

Department of Renewable Energy

(Formerly known as Centre for Energy and Environment)



Rajasthan Technical University, Kota

Rawatbhata Road, Kota-324010

Rajasthan, India

Annual Report 2017

VISIT OF STUDENTS TO A WIND FARM ON THE WAY FROM KANYAKUMARI TO KAYATHAR, TAMIL NADU.



I. Administrative Activities During the Year 2017 :

1. Mr. Bharat Kumar Saxena has been appointed as guest faculty for the academic session 2017-18.

II. Activities of Faculty Members :

- (a) Dr. K. V. S. Rao, *Professor & Head*, Department of Renewable Energy, RTU, Kota:
 - i. Supervised four M.Tech. students leading to receive their degrees.
 - ii. Co-authored 28 research publications.
 - iii. Attended workshop on “Fundamentals of Solar Photovoltaics” organised by Department of Pure and Applied Physics, University of Kota, Kota on March 18th and March 21st, 2017.
 - iv. Accompanied 11 students in educational tour from 24th September to 11th October, 2017 to visit various places of Tamil Nadu and during paper presentation at St. Peter's College of Engineering and Technology, Chennai, Tamil Nadu.
 - v. Accompanied 5 students in educational tour from 21st to 28th December, 2017 to visit Kollam, Kerala during paper presentation at Amritapuri campus of Amrita Vishwa Vidyapeetham and to visit Mangalore and Coorg in Karnataka.
 - vi. Delivered invited lecture on “Promising Green Technologies for Reduction of Water Crisis in India” at *International Conference on Environmental Management and Green Technologies* held at Department of Civil Engineering, St. Peter's College of Engineering and Technology, Chennai, Tamil Nadu from 27th to 29th September, 2017.
 - vii. Chaired a session at *International Conference on Technological Advancements in Power & Energy -TAP Energy 2017* held at Amritapuri campus of Amrita Vishwa Vidyapeetham, Kollam from 21st to 23rd December 2017.
- (b) Mr. Bharat Kumar Saxena, *Guest Faculty*, Department of Renewable Energy, RTU, Kota:
 - i. Enrolled in Ph.D. (Renewable Energy) programme.
 - ii. Co-authored 23 research publications.
 - iii. Attended workshop on “Fundamentals of Solar Photovoltaics” organised by Department of Pure and Applied Physics, University of Kota, Kota on March 18th and March 21st, 2017.
- (c) Contribution by Faculty Members of Other Departments:
 1. Dr. Lata Gidwani, Assoc. Professor, Department of Electrical Engineering, RTU, Kota:
 - i. Supervised one M.Tech. student leading to receive his degree.
 - ii. Co-authored two research publications.
 2. Dr. Mahendra Lalwani, Assoc. Professor, Department of Electrical Engineering, RTU, Kota:
 - i. Supervised one M.Tech. student leading to receive his degree.
 - ii. Co-authored three research publications.
 3. Dr. Vivek Shrivastava, Assoc. Professor, Department of Electrical Engineering, RTU, Kota:
 - i. Co-authored four research publications.
 4. Dr. G. D. Agarwal, Assoc. Professor, Department of Mechanical Engineering, MNIT, Jaipur:
 - i. Co-authored two research publications.
 5. Dr. Namrata Sengar, Asst. Professor, University of Kota, Kota:
 - i. Supervised one M.Tech. student leading to receive her degree.



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III. Academic activities during the year 2017

A. Research Papers Presented in Conferences:

| S.No. | Name of the Conference | Paper Title | Authors |
|-------|--|--|---|
| 1. | <i>IEEE International Conference on Computation of Power, Energy, Information and Communication (ICCPEIC-2017)</i> held at Adhiparasakthi Engineering College, Melmaruvathur, Tamil Nadu from 22 nd and 23 rd March, 2017. | “A Comparative Study of Prediction of Hourly Slope Irradiation” DOI: 10.1109/ICCPEIC.2017.8290415 | Mr. Dhanesh Jain and Dr. Mahendra Lalwani |
| 2. | <i>IEEE International Conference on Computation of Power, Energy, Information and Communication (ICCPEIC-2017)</i> held at Adhiparasakthi Engineering College, Melmaruvathur, Tamil Nadu from 22 nd and 23 rd March, 2017. | “Economic and Financial Assessment of Integrated Solar and Wind Energy System in Rajasthan, India” DOI: 10.1109/ICCPEIC.2017.8290413 | Mr. Norat Mal Swarnkar and Dr. Lata Gidwani |
| 3. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baslios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Comparison of Smart Grid Development in Five Developed Countries with Focus on Smart Grid Implementations in India” DOI: 10.1109/ICCPCT.2017.8074195 | Ms. Akanksha Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 4. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baslios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Net Power Generated by Flettner Rotor for Different Values of Wind Speed and Ship Speed” DOI: 10.1109/ICCPCT.2017.8074170 | Mr. Akshay Lele and Dr. K.V.S. Rao |
| 5. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baslios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Design and Assessment of Solar Photovoltaic System for a Village of Rajasthan” DOI: 10.1109/ICCPCT.2017.8074274 | Ms. Ayushi Khandelwal And Dr. Vivek Shrivastava |



Ms. Divya Mittal, M.Tech. (RET) student receiving 2nd prize for best papers presented in the TAP Energy Conference Kollam, Kerala in Dec. 2017.



Prof. K.V.S. Rao delivering invited talk at IEEE conference held at St. Peters Engineering College, Chennai in Sept. 2017.



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| S. No. | Name of the Conference | Paper Title | Authors |
|--------|--|--|--|
| 6. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baselios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Prediction of Irradiation: A Comparative Study of ANFIS” DOI: 10.1109/ICCPCT.2017.8074227 | Mr. Dhanesh Jain and Dr. Mahendra Lalwani |
| 7. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baselios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Floating Solar Photovoltaic Systems: An Overview and their Feasibility at Kota in Rajasthan” DOI: 10.1109/ICCPCT.2017.8074182 | Ms. Divya Mittal, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 8. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baselios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Technical Analysis of Solar Pumping System based on Irrigation Requirement” DOI: 10.1109/ICCPCT.2017.8074254 | Ms. Gitika Dadhich and Dr. Vivek Shrivastava |
| 9. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baselios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Relevance of Hydrogen as an Alternative of Electricity for Energy Transmission and Transportation of Water in India” DOI: 10.1109/ICCPCT.2017.8074235 | Mr. Mayank Gautam, Dr. K.V.S. Rao and Mr. Bharat Kumar Saxena |
| 10. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baselios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Estimation of Energy Production and Net Metering of Grid Connected Rooftop Photovoltaic System in Rajasthan” DOI: 10.1109/ICCPCT.2017.8074181 | Ms. Monika Agrawal, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 11. | <i>IEEE International Conference on Circuit, Power and Computing Technologies (ICCPCT-2017)</i> held at Baselios Mathews II College of Engineering, Kollam, Kerala from 20 th & 21 st April, 2017. | “Grid Connected Solar PV System Design and Calculation by Using PV*SOL Premium Simulation Tool for Campus Hostels of RTU Kota” DOI: 10.1109/ICCPCT.2017.8074315 | Mr. Ronak Sharma and Dr. Lata Gidwani |



Paper presentation in ICCPCT -2017 at Kollam, Kerala.



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| S. No. | Name of the Conference | Paper Title | Authors |
|--------|--|--|---|
| 12. | <i>International Conference on Recent Advances in Materials, Mechanical and Civil Engineering (ICRAMMCE-2017)</i> held at Marri Laxman Reddy Institute of Technology and Management, Hyderabad, Telangana from 1 st and 2 nd June, 2017. | “Performance of Solar Water Pump for Irrigation: A Case Study of Village Peepalda Kalan in Kota, Rajasthan, India” | Mr. Harjot Singh, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 13. | <i>International Conference on Recent Advances in Materials, Mechanical and Civil Engineering (ICRAMMCE-2017)</i> held at Marri Laxman Reddy Institute of Technology and Management, Hyderabad, Telangana from 1 st and 2 nd June, 2017. | “Optimization of 10 kW Solar PV-Diesel Hybrid Energy System for Different Load Factors at Jaisalmer Location of Rajasthan India” | Mr. S. K. Saraswat and Dr. K.V.S. Rao |
| 14. | <i>International Conference on Recent Advances in Materials, Mechanical and Civil Engineering (ICRAMMCE-2017)</i> held at Marri Laxman Reddy Institute of Technology and Management, Hyderabad, Telangana from 1 st and 2 nd June, 2017. | “Case Study of Fly Ash Brick Manufacturing Units at Kota in Rajasthan” | Ms. Yogita Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 15. | <i>IEEE International Conference on Information, Communication, Instrumentation, and Control (ICICIC-2017)</i> held at Medi-Caps University, Indore, Madhya Pradesh from 17 th to 19 th August, 2017. | “Viability of Grid Connected Solar PV System for a Village of Rajasthan” DOI: 10.1109/ICOMICON.2017.8279175 | Ms. Ayushi Khandelwal and Dr. Vivek Shrivastava |



Paper presentation in ICRAMMCE-2017 at Hyderabad.



Paper presentation in SmartTech-2017 at Bengaluru.



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| S. No. | Name of the Conference | Paper Title | Authors |
|--------|---|--|--|
| 16. | <i>IEEE International Conference on Information, Communication, Instrumentation, and Control (ICICIC-2017)</i> held at Medi-Caps University, Indore, Madhya Pradesh from 17 th to 19 th August, 2017. | “Economic Comparison of Solar PV Water Pumping System with Diesel Pump” DOI: 10.1109/IC OMICON.2017.8279156 | Ms. Gitika Dadhich and Dr. Vivek Shrivastava |
| 17. | <i>IEEE International Conference on Smart Technologies for Smart Nation (SmartTechCon 2017)</i> held at REVA University, Bengaluru from 17 th to 19 th August, 2017. | “Estimation of Weibull Parameters and Wind Power Density at Different Heights for Akal Site at Jaisalmer in Rajasthan” ISBN: 978-1-5386-0586-4 | Ms. Akanksha Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 18. | <i>IEEE International Conference on Smart Technologies for Smart Nation (SmartTechCon 2017)</i> held at REVA University, Bengaluru from 17 th to 19 th August, 2017. | “Reduction in Carbon Dioxide Emission due to Wind Power Generation in India” ISBN: 978-1-5386-0586-4 | Mr. Bharatveer Singh Chouhan, Dr. K.V.S. Rao, and Mr. Bharat Kumar Saxena |
| 19. | <i>IEEE International Conference on Smart Technologies for Smart Nation (SmartTechCon 2017)</i> held at REVA University, Bengaluru from 17 th to 19 th August, 2017. | “Potential of Floating Photovoltaic System for Energy Generation and Reduction of Water Evaporation at Four Different Lakes in Rajasthan” ISBN: 978-1-5386-0586-4 | Ms. Divya Mittal, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 20. | <i>IEEE International Conference on Smart Technologies for Smart Nation (SmartTechCon 2017)</i> held at REVA University, Bengaluru from 17 th to 19 th August, 2017. | “Selection of Electrolyzer-Fuel Cell Combination for Supply of Water and Electricity in Remote Areas” ISBN: 978-1-5386-0586-4 | Mr. Mayank Gautam, Dr. K.V.S. Rao, and Mr. Bharat Kumar Saxena |
| 21. | <i>IEEE International Conference on Smart Technologies for Smart Nation (SmartTechCon 2017)</i> held at REVA University, Bengaluru from 17 th to 19 th August, 2017. | “Feasibility of Establishing Solar Photovoltaic Power Plants at Existing Wind Farms” ISBN: 978-1-5386-0586-4 | Ms. Monika Agrawal, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |



Visit of M.Tech. (RET) students to National Institute of Technology, Calicut.



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| S. No. | Name of the Conference | Paper Title | Authors |
|--------|---|--|--|
| 22. | <i>IEEE International Conference on Environmental Management and Green Technologies (ICEMGT)</i> held at St. Peter's College of Engineering and Technology, Avadi, Chennai from 27 th to 29 th September, 2017. | "Weibull Parameters and Wind Power Density Estimation at Different Heights for Lamba Site at Jamnagar in Gujarat" ISBN: 978-1-5090-4929-5 | Ms. Akanksha Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 23. | <i>IEEE International Conference on Environmental Management and Green Technologies (ICEMGT)</i> held at St. Peter's College of Engineering and Technology, Avadi, Chennai from 27 th to 29 th September, 2017. | "Fuel Saving Analysis in Ship Propulsion due to Application of Flettner Rotor" ISBN: 978-1-5090-4929-5 | Mr. Akshay Lele And Dr. K.V.S. Rao |
| 24. | <i>IEEE International Conference on Environmental Management and Green Technologies (ICEMGT)</i> held at St. Peter's College of Engineering and Technology, Avadi, Chennai from 27 th to 29 th September, 2017. | "Contribution of Hydel and Nuclear Power Plants for Carbon-Dioxide Emission Reduction in India" ISBN: 978-1-5090-4929-5 | Mr. Bharatveer Singh Chouhan, Dr. K.V.S. Rao, and Mr. Bharat Kumar Saxena |
| 25. | <i>IEEE International Conference on Environmental Management and Green Technologies (ICEMGT)</i> held at St. Peter's College of Engineering and Technology, Avadi, Chennai from 27 th to 29 th September, 2017. | "Economic Analysis of Floating Photovoltaic Plant in the Context of India" ISBN: 978-1-5090-4929-5 | Ms. Divya Mittal, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |



Paper presentation and participation by M.Tech. (RET) students in ICEMGT-2017 at Chennai.



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| S. No. | Name of the Conference | Paper Title | Authors |
|--------|---|---|---|
| 26 | <i>IEEE International Conference on Environmental Management and Green Technologies (ICEMGT)</i> held at St. Peter's College of Engineering and Technology, Avadi, Chennai from 27 th to 29 th September, 2017. | "Effect of Window Size and Window Orientation on Solar Chimney Performance in terms of Air Change per Hour" ISBN: 978-1-5090-4929-5 | Mr. Mayank Bhardwaj, Dr. G. D. Agrawal, and Dr. K.V.S. Rao |
| 27 | <i>IEEE International Conference on Environmental Management and Green Technologies (ICEMGT)</i> held at St. Peter's College of Engineering and Technology, Avadi, Chennai from 27 th to 29 th September, 2017. | "Harnessing Solar Energy from Wind Farms: Case Study of Four Wind Farms" ISBN: 978-1-5090-4929-5 | Ms. Monika Agrawal, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 28 | <i>IEEE International Conference on Environmental Management and Green Technologies (ICEMGT)</i> held at St. Peter's College of Engineering and Technology, Avadi, Chennai from 27 th to 29 th September, 2017. | "Economic Analysis of Two Grid Connected Biomass based Power Plants of Rajasthan, India" ISBN: 978-1-5090-4929-5 | Ms. Rashmi Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 29 | <i>IEEE International Conference on Environmental Management and Green Technologies (ICEMGT)</i> held at St. Peter's College of Engineering and Technology, Avadi, Chennai from 27 th to 29 th September, 2017. | "Analysis of Energy Conservation by Building Envelope in Five Climatic Zones" ISBN: 978-1-5090-4929-5 | Ms. Yogita Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 30 | <i>IEEE International Conference on Technological Advancements in Power and Energy (TAP Energy 2017)</i> held at Amritapuri campus of Amrita Vishwa Vidyapeetham, Kollam, Kerala from 21 st to 23 th Dec. 2017. | "Comparison of Wind Speed, Wind Directions, and Weibull Parameters for Sites having same Wind Power Density" ISBN: 978-1-5386-4022-7 | Ms. Akanksha Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |



Visit to wooden palace Padmanabhapuram near Trivandrum during the month of October.



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| S. No. | Name of the Conference | Paper Title | Authors |
|--------|---|---|---|
| 31. | <i>IEEE International Conference on Technological Advancements in Power and Energy (TAP Energy 2017)</i> held at Amritapuri campus of Amrita Vishwa Vidyapeetham, Kollam, Kerala from 21 st to 23 th Dec. 2017. | “Comparison of Floating Photovoltaic Plant with Solar Photovoltaic Plant for Energy Generation at Jodhpur in India” ISBN: 978-1-5386-4022-7 | Ms. Divya Mittal, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 32. | <i>IEEE International Conference on Technological Advancements in Power and Energy (TAP Energy 2017)</i> held at Amritapuri campus of Amrita Vishwa Vidyapeetham, Kollam, Kerala from 21 st to 23 th Dec. 2017. | “Performance Study of Solar Photovoltaic Water Pump used for Irrigation at Jaipur in Rajasthan, India” ISBN: 978-1-5386-4022-7 | Mr. Harjot Singh, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 33. | <i>IEEE International Conference on Technological Advancements in Power and Energy (TAP Energy 2017)</i> held at Amritapuri campus of Amrita Vishwa Vidyapeetham, Kollam, Kerala from 21 st to 23 th Dec. 2017. | “Reduction in Liquid Hydrogen by Weight due to Storage in Different Sizes of Containers for Varying Period of Time” ISBN: 978-1-5386-4022-7 | Mr. Mayank Gautam, Dr. K.V.S. Rao, and Mr. Bharat Kumar Saxena |
| 34. | <i>IEEE International Conference on Technological Advancements in Power and Energy (TAP Energy 2017)</i> held at Amritapuri campus of Amrita Vishwa Vidyapeetham, Kollam, Kerala from 21 st to 23 th Dec. 2017. | “Optimization of Solar Chimney for Ventilation in Buildings using Taguchi Method” ISBN: 978-1-5386-4022-7 | Mr. Mayank Bhardwaj, and Dr. G. D. Agrawal |
| 35. | <i>IEEE International Conference on Technological Advancements in Power and Energy (TAP Energy 2017)</i> held at Amritapuri campus of Amrita Vishwa Vidyapeetham, Kollam, Kerala from 21 st to 23 th Dec. 2017. | “Estimation of Weibull Parameters and Wind Power Density at a Wind Farm Site of Jogimatti at Chitradurga in Karnataka” ISBN: 978-1-5386-4022-7 | Mr. Mohammad Mohsin, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |



Paper presentation in TAP Energy 2017 at Kollam, Kerala. View of Arabian Sea from Amritapuri campus, Kollam, Kerala.



B. Research Papers Published in Journals:

| S. No. | Name of the Journal | Title of the Paper | Authors |
|--------|--|---|---|
| 1* | Applied Mechanics and Materials Vol.877, pp. 378-383 ISSN: 1662-7482 DOI: 10.4028/www.scientific.net/AMM.877.378 @ 2018 Trans Tech Publications Switzerland | “Effect of Skin Friction Coefficient on Power Developed by Flettner Rotor System for Ship Propulsion” | Mr. Akshay Lele and Dr. K.V.S. Rao |
| 2* | Applied Mechanics and Materials Vol. 877, pp. 360-365. ISSN: 1662-7482 DOI: 10.4028/www.scientific.net/AMM.877.360 @ 2018 Trans Tech Publications Switzerland | “Levelized Cost of Electricity and Plant Load Factor of 7.5 MW Grid Connected Biomass Power Plant” | Ms. Rashmi Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |
| 3. | International Journal of Renewable Energy Research Vol. 7, No. 3, pp. 1053-1061, 2017 ISSN: 1309-0127 | “A Review on Optimal inclination Angles for Solar Arrays” | Mr. Dhanesh Jain and Dr. Mahendra Lalwani |

* Papers were presented in ICRAMMCE-2017 conference held at Hyderabad.



Visit of M.Tech. (RET) students to ISHA foundation at Coimbatore, Tamil Nadu.



C. Research Papers Accepted in Conferences:

| S. No. | Name of the Conference | Title of the Paper | Authors |
|--------|--|---|---|
| 1. | <i>IEEE International Conference on Green Buildings and Sustainable Engineering (GBSE2018)</i> held at Rajagiri School of Engineering and Technology, Cochin, Kerala from 24 th and 25 th January. 2018. | “Techno-Economic Analysis of a grid Connected Hybrid Solar-Wind Energy System” | Ms. Monika Agrawal Mr. Bharat Kumar Saxena and Dr. K.V.S. Rao |
| 2. | <i>IEEE International Conference on Green Buildings and Sustainable Engineering (GBSE2018)</i> held at Rajagiri School of Engineering and Technology, Cochin, Kerala from 24 th and 25 th January. 2018. | “Energy Savings in Building by using Insulating Materials at Different Climatic Zones of India” | Ms. Yogita Sharma, Mr. Bharat Kumar Saxena, and Dr. K.V.S. Rao |



Visit of M.Tech. (RET) students to Kudankulam Nuclear Power Plant at Kudankulam, Tamil Nadu.



Visit to Wind farm at Bhainsara, Jaisalmer.



Visit to Rays Solar Park at Gajner, Bikaner.



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D. Workshops/Conferences Attended by M.Tech. (Renewable Energy Technology) Students :

| S. No. | Name of Workshop/Conference | Name of Students | Date of Workshop/Conference | Venue |
|--------|---|--|--|---|
| 1. | Thermal Power Plant Familiarization | Ms. Archana Maan Mr. Dhanesh Jain Ms. Gauranshi Saxena Mr. Moham mad Mohsin Ms. Radhy Rani Nagar Mr. Swapnil Singh Mr. Vineet Kumar Mahaver | 11 th -13 th January 2017 | Electrical Department RTU, Kota |
| 2. | Writing Academic Publications | Ms. Monika Agrawal Ms. Rashmi Sharma Mr. Santosh Saraswat Mr. Vineet Kumar Mahaver | 16 th -18 th March 2017 | IIT, Gandhinagar |
| 3. | Fundamentals of Solar Photovoltaics | Mr. Akshay Lele Ms. Ayushi Khandelwal Mr. Dhanesh Jain Ms. Gitika Dadhich Mr. Moham mad Mohsin Ms. Radhy Rani Nagar Mr. Swapnil Singh Mr. Vikas Verma Mr. Vineet Kumar Mahaver | 18 th & 21 st March 2017 | Department of Pure and Applied Physics, University of Kota |
| 4. | National Training Course on Wind Energy Technology | Ms. Akankasha Sharma Ms. Archana Maan Mr. Bharatveer Singh Ms. Gauranshi Saxena | 20 th -27 th March 2017 | National Institute of Wind Energy (NIWE), Chennai |
| 5. | International Conference on Environmental Management and Green Technologies | Ms. Archana Maan Ms. Gauranshi Saxena Mr. Mayank Gautam Mr. Mohammad Mohsin Ms. Radhy Rani Nagar Mr. Swapnil Singh Mr. Vikas Verma Mr. Vineet Kumar Mahaver | 27 th -29 th September, 2017 | St. Peter's College of Engineering and Technology, Chennai |



Participation of M.Tech. (RET) students in workshop on Writing Academic Publications at IIT, Gandhinagar.



Participation of M.Tech. (RET) students in national training course at NIWE, Chennai.

E. Industrial Visits and Educational Tours Conducted :

1. One student Mr. Harjot Singh visited manufacturing plant of Jain Irrigation System Ltd. Jalgaon, Maharashtra during February 5th-9th, 2017.
2. Five students namely Ms. Monika Agarwal, Mr. Mohammad Mohsin, Ms. Radhy Rani Nagar, Mr. Swapnil Singh, and Mr. Vineet Kumar Mahaver visited wind farms of Inox wind (504 MW) and Orange Jaisalmer Wind Energy Pvt. Ltd. (39.9 MW) at Jaisalmer. They also visited a solar thermal power plant of Godawari Green Energy Ltd (40 MW) at Nokh, Jaisalmer and two solar photovoltaic plants of Rays Solar Park (2 MW of Sharma Industries and 10 MW of Rishabh Energy) during March 22nd-25th, 2017.
3. Three students namely Ms. Akanksha Sharma, Ms. Divya Mittal, and Mr. Mayank Gautam visited 10 kW floating PV plant at Banasura Sagar Dam by Vatsaa Energy Pvt. Ltd. at Wayanad and NIT Calicut during April 16th-26th, 2017.
4. One student Mr. Harjot Singh visited solar water pump installation at Bikaner, Rajasthan during May 14th-19th, 2017.
5. Five students namely Ms. Akanksha Sharma, Ms. Divya Mittal, Mr. Bharatveer Singh, Mr. Mayank Gautam, and Mr. Mayank Bhardwaj were on educational tour from 24th September to 3rd October, 2017. During which they have attended IEEE International Confernece, ICEMGT-17 at St. Peter's College of Engineering and Technology, Chennai from 27th to 29th September. Four students presented their papers in this conference.



Visit to Jain Irrigation Systems Ltd. at Jalgaon.



Visit to floating PV plant at Banasura Sagar Dam at Wayanad, Kerala.



Visit to Wind Turbine Test Station, NIWE, Kayathar, Tamil Nadu.



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6. Eleven students namely Mr. Akshay Lele, Ms. Archana Maan, Ms. Gauranshi Saxena, Mr. Mohammad Mohsin, Ms. Monika Agrawal, Ms. Radhy Rani Nagar, Ms. Rashmi Sharma, Mr. Swapnil Singh, Mr. Vikas Verma, Mr. Vineet kumar Mahaver, and Ms. Yogita Sharma along with Prof. K.V.S. Rao were on educational tour from 24th September to 11th October, 2017 during which they attended IEEE International Confernece, ICEMGT-17 at St. Peter's College of Engineering and Technology, Chennai from 27th to 29th September. Four students presented their papers in this conference. They visited Ramanujan IT city (Green building) Gold Certified at Chennai. They toured Sengulam power house, Anayirankal Dam, and Kanan Devan Hill Plantation (KDHP) tea manufacturing unit at Munnar on 1st and 2nd October 2017. They also visited solar power plant at Cochin airport on 2nd October 2017. They visited Wind Turbine Test Station (WTTS) of National Institution of Wind Energy at Kayathar on 3rd Oct. 2017. They visited the Kudankulam Nuclear Power Plant at Kudankulam on 5th Oct. 2017. They also visited the Isha Foundation on 7th October at Coimbatore.
7. Five students namely Ms. Akanksha Sharma, Ms. Divya Mittal, Mr. Harjot Singh, Mr. Mayank Bhardwaj, and Mr. Mohammad Mohsin along with Prof.K.V.S. Rao were on educational tour from 21st to 28th December, 2017 during which they have attended IEEE International Conference, TAP Energy 2017 at Amrita Vishwa Vidyapeetham, Amritapuri campus, Kollam from 21st to 23rd December. They also toured Harangi Dam at Coorg on 26th December 2017.



Visit to Anayirankal Dam site at Munnar, Kerala.



Visit to Sengulam hydel power plant on Periyar river near Adimali on the way from Munnar to Cochin.



F. Awards and Prizes Won :

1. Mr. Santosh Kumar Saraswat was awarded 1st prize for best paper presentation for his paper titled “Optimization of off-grid SPV-Diesel Hybrid Energy System for Different Electric Loads at Jaipur in Rajasthan, India” at *National Conference on Green Energy and Technology for Sustainable Future (NCGET-16)* at Department of Petrochemical Technology BIT Campus, Anna University, Tiruchirappalli, Tamil Nadu from 16th and 17th September, 2016.
2. Ms. Divya Mittal was awarded 2nd prize in 'Prof. Muhammad H. Rashid Best Paper Award' for her presentation of paper titled “Comparison of Floating Photovoltaic Plant with Solar Photovoltaic Plant for Energy Generation at Jodhpur in India” at *IEEE International Conference on Technological Advancements in Power and Energy (TAP Energy 2017)* held at Amritapuri campus of Amrita Vishwa Vidyapeetham, Kollam, Kerala from 21st to 23rd December, 2017.



M.Tech. (RET) students receiving certificate during ICEMGT conference at Chennai.



Paper presentation in ICCEPIC 2017 at Tamil Nadu.



Visit to Ramanujan IT City (Green Building) Gold certified at Chennai.



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G. Seminars Presented by Students at the Department :

| S. No. | Roll Number | Student Name | Seminar Topics | Name of the Seminar Guide |
|--------|-------------|--------------------------|---|---------------------------|
| 1. | 16EUCRE600 | Ms. Archana Maan | Battery Energy Storage Systems | Prof. K. V. S. Rao |
| 2. | 16EUCRE601 | Ms. Gauranshi Saxena | Super Capacitor Energy Storage System | Prof. K. V. S. Rao |
| 3. | 16EUCRE604 | Mr. Mohammad Mohsin | Weibull Distribution: A tool for Wind Power Estimation | Prof. K. V. S. Rao |
| 4. | 16EUCRE606 | Ms. Radhy Rani Nagar | Energy Storage Technology | Prof. K. V. S. Rao |
| 5. | 16EUCRE608 | Mr. Swapnil Singh | Study of V-trough and Thermosyphon Solar Water Heater | Prof. K. V. S. Rao |
| 6. | 16EUCRE609 | Mr. Vineet Kumar Mahaver | Design and Economic Evaluation PV-Biomass Hybrid System | Prof. K. V. S. Rao |
| 7. | 15ECERE613 | Mr. Vikas Verma | Reducing CO ₂ Emission in Ship Propulsion | Prof. K. V. S. Rao |



Visit to historic wooden palace of Padmanabhapuram in April.



Visit to Harangi Reservoir at Coorg, Karnataka.



M.Tech. (RET) students experiencing scenic beauty of Munnar.



DEPARTMENT OF RENEWABLE ENERGY

H. Thesis Examination and Viva-Voce of M. Tech. (RET) Students Conducted at the Department :

| S. No. | Name of Students | Thesis Title | Supervisor | Date of Oral Examination |
|--------|---|---|---|-----------------------------|
| 1. | Mr. Dhanesh Jain Enrolment No.: 14E2CEREM40P604 | Analysis of Optimal Inclination Angles for Solar Photovoltaic Arrays | Dr. Mahendra Lalwani | 15 th June, 2017 |
| 2. | Mr. Rajendra Kumar Enrolment No.: 14E2CEREM30P611 | Performance Analysis of Three Wind Farms in Rajasthan | Prof. K.V.S. Rao | 15 th June, 2017 |
| 3. | Mr. Santosh Kumar Saraswat Enrolment No.: 14E2CEREM40P615 | Optimization of Solar PV- Diesel Power Plant for Different Locations of India | Prof. K.V.S. Rao | 15 th June, 2017 |
| 4. | Mr. Akshay Lele Enrolment No.: 14E2CEREM40P601 | Some Studies of Wind Assisted Ship Propulsion Systems with Emphasis on Flettner Rotor | Prof. K.V.S. Rao | 2 nd Nov 2017 |
| 5. | Mrs. Manpreet Kaur Enrolment No.: 13E2CEREF4XP607 | Study of Power Demand Supply and Potential of Solar Power in Rajasthan | Dr. Namrata Sengar and Prof. K.V.S. Rao | 4 th Dec 2017 |
| 6. | Mr. Norat Mal Swarnkar Enrolment No.: 14E2CEREM30P608 | Economic Analysis of Hybrid Energy System in Rajasthan, India | Dr. Lata Gidwani | 4 th Dec 2017 |

1. **Mr. Dhanesh Jain :** In this study, R-software with different models, Linear Regression Model, and Adaptive Neural Fuzzy Interference System model with various different member functions are implemented to predict the value of global solar irradiance on tilted plane and comparative study has been done. This study analyzes the optimum tilt angle and orientation angle (surface azimuth angle) of solar photovoltaic array in order to get maximum solar irradiance and to reduce variance of radiation at different sets of subsets of time periods. Artificial Neural Network is used to predict the solar radiation. Optimum combination of tilt angle and orientation angle is computed with the help of optimization algorithm.
2. **Mr. Rajendra Kumar :** This thesis deals with performance evaluation and levelized cost of electricity of three grid connected wind farms located in Sikar and Jaisalmer districts of Rajasthan, India.
 - (i) Performance of a 7.2 MW wind farm at Harshnath hills, Sikar which has 12 wind turbines of Enercon E-40/6.44 model (600 kW) is evaluated.



World's first airport fully powered by solar energy at Cochin, Kerala.



- (ii) Performance of a 102.9 MW wind farm at Jaisalmer containing 49 turbines of S-88 (2.1 MW) model is analyzed.
- (iii) Performance analysis of 36.25 MW wind farm of Akal Site of Jaisalmer containing 29 wind turbines of Suzlon S-66 (1.25 MW) type is done.

Various parameters such as capacity factor, annual usage time/full load hours machine availability, grid availability, and system availability were calculated from the wind farm data. Levelized Cost of Electricity was also estimated.

3. **Mr. Santosh Kumar Saraswat :** Electrical load of domestic, small community, telecom, agriculture pumping, army base camps and remotely located research stations are considered to be below 10 kW. An off-grid standalone solar PV-diesel Hybrid Energy System (HES) is designed for a small scale industry which is having a load of 10 kW (240 kWh/day) with zero percentage loss of load using HOMER software. Accordingly, different electrical loads of 1 kW, 2 kW, 3 kW, 5 kW, 8 kW, 10 kW, 20 kW, and 50 kW for a particular location of Jaipur (Rajasthan) are also considered and analyzed. Feasibility of HES is analyzed for 27 different locations of India. Sensitivity analysis is performed for inflation rate, discount rate, fuel price, annual capacity shortage, and effect of life span of the system.
4. **Mr. Akshay Lele :** Airborne wind turbine and flettner rotor technologies, as an auxiliary source for ship propulsion are analyzed in this thesis.
 - (i) In this thesis previous work done by Mr. K. M. Gilje on Makani's M5 wing (an Airborne Wind Turbine (AWT)), for calculation of tether force is extended for calculation for power. Variation of net power output and forces with respect to wind speeds and ship speeds using M5 AWT have been calculated.
 - (ii) Flettner rotor application for Ship propulsion has been reviewed and the development from 1920 to 2016 is studied in this thesis. Mr. Martin Silvanus's work has been extended and compared for the net power output of flettner rotor using four different empirical formulae of skin friction coefficient based on flat plate boundary layer theory.
 - (iii) Using the graphical results given by different authors for lift and drag coefficients values for rotating cylinder and net power output of flettner rotor are calculated and compared.
 - (iv) The estimation of diesel savings due to power generated by flettner rotor from Kandla to Mumbai sea route is also discussed and it is estimated that upto 10% of fuel saving could be obtained.
5. **Mrs. Manpreet Kaur :** This study aims at projecting the electricity demand for the years 2021, 2031, and 2041 and suggesting methods for meeting the demands in Rajasthan. The study focuses on the estimation of the projected demand based on assumption of electricity for all and standard per capita electricity consumption relevant to the development index. Thus it reflects the gap that has to be bridged by the electricity sector of the state in order to make Rajasthan a developed state. This further helps in deciding the future pace, setting the targets, and policy framing.
6. **Mr. Norat Mal Swarnkar :** In this thesis, he proposed a hybrid energy system which combines both solar photovoltaic (PV) and small wind turbine as renewable energy source at Jaisalmer, Rajasthan and entire system is suitable for residential, institutional, and industrial applications. Simulation using HOMER has been done to calculate total energy production and economic & financial feasibility for all three cases. The financial feasibility in terms of payback period and internal rate of return are calculated using RETScreen software.



M.Tech. (RET) students during M.Tech. Thesis oral examination.

Summary of Academic Performance during 2017

- * 32 Research Publications in IEEE International Conferences.
- * 03 Research Publications in other International Conferences.
- * 03 Research Publications in Journals.
- * 05 Workshops/Conferences Attended.
- * 07 Industrial Visits and Educational Tours.
- * 07 Students Presented Seminars.
- * 06 Students Received M.Tech.(Renewable Energy Technology) Degree.
- * 03 Students Admitted in Ph.D. (Renewable Energy) Programme.
- * 11 Students Admitted in M.Tech. (RET) Programme.

IV. Academic Performance of the Department During Last Five Years :

Department of Renewable Energy was previously known as Centre for Energy and Environment. *Centre for Energy and Environment* was approved by Board of Management (BOM) of the RTU in November 2011. Formal orders for formation of the centre under RTU were issued in March 2013. Admissions in M.Tech. (Renewable Energy Technology) started from 2010 under Mechanical Engineering Department. Students of M.Tech. (RET) from Mechanical Engineering Department were transferred to Centre for Energy and Environment in April 2013.

All admissions to M.Tech. (Renewable Energy Technology) and Ph.D. (Renewable Energy) courses were started by the centre from July 2013.

Centre for Energy and Environment was renamed as *Department of Renewable Energy* in May 2015 and is presently functioning as University Teaching Department of RTU, Kota.

| | 2013 | 2014 | 2015 | 2016 | 2017 | Total |
|--|------|------|------|------|------|-----------|
| Number of students received M.Tech. (Renewable Energy Technology) degree | 00 | 01 | 04 | 08 | 06 | 19 |
| Number of research papers published in International/ National level conferences and Journals | 05 | 09 | 14 | 27 | 38 | 93 |



Dr. Manish Bhargava, Principal of Maharshi Arvind Institute of Engineering and Technology, Jaipur and Dr. Nitin Gupta of MNIT, Jaipur visiting Department of Renewable Energy, RTU, Kota.



Visit of M.Tech. (RET) students to Wind Turbine Test Station of National Institute of Wind Energy at Kayathar, Tamil Nadu.



Visit of M.Tech. (RET) students to Vivekananda Rock Memorial at Kanyakumari, Tamil Nadu.