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## **Overview**

Advances in biofuel research are reshaping the landscape of renewable energy, driven by the need for cleaner, sustainable alternatives to fossil fuels. Recent breakthroughs focus on feedstock innovation, where second generation (lignocellulosic biomass) and third-generation (microalgae) feedstocks are being developed to bypass the challenges associated with first generation biofuels, such as food competition and land-use conflicts. Lignocellulosic feedstocks, including agricultural residues and woody biomass, are rich in cellulose and hemicellulose, which are now being more efficiently hydrolyzed through advanced enzymatic pre-treatment techniques. Similarly, algae have garnered attention due to their high lipid content for biodiesel production, fast growth rates, and the ability to thrive in non-arable environments, reducing pressure on agricultural land. In bioconversion processes, significant progress has been made in metabolic engineering and synthetic biology to optimize microbial strains. Researchers are developing genetically engineered microbes, such as engineered yeast and bacteria, that can ferment sugars more efficiently and tolerate higher biofuel concentrations, thereby boosting yields of bioethanol, biobutanol, and biohydrogen. Overall, advances in biofuel research are moving towards the development of more efficient, sustainable, and economically viable biofuel systems that are critical to the global transition toward renewable energy and the reduction of dependence on fossil fuels. These innovations aim to address technical bottlenecks while aligning with climate goals and energy security strategies.

## **2.0 Objectives**

The main aim of the workshop is to address technical bottlenecks while aligning with climate goals and energy security strategies. The detailed content of the workshop are as follows:

- Bioreactor design for enhanced methane production.
- Bioethanol production from agricultural wastes.
- Advances in pretreatment methods for bioethanol production from lignocellulosic materials.
- Microbial Lipid Production from lignocellulosic for Biodiesel production
- Use of Termite Microbiome in Biotechnology
- Bioelectrochemical system for bioenergy production from wastewater
- Microbial electrolysis cell / Dark Fermentation process for value added products from waste / wastewater

- Materials development for biofuels generation from waste / waste biomass.
- Review and write scientific articles in the field of environmental biotechnology.

<b>Modules</b>	<p><b>Module A:</b> Advances in Anaerobic Digestion Process for Methane and Hydrogen Production, Vaporization of waste for energy production, biological treatment of wastewater and energy production, Advances in bioethanol/ biofuel production from agricultural wastes</p> <p><b>Module B:</b> Basic principles of Bio electrochemical system, Mechanisms of electron transfer, exoelectrogens, BES components: Anode, Cathode materials, catalysts, membrane, architecture, Electrode development and characterization for bioelectrochemical system for efficient energy production.</p>
<b>No. of Participants</b>	<ul style="list-style-type: none"> <li>➤ <b>Number of participants will be limited to 50 only.</b></li> <li>➤ <b>Online participants are limited to 20 only.</b></li> </ul> <p>(If more no. of participants registered, selection will be based on research interest in this field.)</p>
<b>Date of the course</b>	<b>16-21<sup>st</sup>, June 2025</b>
<b>Who Should Attend?</b>	<ul style="list-style-type: none"> <li>➤ Students at all levels (B.Tech./MS/M. Sc./M.E/ M. Tech/PhD) or Faculty from reputed academic institutions and technical institutions.</li> <li>➤ Executives, Bioprocess Engineers and researchers from government organizations including R&amp;D laboratories, Pollution control board etc.</li> </ul>
<b>Registration</b>	<p><b>Course Registration:</b></p> <ul style="list-style-type: none"> <li>➤ Please use the link below for the course registration. <b>Link:</b> <a href="https://forms.gle/Qh7Ct8sRqCn5rFrU7">https://forms.gle/Qh7Ct8sRqCn5rFrU7</a></li> <li>➤ Last date for Course Registration: <b>1<sup>st</sup> June 2025</b></li> </ul>
<b>Course Fee</b>	<p>The participation fees for the course is as follows:</p> <p style="text-align: center;"><b>Course Fee (including GST 18%)</b></p> <p><b>Indian Participants</b></p> <ul style="list-style-type: none"> <li>▪ Students / Research Scholars <b>Rs. 1000 /-</b></li> <li>▪ Faculty and Scientist <b>Rs. 3000 /-</b></li> <li>▪ Industrial participants <b>Rs. 7500 /-</b></li> </ul> <p><b>Foreign Participants</b></p> <ul style="list-style-type: none"> <li>▪ Students / Research Scholars <b>US \$ 200 /-</b></li> <li>▪ Faculty and scientist <b>US \$ 500/-</b></li> <li>▪ Industrial Participant <b>US \$ 1000/-</b></li> </ul> <p>The above fee includes all course materials, computer use for tutorials and assignments, laboratory equipment usage charges, internet facility.</p>
<b>Accommodation</b>	<p><b>Accommodation will be provided on request (<i>Charges per day per person</i>) and based on availability, on additional payment basis as given below.</b></p> <ol style="list-style-type: none"> <li>1. Hostel: ₹115 + 18% GST</li> <li>2. Guest House (Double Occupancy): ₹2000 + 18% GST</li> <li>3. Guest House (Single Occupancy): ₹1200 + 18% GST</li> </ol>
<b>Payment Procedure</b>	<p><b>Indian participants:</b></p> <p>Go to <a href="https://www.onlinesbi.sbi/sbicollect/">https://www.onlinesbi.sbi/sbicollect/</a> → Accept the terms and conditions → State: Tamil Nadu → Type: Educational Institutions → select Conference and Workshop NIT Trichy → Category: “<b>CHL2025- ADVANCES IN BIOFUELS AND BIOENERGY</b>” and provide details of payment and submit.</p> <p><b>International Participants:</b></p>

Required to make the course fee payment via SWIFT transfer.

**Account Details for SWIFT Transfer:**

Account Number: **38322028974**;

Account Name: **Director, NIT-Tiruchirappalli**,

SWIFT Code: **SBININBB190**

Bank Name: **State Bank of India**

**Speakers**

**Dr. Raj Boopathy, Professor, Nicholls State University, USA**



**Dr. Raj Boopathy** is an Alcee Fortier Distinguished Service Professor of biological sciences at the Nicholls State University, USA. He received the Jerry Ledet Foundation Endowed Professorship in Environmental Biology in 2002 and John Brady Endowed Professorship in 2012. In 2008, Dr. Raj Boopathy received the Nicholls State University's Presidential Award for Teaching Excellence. He has more than 35 years of research experience in the area of bioremediation and bio-processing. His research involves bioremediation of hazardous chemicals including oil spills and explosives, biological treatment of wastewater, antibiotic resistance genes in the environment, and bio-ethanol production. He has published more than 250 research papers in peer-reviewed journals and 25 book chapters. He edited three books. His research work has been cited more than 13,000 times with a h-index of 60 and an i10 index of 180. He reviewed research grants for National Science Foundation, Department of Defense, US Environmental Protection Agency, Department of Energy, and numerous private agencies and foreign governments including South Africa, Switzerland, Indonesia, Hong Kong, UK, and Israel. He is the editor of the journal, Environmental Quality Management, Current Pollution Reports, Applied Nano, and Applied Sciences. He also serves as a senior editor of the Journal, Renewable Bioresources and is on the Editorial Boards of various journals including International Biodeterioration & Biodegradation, Bioresource Technology, and the International Journal of Soil and Sediment Contamination. He received Fulbright scholarship and spent six months teaching and conducting research at the Institute of Technology (ITB) in Bandung, Indonesia in 2007. He also received European Union-US biotechnology Fellowship and Leverhulme commonwealth fellowship. He has been elected as a Fellow of various societies including International Union of Pure and Applied Chemistry (IUPAC), Society for Industrial Microbiology and Biotechnology (SIMB) and the International Forum on Bioprocessing (IFBioP). Dr Raj Boopathy was selected as a Fulbright Senior Scholar Specialist to visit various countries for next five years by the US State Department and he recently visited Malaysia and Indonesia as a Fulbright Specialist. He also received Dr. Waksman Award from SIMB for his contribution in Microbiology Education in 2017. He is the recipient of the World Class Professor (WCP) award from the Government of Indonesia. He received Lifetime Achievement Award for his contribution to Bioprocessing Research by the International Bioprocessing Association (IBA). Dr. Boopathy recently received the University of Louisiana (UL) System's Outstanding Faculty Award for the year 2023. Dr. Boopathy is a visiting professor in the Department of Chemical Engineering, Institute of Technology Bandung (ITB) Indonesia.

**Dr. N. Samsudeen, Associate Professor, NIT Tiruchirappalli**

**Dr. N. Samsudeen** is working as Associate Professor, Department of Chemical Engineering, National Institute of Technology, Tiruchirappalli, India. He has more than 16 years' experience in teaching and research. His main research areas are for wastewater treatment and simultaneous biofuel production from Bioelectrochemical system, biodiesel production, and Biosorption. He has received Prestigious Bioenergy Award for Cutting Edge Research (B-ACER) Fellowship in 2018 and received Chemical Engineering best faculty award, NIT Tiruchirappalli, 2021. He has visited university of Louisville, Kentucky, USA for a period of six months (2017-2018). He has two Indian patent (Granted) in the area or wastewater treatment and energy generation. He has published more than 60 research articles in the highly reputed journals like Bioresource technology, Chemical Engineering journal, International Journal of hazardous materials, International Journal of hydrogen energy, Renewable energy etc. He has attended 35 International conferences 7 chapters in springer and Elsevier etc. He has delivered guest lecture in the bioelectrochemical system in several colleges nearby NIT Tiruchirappalli.

**Dr. M. Matheswaran, Professor, NIT Tiruchirappalli**

**Dr. M. Matheswaran** is working as Professor in the Department of Chemical Engineering at National Institute of Technology, Tiruchirappalli, India. He obtained his Ph.D in Sunchon National University, Suncheon, South Korea. He received a Hiyoshi Young Leaf Award from Hiyoshi Corporation, Japan and Hiyoshi India Ecological Services Pvt. Ltd., Chennai. He has more than 15 years' research experience in Nanomaterial synthesis and its application, Electrochemical Engineering, Wastewater treatment, Electrochemical Oxidation etc. He has published more than 70 research articles in leading peer review journals, conference proceedings and books.

**Course coordinators****Contact information****Dr. N. Samsudeen / Dr. M. Matheswaran**

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