

GLOBAL INITIATIVE OF ACADEMIC NETWORK(GIAN)  
Ministry of Human Resources Development  
Government of India

A 5 Day Course On  
**Global Challenges of Solar  
Energy and Solar Fuels'**  
30<sup>th</sup> Jan – 4<sup>th</sup> Feb, 2019

Venue



JNTUH College of Engineering, Kukatpally, Hyderabad

**About GIAN:**

Govt. of India approved a new program titled Global Initiative of Academic Networks(GIAN) in Higher Education aimed at tapping the talent pool of scientists and entrepreneurs, internationally to encourage their engagement with the institute so of Higher Education, viz., all IITs, IIMs, Central Universities, IISc Bangalore, IISERs, NITs and IIITs subsequently cover good State Universities where the spinoff is vast. The GIAN website may be visited for detailed information.

**Overview**

As one of the most abundant and widespread energy resources available, sunlight is very attractive as a renewable energy source that could be the pillar of a sustainable energy future. In the last several decades, decreasing costs of photovoltaic technology have helped spur the spread of solar electricity. However, at present solar energy remains a minor player in the global energy landscape. Even if a revolution in the manufacture of photovoltaics successfully reduces the cost of solar electricity to a level that is economically competitive with fossil fuels, the widespread implementation of solar as a primary energy source will require the ability to proton exchange membrane fuels cell at the University of Chemical Engineering from Caltech (2006) and a BS in Chemical Engineering from the He

overcome the intermittency of sunlight. In order to have energy from the sun at night, a cost-effective storage mechanism is needed. An ideal solution would be to store solar energy in the form of chemical bonds – to convert sunlight into energy-dense fuels. Nature utilizes this approach through the mechanism photosynthesis. However, the energy conversion and storage efficiency of even the most rapidly growing plant is less than 1%. By pursuing artificial photosynthesis, the combination of light absorbing semiconductors and highly active catalysts in an inorganic photo electrolysis system, cost-effective fuel production at higher efficiency is possible.

The main topics of the course is presented as follows:

**Course:** Global challenges of Solar Energy and Solar Fuels (30<sup>th</sup> Jan – 4<sup>th</sup> Feb, 2019)

**Main Topics:**

- Overview of Solar Energy and Semiconductors
- Solar Cell Device Physics
- Photovoltaic Technologies and Characterization
- Photochemistry for Solar Cells
- Concepts for Solar Fuels

*Number of participants for the course will be limited to fifty.*

**Benefits of Attending the Course:**

Candidates who have attended the course will understand the fundamental device physics controlling semiconductor behavior in solar cells, the criteria and parameters for efficient photovoltaics and solar fuels generation and also get familiarized with major photovoltaic technology designs, photoelectrode materials, hydrogen and oxygen evolution catalysts and techniques used to characterize solar cells and photo electrodes for solar fuels

**Who should attend:**

This course is intended to provide students, teachers, researchers, executives, engineers and researchers from manufacturing, service and government, organizations including NGOs and R&D laboratories. Students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions are invited to

**For the participation in the course, registration with GIAN is mandatory.**

Registration to the portal is one-time affair and will be valid for the lifetime of GIAN. Once registered in the portal, an applicant will be able to apply for any number of GIAN courses as and when necessary. One-time Non-refundable fee of Rs. 500/- is to be charged for this service. For registration, the website is: [www.gian.iitkgp.ac.in/GREGN/index](http://www.gian.iitkgp.ac.in/GREGN/index)

**Course Fee:**

The participation fees for taking the course is as follows:

<b>Participants from abroad ( US dollars) :</b>	<b>\$500</b>
<b>Industry/ Research Organizations</b>	<b>: Rs. 5000/-</b>
<b>Academic Institutions</b>	<b>: Rs. 3000/-</b>
<b>Full time Students</b>	<b>: Rs. 1000/-</b>
<b>Full time SC/ST students</b>	<b>: Rs. 500/-</b>

**There will be a concession of 50% of the fee for the faculty working in the constituent and affiliated colleges of JNTUH.** The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility, Tea, Snacks, Lunch.

**Evaluation and Grading**

There will be evaluation at the end of each module on the understanding of the concepts by the participant made during the course. Based on the evaluations finally a letter grade will be awarded to the participant. A completion certificate shall also be issued.

**The Faculty**



**Dr. Joshua Spurgeon**, is the Theme Leader for Photovoltaics/Solar Fuels research at the Conn Center for Renewable Energy Research and is focused on economically viable approaches to solar fuels, electro synthetic fuel formation and novel, low-cost solar cell technologies. He received his doctorate in Chemical engineering from the California Institute of Technology in 2010. He also holds an MS University of South Carolina (2004). He

conducted research on proton exchange membrane fuels cell at the University of South Carolina (2000 – 2004), before pursuing research into scalable and inexpensive nanostructured photovoltaics at Caltech (2004 – 2009). As a post-doctoral scholar at Caltech (2010), he worked on multifunctional membranes for solar fuels applications and demonstrated the viability of solar-driven water vapor electrolysis. He then became a Research Scientist at the inception of the US Department of Energy's solar fuels innovation hub, the Joint Center for Artificial Photosynthesis (JCAP, 2011 – 2013), where his research involved photoelectrochemical studies of the interfaces between catalysts and semiconductors. He became Project Lead for the Interface group and Processing, Materials, and Integration Team at JCAP (2013) before leaving for the Conn Center at the University of Louisville in 2014. He has published 30+ papers in the area of solar energy and catalysis as well as 8 patents, and he was a US National Science Foundation Fellow, and also won the Demetriades Prize in Renewable Energy at the California Institute of Technology. Dr. Spurgeon's research includes the study of novel photoelectrode materials for solar fuels generation, engineering approaches to produce low-cost solar fuels, and the design and innovation of novel catalysts and electrolyzer systems for fuel formation through the reduction of carbon dioxide.



**Dr. Ramachandra Rao K** is working as Associate Professor in Physics & Head Department of Physics, Government College (A), Rajamahendravaram, A.P. He received the State Best Physics Teacher Award and IUFF (Inter University Faculty Form) Award from the O/o Commissionerate of Collegiate Education, Government of Andhra Pradesh. He established a Research facility "Crystal Growth and Nano-science Research Centre" and guiding M.Phil. and Ph.D. students. He got UGC and DAE-BRNS Research Projects to his credit and also has collaborative research work with BARC, Mumbai NPL, New Delhi, SSN, Tamilnadu RRCAT, Indore and Conn Center Renewable Energy Research, UoL-USA.

Selected for Prestigious Indian Raman Post-Doctoral Fellowship-2016 and worked at University of Louisville, USA on Renewable Energy Resources. He has published 57 Research articles in various National and International Journals and attended more than 60 National and International Seminars/Workshops and presented papers and also given Invited talks. He received SRPF fellowship twice by IASc, Bangalore. He has organized 01 International Conference, 08 workshops, 01 National level Refresher Course and 07 National conferences/workshops in Physics. Member of AP knowledge Commission, Government of Andhra Pradesh. He is a life member of many National Science Associations and also on the editorial/ Review board member of National/International Journals.



**Dr. K. Venkateswara Rao** is working as Professor & Head, Centre for Nano Science and Technology, Institute of Science and Technology, JNTU University, Hyderabad (JNTUH). PhD in Cancer nanotechnology-Imaging of Cancer cell, Johns Hopkins University, School of Medicine (2016-2017). PhD in (Physics) Synthesis of nano-materials and characterization, Central University of Hyderabad with Awarded (2003-2008). His interests are in Nanomaterial Synthesis, Characterization of Nanostructured materials, Oxide Nano Materials, Graphene Based Materials, humidity sensing, Gas sensing, Glucose sensing, Battery Materials, solar cells, Seed Generation, cancer nanotechnology.



**Dr. Ch. Shilpa Chakra** is Assistant Professor, Centre for Nano Science and Technology, Institute of Science and Technology, JNTU Hyderabad, India. She received Ph. D in Nano Science and Technology from JNTU Hyderabad. She has authored 45 peer-review articles. Her research focuses on Cancer Nanotechnology, Nanobiotechnology and applications using Energy materials.

## About JNTUH:

The J.N.T University was in existence since 1972. It is a teaching and research oriented university consisting of 4 constituent engineering colleges JNTUH College of Engineering, Hyderabad (JNTUHCEH), JNTUH College of Engineering, Jagityala (JNTUHCEJ), JNTUH College of Engineering, Manthini (JNTUHCEM), JNTUH College of Engineering, Sulthanpur (JNTUHCES) and more than 400 affiliated colleges. In addition to the constituent colleges, the other units of JNTUH are School of Information Technology (SIT), Institute of Science and Technology (IST), School of Management Studies (SMS) and Academic Staff College (ASC). The university has numerous collaborative, teaching and research programs with universities from abroad and within India and with industries in the state of Telangana. The university offers engineering programs at both UG and PG level and many science and humanities programs at PG level. In addition, university also offers Ph.D. in engineering, science and humanities disciplines.

## Contact Information:

### Course Coordinators

#### Dr. K. Venkateswara Rao

Professor & Head of Nanotechnology Centre for Nano-Science and Technology, Institute of Science and Technology Jawaharlal Nehru Technological University Kukatpally- HYDERABAD-500085  
e-mail: kalagadda2003@jntuh.ac.in, kalagadda2003@gmail.com

#### Dr. Ch. Shilpa Chakra,

Assistant Professor, Centre for Nano-Science and Technology, Institute of Science and Technology Jawaharlal Nehru Technological University Kukatpally- HYDERABAD-500085  
e-mail: Chilpachakra.nano@jntuh.ac.in

### GIAN Local Coordinator

#### Dr. G .Krishna Mohana Rao

Professor of Mechanical Engineering & JNTUH College of Engineering  
Mail id: [kmrgurram@jntuh.ac.in](mailto:kmrgurram@jntuh.ac.in)