

**PONDICHERRY UNIVERSITY**

**CENTRE FOR GREEN ENERGY TECHNOLOGY**

**(MNRE CENTRE OF EXCELLENCE)**

**MADANJEET SCHOOL OF GREEN ENERGY TECHNOLOGIES**

**BROCHURE**



**JUNE 2013**

# **CENTRE FOR GREEN ENERGY TECHNOLOGY**

## **MADANJEET SCHOOL OF GREEN ENERGY TECHNOLOGIES**

### **PONDICHERRY UNIVERSITY**

The Centre for Green Energy Technology (C-GET) was established in 2010 under the aegis of Madanjeet School of Green Energy Technologies with a vision to promote education and research in environmentally clean methods of energy production, conservation and utilization. The centre offers M. Tech. in Green Energy Technology which is partly supported by South Asia Foundation (SAF). Recently, CGET has been awarded as Centre of Excellence by ministry of new and renewable energy (MNRE). SAF also recognized the centre as Centre of Excellence. The centre also promotes research in the fields of all clean sources of energy production, conversion and utilization like solar photovoltaic, solar thermal, energy storage, fuel cells, bio-fuels, wind energy, ocean energy, chemical energy, applications of nanotechnology for energy conversion, etc. The centre has specialized faculties to teach, offer consultancy and take up research work in many core areas of green energy. Establishment of MOUs with various alternate energy generating firms specializing in photovoltaic, solar-thermal has taken place. In addition, several MOUs with industries specializing in solar thermal devices and power plant engineering are in pipeline.



## **PROGRAMMES OFFERED**

### **M.TECH PROGRAMME**

The major subject areas covered in this program include alternate energy sources - generation, distribution, utilization, fuel cells, green nanotechnology, green economics, waste to energy, biofuels etc. The course is aimed to train talented students in the area of renewable and clean energy technology and create scientifically and technologically skilled man power. This program is designed for two years spread into four semesters. First three semesters are for hard and soft core courses and final semester is for project. Many soft-core courses are stand alone, so, they can be taken at any time offered by the Centre. In addition there will be

some bridge courses to fill the knowledge gap. Most of the first semester courses will be on energy and modelling. In the second and third semester, courses will be based on energy, environment, chemistry, management and other GET related fields. Students will select courses suiting their background and interest. Each theory course will have a project component which will be either individual or group based.

From this year on (2013-2014), about 15 MTech (on merit basis) students may be given MNRE fellowship as per norms.

### **PH.D., PROGRAMME**

CGET offers Ph.D. programme to carry out research and development in the field of Photovoltaics, Energy Materials, Energy Storage, Energy Devices, Fuel Cells, Green Chemistry, Bio Energy, Technology development in the field of Solar Concentrators and other Solar Thermal Devices and Hybrid Clean Energy Systems. Currently, admission to part time (Internal & External) PhD is not entertained in the Centre. Only regular PhD programme is offered.

From this year on (2013-2014), 5 PhD scholars may be given MNRE fellowship as per CSIR-UGC/AICTE norms.

### **PG DIPLOMA IN GREEN ENERGY TECHNOLOGY**

The goal of Post Graduate Diploma in Green Energy Technology is to develop highly skilled manpower training in green energy technologies and building nationally /internationally recognized “expertise” in the development and deployment of clean energy technologies through post-graduate education, training and research activities. This is a one year diploma programme spanning into two semesters. First semester will focus on the theoretical aspects of various renewable and green energies technologies. The second semester will be a complete project work, preferably done in industries or reputed R&D institutes.

### **ADMISSIONS**

**M.Tech.:** Admission of this course is done based on the marks secured in the All India entrance examination conducted by Pondicherry University. The meritorious candidate from the entrance test will be eligible for “SAF-Madanjeet Singh Group Fellowship”.

[www.southasiafoundation.org](http://www.southasiafoundation.org)

The entrance test will have multiple choice questions (100 questions). Questions will be from mathematics, Physics, Chemistry, Materials Science, Engineering and Bio-technology.

**Ph.D.:** Being an interdisciplinary field, the entrance test will have multiple choice questions (100 questions). The questions will be from Green technology, Mathematics, Physics, Chemistry, Biology and Engineering fields.

### **THRUST AREAS**

The following are the thrust areas of our centre currently focussed for teaching and conducting high quality research.

- Solar Thermal Energy Technology
- Solar Photovoltaic Technology
- Bio-energy Technology
- Energy Material Development
- Energy Conversion and Storage Technology
- Green Combustion Technology

## INFRASTRUCTURE

C-GET establishment is in pipeline with the state of art facilities and infrastructure. Currently, the centre possesses the following high-tech equipments in the laboratory to cater the needs of the Centre.

- Class AAA 10 x 10 cm<sup>2</sup> Solar Sun simulator with I-V characterization facility.
- Electrochemical workstation with impedance analyser for electro-nanofabrication and battery & Supercapacitor characterization
- Optical Pyranometer for solar irradiation measurement and analysis
- BET surface area analyzer
- Microwave Synthesizer
- C-5000 Bomb calorimeter for fuel characterization and analysis
- Spin coating unit
- Electrolysis unit for H<sub>2</sub> and O<sub>2</sub> production
- PEM fuel cell
- Spray deposition system
- Tubular Diffusion furnace
- High-temperature ovens
- Basic Molecular biology and biochemistry facility
- Ultrasonic bath
- -40° C Freezer
- Photoelectrochemical cell.
- Orsat Apparatus
- Solar thermal gadgets

Following are the representative infrastructures currently available in the Centre.



## **THE FOLLOWING COURSES ARE CURRENTLY OFFERED**

### **SEMESTER I**

Energy, Environment and Sustainable Development  
Renewable Energy Resources & Systems  
Modelling and Simulations  
Fuels & Combustion Technology  
Nanomaterials and Nanotechnology  
Heat Transfer and Electrical Power- Generation, Transmission and Distribution  
Bio-energy & Conversion Systems  
Energy Laboratory –I

### **SEMESTER II**

Wind Energy & Small Hydropower Systems  
Solar Thermal Energy: Fundamentals, Devices and Systems  
Solar Photovoltaic Energy Conversion  
Processing Of Green Energy Materials  
Electrochemical Energy Conversion and Storage  
Waste to Energy Conversion  
Energy Laboratory –II

### **SEMESTER III**

Mini-Project: Research Methodology, Proposal Writing and Defence  
Solar Photovoltaic Technology  
Advanced Battery and Fuel Cell Technologies  
Nanotechnology for Energy Systems  
Industrial Energy Audit and Management  
Algal Energy Technology  
Energy Laboratory – III

### **SEMESTER IV**

Green Energy Technology Dissertation and Viva-Voce

### **RESEARCH PROJECTS ON PIPELINE:**

Ministry of New and Renewable Energy (MNRE) and South Asia Foundation (SAF) has been supporting teaching and research activities of the Centre. SAF supports USD200,000 per annum. Eight students from SAARC countries are admitted each year for MTech programme with SAF scholarship. In addition, individual faculty members have projectors that are supported by DST, CSIR and UGC.

### **PLACEMENTS**

M.Tech. Graduates in Green Technology gain employment in emerging clean and renewable energy sector where national and multinational industries are focusing their business activities on alternate energy production and usage. Centre has in association with the placement cell to enable students for getting better placement.

### **DEAN**

**Dr. H. Surya Prakash Rao** (IISc Bangalore)



**H.S.P. Rao**, Professor, Department of Chemistry, Pondicherry University, is currently the Dean, Madanjeet School of Green Energy Technologies. He was born in 1953 in Punganuru, Andhra Pradesh and had his early education in Hyderabad. He was a student of B.Sc. (special, 1973) and M.Sc. (Organic Chemistry, 1975) in Osmania University, Hyderabad. He joined Indian

Institute of Science, Bangalore for Ph.D. in 1975 and obtained his degree in 1980 by working in the area of stereochemistry of organic compounds. He had postdoctoral training in USA and India (Rice University, Houston, Texas, University of Minnesota, Minneapolis, Minnesota and Hyderabad University) during 1980-1985. He was a visiting scientist in the University of Nijmegen, Nijmegen, The Netherlands during 1999-2000 and 2000-2002). He visited Taiwan in 2007 and USA in 2011 to give invited talks. He was a Lecturer (North Eastern Hill University, 1985-88), Reader (Pondicherry University, 1988-97) before becoming Professor (1997-present). His current research interests include synthesis and stereochemistry of sulfur, nitrogen and oxygen heterocycles; development of reagents, reaction conditions and green chemical methods, synthesis of 8-aza-steroids etc. He teaches courses in organic chemistry to the post-graduate and integrated undergraduate-postgraduate students. He has been in the editorial board of *Indian Journal of Heterocyclic Chemistry*, *Journal of Chemical Science*, *ISRN Journal of Organic Chemistry* and *ARCHIVOC*. Under his guidance 11 research scholars obtained their Ph.D. and 22 scholars their M.Phil. degrees. He has been a recipient of Chemical Society of India Bronze medal (2008) and National Merit Citation. His extension activities include development of higher education in India as a member of peer teams of National Assessment and Accreditation Council. He was the President of Pondicherry Science Forum, council member of National Organic Symposium Trust and Chemical Research Society of India. He is a member of Indian Chemical Society, Indian Science Congress, National Magnetic Resonance Society and Indian Council of Chemists.

*Specialization:* Synthetic Organic Chemistry, Green Chemistry, Chemistry of Organic Molecules of Medicinal Interest

## CORE FACULTIES

### *Associate Professor & Centre Head:*

#### **Dr. P. Elumalai, Ph.D.** (IISc, Bangalore)



**Perumal Elumalai** is received his MSc in Chemistry from University of Madras in 1997 and PhD in Solid State & Structural Chemistry from Indian Institute of Science Bangalore in 2003. He was a rank holder in MSc Chemistry. After completing PhD, he moved to Kyushu University, Japan for post-doctoral research. He was recipient of a prestigious fellowship, Japan Society for the Promotion of Science (JSPS) fellowship awarded by Japanese Government. He has won award of World Young Ceramist by Ceramic Society of Japan for his contribution to ceramics applications. He has visited USA, Italy, Singapore, China and Japan for his professional developments. He has over 13 years of teaching/ research experiences. He has published more than 45 research papers in reputed international journals and holds a patent. His paper on ammonia sensor has been taken by Mitsubishi Corp. for testing. He has presented talks in more than 20 international conferences and symposiums. Currently his h-index is 14 with total no. of citations 550. One of his papers has been highlighted in *global medical discovery*. Dr. Elumalai has handful of experiences on electrode materials for lithium-ion battery, electrochemical supercapacitors, electrocatalysts for fuel cells, electrochemical sensors for automotive-exhausts & environmental monitoring. He extensively uses nanomaterials for the above systems. Currently he is handling three projects supported by DST, CSIR and UGC.

*Specialization:* Energy Conversion, Storage and Sensors: Lithium-ion batteries, Super capacitors, Fuel cell catalysts and Automotive-Exhausts Sensors.

### *Readers:*

#### **Dr. Periyasamy Thilakan, Ph.D.** (Anna University, Chennai)



Doctorate in Physics from Anna University, Chennai specialised in the “field of space quality Solar cell fabrication and Characterization” in the year of 1997,

worked abroad for more than 10 years at Italian National Laboratory for New Technology-Naples, Italy, Nagoya Institute of Technology-Nagoya, Japan, Nanyang Technological University - Singapore, Nanotechnology Research Centre, Hokkaido University-Sapporo, Japan, Olympus Corporation, Japan, Japan Advanced Institute of Science and Technology (JAIST), Japan, Sungkyunkwan University (SKKU), South Korea, VIT-India etc., *Received*: International Centre for Theoretical Physics fellowship award (ICTP-TRIL), Italy, ENEA-Fellowship Award, Italy, Telecommunication Advancement Professional Fellowship (TAO) award of Japan, IITA- Visiting Professorship, Ministry of Information and Communication, South Korea. *Visited as Invited Special Guest* Researcher to Hahn-Meitner Institute-Berlin, Germany, University of Neuchâtel-Switzerland, Light Technology Research Institute-South Korea, Walter Schottky Insitute – Munich, Germany, Scivax Corporation, Tokyo, Japan etc., Published more than 40 papers in the international journals, more than 50 papers in the conferences and delivered more than 70 lectures in the national and international forums.

*Specialization*: Semiconductor epitaxial growth of thin films and devices using PECVD, MOCVD, MBE etc., Nanomaterials and device processing and characterization techniques, Photolithography, e-beam lithography & Nanoimprint lithography, Device processing and analysis of solar cell, LED, LASER, SET, SPE etc., SPV power plant design and installation, Porous TiO<sub>2</sub> super molecular nanocrystallites, High vacuum machineries.

#### **Dr. B. M. Jaffar Ali, Ph.D.** (IISc, Bangalore)



**B.M. Jaffar Ali** obtained M.Sc. degree in Materials Science from *College of Engineering, Anna University, Chennai* (1990); Ph.D. in Physics from *Indian Institute of Science, Bangalore* (1998). Was a *Postdoctoral Fellow* at Department of Physics of Complex Systems, The Weizmann Institute of Science, Israel (1998-2000) and served as a *Visiting Scientist* at National Centre for Biological Sciences, TIFR-Bangalore (2000-2002). Worked as faculty *Scientist* at Life Sciences Division, AU-KBC Research Centre, Anna University, Chennai (2002-2010) where he has established Optical Nanomanipulation Laboratory and conducted independent research in the field of diagnostic biosensors, systems biology and mechanobiology. Recipient of DAE Young Scientist Research Award (2003) and completed sponsored research projects to the tune of Rs.200 lakhs. He has been consultant to few companies on development of a low cost prototype instrument and methodology for the detection of bacterial pathogens. Holds one Indian patent to his credit. Has guided four M.S.(by Research), two M.Phil, one Ph.D., degree theses. He has published about 21 research articles in refereed journals including, PNAS, J.Chem.Phy, Physics Letters A, Pramana, Applied Optics, Science of Advanced Materials, Journal of Nanobiotechnology, Current Microbiology, IEEE SysBio, and SPIE Proceedings. His work on single molecule DNA compaction published in PNAS with impact factor of ~10, has received more than 90 citations. His recent work published in Journal of Nanobiotechnology has been marked among highly accessed paper in the website. His teaching and research interest include Biophotonics, Bioenergy, Biosensors, Systems Biology and Wind Energy Conversion Systems.

*Specialization*: Bioenergy, Biophotonics, Biosensors and Nanobiotechnology.

#### **Assistant Professors:**

##### **Dr R. Arun Prasath, Ph.D.** (Anna University, Chennai – *with German fellowship DAAD*)



**R. Arun Prasath** obtained his doctoral degree in Chemical Science/Materials from Anna University, India. He was a recipient of prestigious DAAD fellowship, (1999-2001) for his doctoral research work at Max-Planck Institute for Polymer Research, Mainz, Germany. After his doctoral degree he worked as material researcher in several prestigious institutes; as research associate in Indian Institute of Science, Bangalore, India (2002-2004), as postdoctoral researcher in University of Strathclyde, Glasgow, United Kingdom (2004-2006) and in University of New South Wales, Sydney, Australia (2006-2008), and as

senior researcher in Ghent University (2008-2010) with special fellowship called BOF. He has published more than 20 peer-reviewed journal articles, co-inventor in 3 International patents as well as in 2 European patent applications. For his profession development, he has visited Germany, United Kingdom, Australia, Belgium, Brazil, Italy, and Bangladesh. He has presented more than 40 oral presentations in various conferences/seminars/courses/invited talks.

*Specialization:* Polymeric materials, Hybrid materials, Biomaterials, Green nanomaterials and Sustainable materials for applications that include: solar energy, bio-energy, fuel cells, sensors and sustainable development.

**Dr. Prasanth Ravindran, Ph.D.** (Eindhoven University of Technology, Netherlands)



**Prasanth** received his Ph.D from Eindhoven University of Technology (The Netherlands) for the thesis entitled “Photonic Switching in III-V semiconductor Nanostructures”. After Ph.D he continued his research as a Post-doctoral Fellow at Peter Debye institute, Utrecht University. He demonstrated the polariton confinement and resonance enhancement leading to polariton lasing in nanocavities. Prior to joining at Pondicherry University, he was as an Assistant Professor at Amrita Centre for Nanosciences. He also worked at National Institute of Nanotechnology, Canada during that time. He has more than 40 international publications. He published articles in leading journals such as Applied Physics Letters, Physical review Letters, Advanced Functional Materials, IEEE Quantum Electronics etc and reviewed articles for many leading journals. He presented papers in many International conferences held in USA, Germany, Belgium, Luxemburg, France and Singapore. His current research interest is in modelling, fabrication and characterization of nano-solar devices based on one dimensional nanostructures.

*Specialization:* Nano-Photonics/Nano-Photovoltaics

**Dr. A. Sreekumar, Ph.D.** (Cochin University of Science and Technology, Kochi)



**A. Sreekumar** received his PhD from Cochin University of Science and Technology, Kochi with specialization in Solar Thermal Engineering. He obtained his M.Tech in ‘Energy Management’. He has got several years of work experience in industry and institutes in renewable energy sector. He has worked as Head and Senior Scientist, Solar Energy Division of Sardar Patel Renewable Energy Research Institute (SPRERI), Gujarat. Prior to joining university, he was serving as Asst. General Manager (Projects) & Head (R&D) in Cargo Power and Infrastructure Ltd., Gujarat. Published several research papers in national and international journals.

*Specialization:* Solar thermal energy devices and thermal energy storage.

**Ph.D Admission Requirements**

Intake	Eligibility criteria for admission
Subject to vacancies with the faculties	M.Sc in Physics/ Physics (with photonics specialization)/ Photonics/ Chemistry with Mathematics at BSc level/ Materials Science with Chemistry at BSc level / Electronics/ BioChemistry/ Biotechnology/ Nanoscience with Chemistry at BSc level. Or M.E/M.Tech in Thermal/ Electrical/Mechanical/Chemical/Electronics & communication/Nanotechnology/ Nanoscience and Technology/ Green Energy Technology/ opto-electronics/ Biotechnology. with at least 55% marks in qualifying examination.



### **M.Tech in GET (two years) Admission Requirements**

<b>Intake</b>	<b>Eligibility criteria for admission</b>
26 + 8* (*SAF Sponsored)	B.E/B.Tech in Mechanical, Electrical, Civil, Electronics, Chemical or Biotechnology or M.Sc in Physics, Chemistry, Material Science, Nanoscience or Photonics with Mathematic at B.Sc level with at least 55% marks in qualifying examination.

### **PG Diploma in Green Energy Technology (one year) Admission Requirements**

<b>Intake</b>	<b>Eligibility criteria for admission</b>
15	B.E/B.Tech in Mechanical, Electrical, Civil, Electronics, Chemical or Biotechnology or M.Sc in Physics, Chemistry, Material Science, Nanoscience or Photonics with Mathematic at B.Sc level with at least 55% marks in qualifying examination.

### **CONTACT**

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