar / Dr. Abhijit Ray
Anand Singh	2013-Pursuing	Smart grids	work in progress	Dr. Indrajit Mukhopadhyay
Arvind Chavada	2014-Pursuing	Copper oxide and chalcogenides for photo cathodes		Dr. Abhijit Ray / Dr. Indrajit Mukhopadhyay

Contact:
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