Prof. Debabrata Das
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Dr. Debabrata Das pursued his doctoral studies from Indian Institute of Technology (IIT) Delhi and post-doctoral research work at University of Utah (UU), USA. Presently, he is a INAE-AICTE Distinguished Visiting Professor of SRM Institute of Science and Technology, Chennai and Heritage Institute of Technology, Kolkata. In addition, he is the Scientific Advisor of M/s. Dhampur Sugar Mills Ltd., New Delhi. He was also associated as MNRE Renewable Energy Chair Professor for three years and Professor for 32 years at IIT Kharagpur. He is actively involved in the research of hydrogen biotechnology for a period of more than twenty years. His commendable contributions towards development of a commercially competitive and environmentally benign bioprocess for the biohydrogen production from organic wastes using both mesophilic and thermophili cmicroorganisms added a new dimension to the field.

He has more than 170 research publications in the peer-reviewed journals and contributed more than 38 chapters in the books published by International publishers. He has been awarded with 2 international patents and applied for 4 more. He has been awarded as Fellow of Indian National Academy of Engineering (2015) and Fellow of International Association of Hydrogen Energy (2016). He has been honored with a number of prestigious awards and facilitation by many international and national societies. A few of them are Akira Mitsui Award of International Association of Hydrogen Energy at WHEC2008 at Brisbane, Australia, Malaviya Memorial Award2013 of Biological Research Society of India at Jawaharlal Nehru University, New Delhi.

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SRM INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be **University** *u/s 3 of UGC Act, 1956)*

Directorate of Research

In association with

Department of Chemical Engineering

Invites you for the lecture series on

Fundamentals of Biofuel Production Processes

Talks delivered by

Dr. Debabrata Das,
Ph.D.(IIT–Delhi), FIAHE, FNAE, FBRS, FAScT, FIE(I)
INAE–AICTE Distinguished Visiting Professor, SRM IST

- E - Certificates will be given to all participants
- All the undergraduate students, post graduate students, research scholars and faculty members from the Various disciplines are eligible to attend the lecture series.
- **Free Registration**

Registration link: https://forms.gle/t82WQQvzYiaPHh2e7

Fundamentals of Biofuel Production Processes

Research on renewable energy has accelerated in recent years to address the rising concerns over energy security, fossil fuel depletion, and climate change. It is estimated that a four time increase in present bioenergy production can lead to an almost 50% greenhouse gas reduction by 2050. New and renewable energy sources such as wind, solar and hydrothermal are reported to suffer from high production costs, complex conversion technologies and high energy input. Hence, the most promising alternative to fossil fuels appears to be biomass. Dr. Das' six lectures in this series delve on various aspects on biofuel production processes.

Among the various renewable energy sources, the less energy intensive and environmental friendly biochemical conversion of abundantly available biomass to biofuels appears most promising. One of the major challenges for the commercialization of biofuel industries is the lack of high yielding robust microbial strains that can thrive in harsh environmental conditions. The first lecture will describe the different genera of microbial strains involved in the high-yield biofuel production and discusses the means of their selection, optimization, and improvement for enhanced biofuel production.

The biochemical conversion of biomass to biofuels is catalyzed by the complex metabolic pathways in microorganisms. Hence, the knowledge of the metabolic pathways is essential to enhance the yield of the desired product and to improve process efficiency. Furthermore, once known, these pathways can be redefined and reconstructed into suitable hosts using various metabolic engineering approaches. The second lecture provides an insight into the various biochemical pathways that are currently exploited for biofuel production.

The use of synthetic biology has paved the way for fabricating or synthesizing newer pathways and genetic constructs to optimize both microbial hosts and the feedstock for reducing the costs and enhance biofuel production processes. In the third lecture, various such genetic and metabolic engineering tools will be described that have been employed so far for the advancement of biofuel production. In addition, the existing and future challenges imposed by the use of such complex biological systems will also be examined.

Photosynthetically efficient algae which does not require arable land and also possess high lipid yield potential appears to be best prospect for renewable and sustainable future as they can be used for carbon dioxide mitigation, bioremediation and biofuel production. This is however hindered by the poor biomass yields and unfavorable economics. The microalgal biorefinery concept promises to alleviate this by utilizing the proteins, carbohydrates and lipids and the whole biomass itself for the production of various value added products. The fourth talk discusses the potential and barriers in the commercialization of this microalgal biorefinery concept.

Reactor configurations play a very important role in chemical and biochemical processes. The batch reactor is simple in construction and requires less capital and infrastructure investment, can accommodate different types of feedstock and not require stringent operating conditions. However, it has various disadvantages such as low productivity, large downtime, variation in product quality, and intensive labor and energy requirements. This can be overcome with continuous flow systems, but which have their own disadvantages. The fifth and penultimate lecture makes a critical analysis of these reactors to determine the suitability of the process for gaseous fuels generation such as methane and hydrogen.

Biofuels are either in solid, liquid or gaseous forms. Solid food wastes can be easily converted to gaseous methane and hydrogen by an anaerobic digestion process. The liquid fuels are ethanol and biodiesel obtained from conversion of food grains and oilseeds. Solid fuels which are mainly from dry lignocellulosic biomass suffer from transportation and poor energy conversion efficiency. However, attempts have been made to convert lignocellulosic feedstock, oil seed, and algae to liquid fuels such as ethanol, biodiesel, and butanol on a large scale. This sixth and last lecture discusses the scale-up of these biofuel production processes with various case studies.

Programme Schedule

25.04.2022 - Monday		
09.30 a.m	-	Welcome address
09.45 a.m	-	Introduction about the speaker
09.50 a.m	-	Introduction about Lecture Series
10.00 am - 11.00 am	-	Microorganisms involved in biofuel production processes
26.04.2022- Tuesday		
10.00 am - 11.00 am	-	Biochemical pathways for the biofuels production
27.04.2022- Wednesday		
10.00 am - 11.00 am	-	Molecular biology approaches for the improvement of biofuels production
28.04.2022- Thursday		
10.00 am - 11.00 am	-	Algal Biorefineries and its Potentiality
29.04.2022- Friday		
10.00 am - 11.00 am		Effect of reactor configurations on the biofuel production
30.04.2022 Saturday		
10.00 am - 11.00 am		Scale-up and Case studies of biofuels production processes
11.05 p.m		Concluding remarks
11.15 p.m.		Vote of Thanks