Fire Dynamics and Safety

Overview

Understanding fire risks and appropriate fire mitigation is very important to any engineering practice and risk management within diverse industries such as the oil and gas sector, building and infrastructure design, fire-fighting department, emergency responders, renewable energy sector, chemical and process industries etc. Fire dynamics is a multi-disciplinary field that deals with the complex processes involved in the initiation, growth, spread, and suppression of fires. The process is further complicated by the interaction of flames surrounding the fluid flow field, heat transfer, the nature of fuel, and the local environmental conditions. Recent growth in the adoption of battery electric vehicles has also seen increased exposure of the common public and emergency responders to the hazards of battery fires. It is, therefore, important to develop an understanding of the field and associated risks to be able to identify and classify them, design safe industrial and residential spaces, and provide efficient solutions in the context of fire safety and protection.

Advances in computational tools and combustion kinetics have enabled accurate prediction of combustion events such as ignition, propagation, emissions, and extinction limits. Developing a familiarity with such tools along with an understanding of the fundamental concepts associated with the processes is expected to not only be extremely useful to the current and future industries but also to develop future research activities in this field in India.

<table>
<tr><td>Modules</td><td>✓ Combustion Fundamentals & Fire Risk Scenarios
✓ Modelling Radiation & Conjugate Heat Transfer
✓ Fire Dynamics & Flame Propagation
✓ Advanced Combustion Kinetic Models & Flame Extinction Predictions
✓ Hands-On with Fire Dynamics & Combustion Modeling Tools
The number of participants for the course is limited and is on a first-come-first-serve registration basis.</td><td>Aug 20th –24th, 2025</td></tr>
<tr><td>Who Should Attend</td><td colspan="2">✓ Senior undergraduate students, and graduate students pursuing M.Tech/MS/Ph.D. in Mechanical/ Chemical/ Materials/Civil/Aerospace Engineering would benefit the most.
✓ Practicing engineers, scientists & policy makers working in thermal, automotive, fire safety, building, construction industries, and in government research organizations.
✓ Faculty members from organizations such as IITs, IISERs, NISER, and other academic/research institutions interested in the best practices and recent advances in the field of fire dynamics and safety.</td></tr>
<tr><td>Fees</td><td colspan="2">The participation fees for taking the course are as follows:
Participants from abroad: US $250
Industry/ Research Organizations: INR 8000
Academic Institutions: Faculty – INR 4000 and Students – INR 1000
The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, and 24 hr free internet facility. The participants will be provided accommodation on a payment basis.</td></tr>
<tr><td rowspan="3">Mode of Registration</td><td colspan="2"><u>Step 1:</u> The Course fee is to be deposited online in the account provided below. Participants should pay course fee through online mode (NEFT/IMPS/UPI) and identify the transaction ID/details with date.</td></tr>
<tr><td><u>Online Bank Transfer (NEFT/IMPS)</u>
<u>Account Name:</u> CEP, IIT BHUBANESWAR
<u>Account Number:</u> 24282010001960
<u>Bank Name:</u> CANARA BANK
<u>IFSC Code:</u> CNRB0017282
<u>MICR No:</u> 752015014
<u>Branch Name:</u> IIT BHUBANEWAR, ARGUL BRANCH
<u>Branch Address:</u> IIT BHUBANEWAR, ARGUL, JATNI, KHORDA – 752050</td><td><u>OR</u>
<u>Use UPI link</u>
 
</td></tr>
<tr><td colspan="2"><u>Step 2:</u> After online payment of course fee, fill the details in the google form at LINK</td></tr>
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The Faculty & Expert

Prof. Sunil Kumar is Professor of Mechanical Engineering at New York University whose research focuses on thermal radiation, fire dynamics, thermal-fluid analysis, and optics. He has received several fire prevention and safety research grants over the last two decades from the U.S. Department of Homeland Security (DHS). He led the DHS-funded "Wind-Driven High-Rise Fires" project with the Fire Department of New York (FDNY) and the National Institute of Standards and Technology, which produced revolutionary changes in many of FDNY's tactics that have since been implemented by FDNY and other U.S. fire departments. His group also developed an innovative training methodology to translate and disseminate fire safety research, and to educate firefighters. This has been adopted by more than 1000 fire departments.

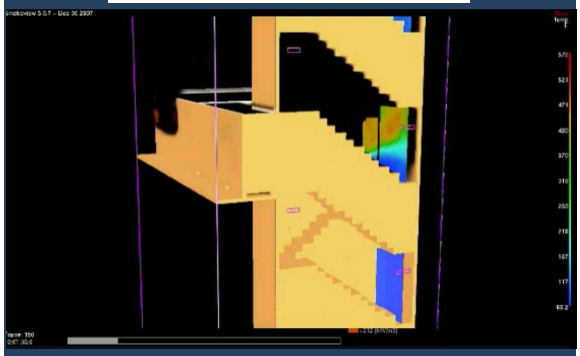
Dr. Malay Ku. Pradhan is an expert in Safety, Health, and Environmental Management with a career spanning over three decades and currently serves as the General Manager at the Odisha State Disaster Management Authority (OSDMA), overseeing the Chemical Disaster Cell. He is a Life Member of the Indian Society for Non-Destructive Testing (ISNT), the Indian Institute of Metals (IIM), and the Indian Society for Technical Education (ISTE). Dr. Pradhan has organized numerous state, national, and international seminars and workshops benefiting industrial workers across Odisha and served as the Program Coordinator of the "Vision Zero International Conference" held in collaboration with DGUV, ISSA, and IGFP in Bhubaneswar.

Prof. Swarup K. Mahapatra is a Professor of Mechanical Engineering in the School of Mechanical Sciences, IIT Bhubaneswar. He holds a PhD degree from Jadavpur University and an M.E in Mechanical Engineering from IIT Roorkee. He specializes in the area of Radiation Modeling, Conjugate Heat, and Mass Transfer and Flow through Porous Media. He has over 55 international journal publications and has received multiple research grants from DRDO, MHRD, and DST.

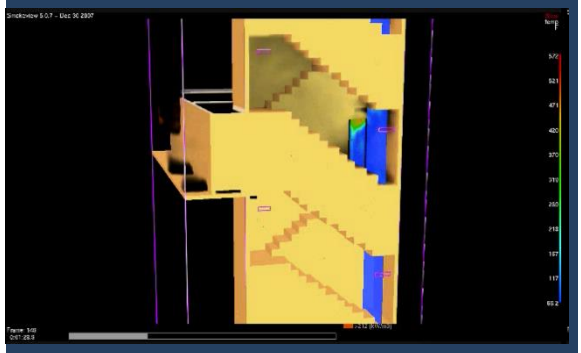
Dr. Prasenjit Rath is an Associate Professor of Mechanical Engineering at the School of Mechanical Sciences, IIT Bhubaneswar. He holds a Ph.D. in Mechanical Engineering from Nanyang Technological University, Singapore, and an M.Tech in Mechanical Engineering with a specialization in Thermal and Fluids Engineering from IIT Guwahati. His key research areas are CFDHT as applied to materials processing, phase change heat transfer, Radiation Heat Transfer in Participating Media and ultrafast transport.

Dr. Amrit B. Sahu is an Assistant Professor in the School of Mechanical Sciences, at IIT Bhubaneswar. He holds a Ph.D. in Mechanical Engineering from the Indian Institute of Science, Bangalore, and has worked as a postdoctoral researcher at the University of Birmingham, UK, and the National University of Ireland, IRE. He also worked as a Technology Consultant and Combustion R&D Engineer at multiple startups in the US. At IIT Bhubaneswar he engages actively in the research areas of clean combustion technologies, combustion kinetics, and zero/low carbon fuels for the power and transport sector.

Fire without PPV



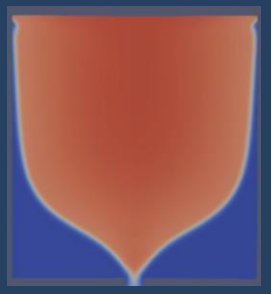
Fire with PPV



Flame propagation

Experiment

CFD



Course Coordinators

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