

Biofuels Engineering

(Global Initiative of Academic Network, MHRD)

Overview

An ever increasing rise in global population and development increases demands on global energy supplies. Globally, energy security has been at the forefront of political debate. The European Union has set ambitious targets on renewable energy. Large developed nations have high carbon emissions and are under pressure to put a price on carbon. This has led to renewed focus on developing alternatives to fossil derived fuels from more secure and sustainable sources.

This will only be achieved through research and development of novel technologies where bioenergy and biofuels become an intrinsic part of the renewable energy mix for power generation and transport fuel. First generation biofuel production is limited due to the possible threat to food supplies and biodiversity over a certain threshold. Second and third generation biofuels can provide a much larger proportion of fuel supply more sustainably, affordably and with greater environmental benefits. Utilizing non-food feedstocks such as waste residues and algae are currently yielding the greatest potential opportunities in the long term.

The course Biofuels Process Engineering has been carefully structured to equip talented engineers of the highest standard with an advanced understanding and practical experience of employing biofuel research and advanced process technology within the wider bioenergy industry.

This course is planned to make participants, who wish to specialize in the field of bioenergy and biofuel applications.

Objectives:

This is an applied course with an objective to develop basic understanding of renewable energy engineering and role of biofuels.

After completion of this course, the participants are expected to learn about:

- The current energy challenges and the importance biofuels in achieving energy security and minimizing greenhouse gases emissions;
- The overview of available renewable and alternative energy sources;
- Biomass resources, types of biofuels and the bio-refinery concept;
- Mass and energy balances, biomass characterization techniques, unit operations, and thermodynamics in biomass conversion process;
- The concept of 1st generation, 2nd generation, and advanced biofuels;
- Techno-economic analysis of various biofuel conversion technologies and their environmental attributes; and
- The increasing role of renewable energy engineers to address growing energy needs.

Modules	Biofuels Engineering Duration: 11-07-2016 to 15-07-2016 Number of participants for the course will be limited to fifty.
You Should Attend If you are an	<ul style="list-style-type: none">• Executive, engineer and researcher from manufacturing, service and government organizations including NGOs and R&D laboratories.• Student at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.

Fees	<p>The participation fees for taking the course is as follows:</p> <p>Participants from abroad(For both the modules) : US \$500</p> <p>Industry/ Research Organizations: Rs. 10000/-</p> <p>Academic Institutions: Rs. 5000/-</p> <p>Students of Constituent Units of JNTUH: Rs. 1000/-</p> <p>SC/ST students Rs. 500/-</p> <p>The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility, Tea, Snacks, Lunch. The participants will be provided with accommodation on payment basis.</p>
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The Faculty

Dr. Sandeep Kumar: working as Assistant Professor, Department of Civil and Environmental Engineering Director, Energy Cluster (<https://www.odu.edu/eng/research/clusters/energy>), Old Dominion University, Norfolk, VA. He earned PhD in Chemical Engineering from Auburn University. He has developed biomass conversion processes using hydrothermal technology (sub- and supercritical water) for NSF funded projects and has direct experience in industry R&D and follow-on project implementation. Dr. Kumar's research focuses on thermochemical / hydrothermal reactions processes for the conversion of biomass/algae to different biofuels such as biocrude/bio-oil, biochar, syngas, and hydrogen which is directly aimed at supporting the commercial production of biofuels from 2nd and 3rd generation biomass feedstock. Expertise in high temperature and high pressure hydrothermal reactions of biomass.

Dr. V Himabindu is presently working as an Associate Professor in the center for Environment, Institute of Science and Technology, JNT University Hyderabad. She is also coordinating the center for alternative energy options. She received her doctoral degree in Chemistry in the year 1998. She published more than 100 technical papers in various national/international journals/conferences. 12 students were awarded Ph.D. degrees under her supervision and two more are continuing. She is currently working on 12 research projects funded by national and international organizations like BARC, APPCB, DRDO, DST, UGC, SEDA- Sweden, MNRE, DBT in the areas like Pollution monitoring and control technologies, reuse and Recovery of materials from waste, Remediation of

contaminated lakes, Biofuels, Carbon nano materials, Energy materials, Hydrogen production and storage etc.

Course Coordinator:

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For registration of GIAN portal and Course you may follow the link given below:

<http://www.gian.iitkgp.ac.in/GREGN>

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.

Course details:

Biofuels Engineering

11/07/2016 Monday

Lecture 1: 9.30 AM to 11.00AM

Introduction, energy units, terminologies, energy security, and renewable energy sources

Lecture 2: 11.15 AM to 12.45AN

Greenhouse Gases, Photosynthesis for Biofuels

Lecture 3: 2.00PM to 4.00PM

Biofuels present scenario

12/07/2016 Tuesday

Lecture 4: 9.30 AM to 11.00AM

Types of biomass and available resources

Lecture 5: 11.15 AM to 12.45AN

Lignocellulosic biomass composition and characterizations

Lecture 6: 2.00PM to 4.00PM

Anaerobic Digestion of biomass

13/07/2016 Wednesday

Lecture 7: 9.30 AM to 11.00AM

Pyrolysis, bio-oil upgradation, and biochar

Lecture 8: 11.15 AM to 12.45AN

Biomass gasification followed by Fischer-Tropsch synthesis for liquid fuels

Tutorial 1: 2.00PM to 4.00PM

Demonstration of Pyrolysis process, Hydrothermal (sub- and supercritical water) technology for biofuels

14/07/2016 Thursday

Lecture 9: 9.30 AM to 11.00AM

Biochemical Conversion Process, bioethanol production from 1st and 2nd generation biomass feedstock

Lecture 10: 11.15 AM to 12.45AN

Algae to biofuels and challenges

Tutorial 2: 2.00PM to 4.00PM

Demonstration of Hydrothermal process

15/07/2016 Friday

Lecture 11: 9.30 AM to 11.00AM

Biohydrogen and Methane, Biopower, co-firing, biomass torrefaction and carbonization, Biodiesel Process, vegetable oil sources and production, current technologies and challenges.

Lecture 12: 11.15 AM to 12.45AN

Biobased products, life cycle analysis, and water use in biofuels, Biofuels economics, policies, and future R&D

Tutorial 3: 2.00PM to 4.00PM

Demonstration of Biodiesel and biohydrogen process