



One Week GIAN Course on



Advanced Thermal Systems: Energy, Exergy and Economic Approach

Overview:

There is a growing interest for Advanced Thermal and Energy Systems in recent years due to Industrial Development and Economic Growth in many Countries. In the present course, the Advances in Fossil Fuel based Thermal and Power Generation Systems will be discussed. The Fluidized Bed Combustion Technology (FBC), Integrated Coal Gasification Power Generation Systems (IGCC) and Advances will be presented. Experimental Investigations, Measurement Techniques and Numerical Modelling of Heat Transfer in Fluidized Bed Combustor/ Gasifier will also be presented. Biomass co-firing with Coal and Natural Gas is also receiving attention to reduce Greenhouse Gas emissions. The Biomass co-fired Power Generation Systems, their Analysis and Advances will be discussed. The developments in Solar, Biomass and Natural Gas Hybrid Power Generation and Integrated Thermal Systems will also be presented.

The Second Law of Thermodynamics is receiving lot attention for the Analysis of Power Generation and Thermal Systems. In the course, the Second Law Analysis of Natural Gas, Coal and Biomass Power Generation Systems will be presented. The Exergy Analysis for Thermal and Power Generation Systems and the role of Exergy Analysis in the design and development of Advanced Coal, Biomass, Natural Gas and Solar based Thermal and Power Generation Systems will be discussed. The Exergy, Cost, Energy and Mass (EXCEM) Analysis will also be discussed. Exergy Economics Approach vs. Energy Economics Approach for Thermal and Power Generation Systems will be discussed (state of the art and research status in Exergy Economics Area; contributions of Exergy Economics to Climate change and Sustainability side; implications for Policy Formulation). The role and importance of Exergy Analysis to reduce Global Emissions, improve Thermal and Power Generation Systems design and performance and in Sustainability will be presented. The role of Exergy Analysis for Thermal Energy Storage Systems and District Energy Systems will also be discussed. Future research directions in Exergy Area will be presented. Course participants will learn the Advances in Thermal Systems through brainstorming lecture series, discussion, and question answer sessions. Also, different assignments will be shared on this particular subject area to stimulate research motivation of

participants. Attending this course will be of great benefit to the participants by familiarizing themselves with the state of the art in Energy Technologies and planning long-term research programmes.

Objectives:

The prime objective of this course is to educate/ acquaint the participants with recent Advances in Thermal Systems by the principles of Energy, Exergy and Economic Analysis. In order to achieve this, the following objectives of the present course have been laid out:

- i) Expose the participants to Thermal and Energy Systems, recent Advances and Environmental issues, Global Warming and the need for Advanced Thermal and Power Generation Systems
- ii) Advances in Coal, Natural Gas, Biomass based Power Generation and Thermal Systems and Solar based Hybrid Power Generation and Integrated Thermal Systems
- iii) Exergy Analysis and its role in the performance analysis and improvement of Thermal and Power Generation Systems design
- iv) The role of Exergy Analysis to reduce Emissions, develop improved Design of Thermal Systems and in Sustainability and the details on Exergy, Cost, Energy and Mass (EXCEM) analysis

<p style="text-align: center;">Course Contents Date October 20th-25th, 2017</p>	Module A	Module B
	<ul style="list-style-type: none"> ▪ Energy and environmental issues, global warming and the need for advanced power generation systems. ▪ Gasification and its present state of art; advances in coal based power generation systems (fluidized bed combustion) and integrated coal gasification combined cycle (IGCC) power generation systems. ▪ Experimental investigations in fluidized bed combustors/ gasifiers and measurement techniques; numerical modelling of heat transfer in fluidized bed combustors/ gasifiers. ▪ Advances in natural gas combined cycle power generation and thermodynamic analysis (energy approach); biomass co-fired coal and natural gas thermal and power generation systems. ▪ Solar, biomass and natural gas hybrid power generation systems and developments. ▪ Cogeneration systems, types and analysis; developments in integrated and multi-generation thermal systems ▪ Tutorials, problems, discussion and case study on above topics. 	<ul style="list-style-type: none"> ▪ First and second law of thermodynamics; entropy and exergy; exergy in policy development and education. ▪ Exergy analysis and its role in the performance improvement of thermal and power generation systems sustainability; future research directions in exergy area. ▪ Exergy analysis of coal, biomass, natural gas and solar based power generation and thermal systems. ▪ Exergy analysis of cogeneration and district energy systems; exergy analysis of thermal energy storage systems. ▪ Exergy economics approach vs. Energy economics approach for thermal and power generation systems. ▪ Exergy, cost, energy and mass (EXCEM) analysis for thermal systems (state of the art and research status in exergy-economics area; contributions of exergy-economics to climate change and sustainability side; implications for policy formulation) ▪ Tutorials, problems, discussion and case study on above topics.
Date of Examination: October 25 th , 2017		

<p>You should attend if you are...</p>	<ul style="list-style-type: none"> ❖ PG/PhD students, Faculty members with research focus in Thermal and Energy Systems Area (Mechanical Engineering, Chemical Engineering, Energy Engineering) ❖ Consulting Engineers working in Thermal and Energy Area ❖ Pre-Final / Final year Undergraduate students (Mechanical Engineering, Chemical Engineering, Energy Engineering)
<p>Registration Fees</p>	<p>Participants from Abroad: US\$500 Industry/ Research Organizations: Rs. 5000/- Faculty Members: Rs. 3000/- Students (Pursuing PhD / Master/ Bachelor Courses): Rs. 2000/- NIT Mizoram: Free (Faculty / Student / Researcher)</p> <ul style="list-style-type: none"> ▪ Registration Fee only includes attendance to Sessions, Course material and Lecture notes. ▪ UG and PG students need to produce a document as a proof of Student Identification and a letter of Nomination from their Institute/College. ▪ The Registration Fee has to be paid by DD drawn in favor of Director, NIT Mizoram, payable at SBI Bawngkawn, Aizawl - 796012.

Registration:

Register for the course online at <http://www.gian.iitkgp.ac.in/GREGN/index>. The last date of registration is **13th October, 2017**. To register or for any questions please send E-mail to abhinit05@gmail.com

Number of participants for the course is limited to **50**.

Course Faculty:



Prof. B.V. Reddy

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Dr. Bale V. Reddy is Professor in Department of Automotive, Mechanical and Manufacturing Engineering in Faculty of Engineering and Applied Science, University of Ontario Institute of Technology (UOIT), Oshawa, Ontario, Canada. Prior to this Dr. Reddy also worked as an Associate Professor in Mechanical Engineering Department, University of New Brunswick (UNB), Fredericton, Canada. Dr. Reddy received his M.Tech and PhD degrees in Mechanical Engineering from IIT Kharagpur, India under the guidance Prof. P.K. Nag. Dr. Reddy has 20 years of teaching and research experience in Mechanical Engineering with focus on Thermal and Energy Systems, Heat Transfer and Energy Management.

Dr. Reddy research interests are in the area of Clean Energy Systems, Fluidized Bed Combustors, Coal, Biomass, Natural Gas, Waste Heat Recovery, Exergy Analysis, Hydrogen, Solar Energy and Energy Management. He has led funded research projects in the area of Thermal and Energy Systems. Dr. Reddy has

published 200 papers in refereed Journals (various refuted Journals) and refereed Conference Proceedings. Dr. Reddy has also contributed Book Chapters along with his research collaborators in Energy Systems Area. Dr. Reddy also acted as reviewer for research grant proposals from many agencies. He has also served on tenure and promotion committees. He is also involved in the organization of many International Conferences as Conference Chair, Track Chair, Organizing Committee Member, Advisory Committee Member etc. Dr. Reddy has delivered key note and invited presentations in many International Conferences in various countries and has also chaired technical sessions in International Conferences. Dr. Reddy also taught various graduate (Advanced courses in Thermal Systems, Energy Systems, Energy Storage, Exergy Analysis; Advanced Thermodynamics and Heat Exchangers Design) and undergraduate courses in Mechanical Engineering. Dr. Reddy has also received Best Professor Award for teaching excellence five times both in India (VIT, Vellore) and in Canada (UNB, Fredericton; UOIT, Oshawa).

Course Coordinator:



Dr. Abhijit Sinha

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Dr. Abhijit Sinha has completed his Ph.D in Mechanical Engineering from National Institute of Technology (NIT) Silchar, Assam, India, in the year 2014. He did his M.Tech from the same Institution in Thermal Engineering in the year 2011 and B.Tech in Mechanical Engineering from National Institute of Technology (NIT) Agartala, Tripura, India, in the year 2009. He has published various National and International Journals/ Conferences and participated in different Workshops. He is also the organizing member of various Workshop and Conferences. His research area includes Thermodynamics, Energy and Exergy Analysis, Thermal Design and Optimization, Energy Conversion and Management, Renewable and Sustainable Energy and CFD. Presently he is working as an Assistant Professor in the Department of Mechanical Engineering, NIT Mizoram, Aizawl, India.

A
One Week GIAN Course
on

ADVANCED THERMAL SYSTEMS: ENERGY, EXERGY AND ECONOMIC APPROACH
(Under the Aegis of MHRD- Global Initiative of Academic Networks)

October 20 - October 25, 2017 at NIT Mizoram

Registration Form

GIAN Portal Application Number:

1. Name of the Candidate:
2. Category: Academic / Industry /Student
3. Category of Registration: SC/ ST/ General & OBC
4. Organization:
5. Address:

6. Mobile Number:
7. E-mail:
8. Highest Academic Qualification:
9. Demand Draft Details:

Bank Draft Number:

Date:

Amount:

Drawn on:

Signature of the Candidate

Signature of the Head of the Dept. /Institution

Important Points:

- ❖ First **Register** in GIAN portal, <http://www.gian.iitkgp.ac.in/GREGN/index>. Get Application Number.
- ❖ Fill in this Registration Form. Take a print out of it. Get it signed by Corresponding Authority.
- ❖ Draw DD (amount specified in brochure) in favour of "**Director NIT Mizoram**" payable at SBI Bawngkawn, Aizawl – 796012 and send the hard copy of this Registration Form with DD to: **Dr. Abhijit Sinha , Assistant professor, Department of Mechanical Engineering, National Institute of Technology Mizoram, Chaltlang, Aizawl, Mizoram-796012**, Contact: +91-9678847689, E-mail: abhinit05@gmail.com.