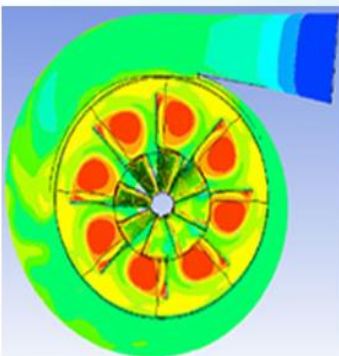
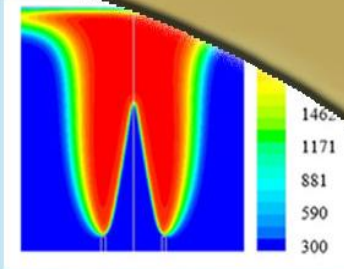
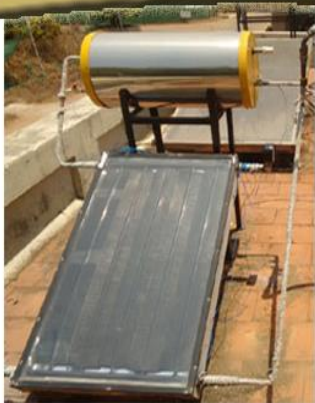


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# National Institute of Technology Karnataka, Surathkal

## Department of Mechanical Engineering



## ABOUT THERMAL ENGINEERING GROUP

The first Master program in the department was started in Heat Power Engineering in the year of 1971, and it was renamed as M. Tech. in Thermal Engineering in the year of 2008. The Program emphasizes on fundamental principles of Thermal Engineering for various applications, which includes Theory and Design of internal combustion engines, Computational fluid dynamics, Measurement in thermal systems, Advanced Fluid mechanics, Combustion, Refrigeration and Cryogenics, Air-Conditioning Systems, Nanofluids, Turbo machines, etc. Students are also encouraged to do their projects in industries, wherever there are chances of exposure to various avenues in Thermal Engineering. The program has traversed the path of knowledge dissemination and generation as well as delivered more than 600 Thermal Engineering post graduates to the nation.

## PROGRAM EDUCATIONAL OBJECTIVES

- ✦ Prepare graduates with good analytical, computational and experimental skills to design and develop energy efficient systems for sustainable development
- ✦ Prepare graduates with high level of technical competency combined with research and complex problem solving ability to generate innovative solutions in thermal engineering and allied areas.
- ✦ Pursue lifelong learning for career and professional growth with a concern for society and environment.
- ✦ Inculcate teamwork, communication and interpersonal skills adapting to changing environments of technology.

## PROGRAM OUTCOMES

- a. Graduate will be able to demonstrate and apply in depth technical knowledge of engineering in design and operation of various thermal systems.
- b. Graduate will be able to design and conduct experiments, as well as to organize, analyze and interpret data to produce meaningful conclusions and recommendations
- c. Graduate will be able to identify, formulate and solve complex engineering problems
- d. Graduate will be able to understand professional, legal, and ethical issues and responsibilities
- e. Graduate will be able to convey thoughts effectively on the basis of acquired soft skills and self-confidence for the consistent and effective knowledge sharing process
- f. Graduate will be sensitive towards the impact of engineering solutions in a global, economic, environmental and societal context.
- g. Graduate will be able to understand the need for, and an ability to engage in life-long learning and continual updating of professional skills
- h. Participate effectively in multidisciplinary teams in both leadership and fellowship roles throughout their association and worked with welcomed diversity.
- i. Establish themselves as practicing engineers/professionals in their careers and to effectively and economically employ and integrate technology and people with appropriate consideration for future.
- j. Graduate will be able to develop an alternate career as an entrepreneur.

## FACULTY MEMBERS (THERMAL ENGG.)

|  |   |
|--|---|
| <p><b>P. Mohanan, Ph.D. (IIT Delhi)</b><br/> <b>Professor</b><br/> <b>Research Interests: Internal Combustion engines, Combustion, Heat Transfer, Biodiesel, Alternative fuels, Environmental Pollution and control, Automobile pollution, Energy systems, Renewable energy.</b><br/>         Mobile: +919845713567<br/>         Mail-id: pmn@nitk.ac.in</p>   | <p><b>T. P. Ashok Babu, Ph.D. (IIT Delhi)</b><br/> <b>Professor</b><br/> <b>Research Interests: Thermal Engineering, Refrigeration and Air conditioning, Renewable Energy, Solar Energy, Heat Transfer, IC Engines</b><br/>         Mobile: +919986548546<br/>         Mail-id: tpashok@rediffmail.com</p>  |
| <p><b>Ravikiran Kadoli, Ph.D. (IIT Madras)</b><br/> <b>Professor</b><br/> <b>Research Interests: Structural mechanics, Mechanics and applications of advanced materials, Fluid Structure Interaction and other coupled problems like heat and mass transfer, Computational fluid dynamics.</b><br/>         Mobile: +919844400659<br/>         Mail-id: rkkadoli@rediffmail.com, rkkadoli@nitk.ac.in</p> | <p><b>Suresh Kumar Y, M.E. (Mangalore University)</b><br/> <b>Associate Professor</b><br/> <b>Research Interests: Thermal Engineering, IC Engines, Fluid Mechanics and Machinery</b><br/>         Mobile: +919448254984<br/>         Mail-id: suresh.yesky@gmail.com</p>  |
| <p><b>Kumar G.N, Ph.D. (IIT Delhi)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Alternative fuels for IC engines, Simulation of I.C. engines, Heat Transfer</b><br/>         Mobile: +919481848572<br/>         Mail-id: gnkumar33@gmail.com</p>  | <p><b>Vasudeva M, (PhD, IIT Bombay)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Gasification of Biomass for Power and CHP, Polygeneration, Environmental impacts and Sustainability assessment of bioenergy.</b><br/>         Mobile: +919008889796<br/>         Mail-id: vasudevmadav@gmail.com</p>                                      |
| <p><b>Veershetty Gumtapure, Ph.D. (IIT Madras)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Renewable energy, Solar Energy Conversion, Biomass Utilization</b><br/>         Mobile: +919591415911<br/>         Mail-id: veesg@yahoo.co.in, veesg@nitk.ac.in</p>   | <p><b>Vijaykumar Hindasageri, Ph.D. (IIT Bombay)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Combustion of premixed flames, experimental and numerical heat transfer and fluid flow, Impinging flame jets, Ocean wave energy conversion</b><br/>         Mobile: +919920146578<br/>         Mail-id: vijaykumar.hindasageri@gmail.com</p> |
| <p><b>Ajay Kumar Yadav, Ph.D. (IIT Kharagpur)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Heat transfer, Refrigeration &amp; Air Conditioning, Renewable Energy, Bio-fuels, IC Engines, CFD, Nanofluids</b><br/>         Mobile: +919035552339<br/>         Mail-id: ajaykyadav@nitk.edu.in</p>  | <p><b>Sathyabhama A, Ph.D. (NITK Surathkal)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Heat transfer, Refrigeration &amp; Air-conditioning, Energy sources, Energy Audit</b><br/>         Mobile: +919448134433<br/>         Mail-id: bhama72@gmail.com</p>  |
| <p><b>Anish S, Ph.D. (IIT Madras)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Turbomachines, CFD, Droplet evaporation, Organic Rankine Cycle, Fluid structure interactions</b></p>   | <p><b>Arun M, Ph.D. (University of Greenwich)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: CFD, Turbulence, Heat and Mass transfer, Combustion,</b></p>  |

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| <p>Mobile: +919036317552<br/> Mail-id: anish@nitk.ac.in,<br/> anish.surendran@gmail.com</p>   | <p><b>Multi-phase flows, Fire Safety Engineering</b><br/> Mobile: +917795541824<br/> Mail-id: m.arun1978@gmail.com</p>   |
| <p><b>N.Gnanasekaran, Ph.D. (IIT Madras)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Inverse Heat Transfer, Optimization in thermal systems, Microfluidics</b><br/> Mobile: +917204877348<br/> Mail-id: ngs.iitm@gmail.com</p>  | <p><b>Ranjith M, Ph.D. (Dong-A University, Busan, South Korea)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Immersed Boundary Dynamics, CFD, Fluid structure Interaction, Microfluidics, Biological Fluid dynamics, Fluid Flow and heat transfer, Renewable Energy Utilization</b><br/> Mobile: +918050159645<br/> Mail-id: mranji1@nitk.edu.in</p> |
| <p><b>Arumuga Perumal D, Ph.D. (IIT Guwahati)</b><br/> <b>Assistant Professor</b><br/> <b>Research Interests: Lattice Boltzmann Method, CFD, Microfluidics (MEMS) and Numerical Heat Transfer</b><br/> Mobile: +919159860535<br/> Mail-id:perumal.iit@gmail.com,<br/> perumal@nitk.edu.in</p> | <p><b>Professor. Shuichi Torii, Ph.D. Kumamoto University</b><br/> <b>Visiting Faculty</b><br/> <b>Research Interests: Heat Transfer, Fluid Dynamics, Numerical Simulation, Production and Development of Renewable Energy Combustor</b><br/> Mail-id:torii@mech.kumamoto-u.ac.jp</p>  |

## CURRENT RESEARCH AREA

- Emission Studies on Engines
- Combustion of premixed flames
- Multi-phase flow
- Nanofluids
- Computational fluid dynamics
- Renewable Energy Systems
- Solar Energy
- Wind Energy
- Natural Circulation Loops
- Inverse Heat Transfer
- Pool Boiling
- Turbine aerodynamics
- Wet compression
- Immersed boundary method
- Microfluidics
- Biological Fluid dynamics & Heat Transfer
- Biomass and Biogas
- Alternate Refrigerants
- Alternate Refrigeration Methods

## Completed R&D Projects

1. Alternate refrigerants to CFC's and HCFC's, Funding Agency: - MHRD, Investigator: - T. P. Ashok Babu.
2. Studies on Bio-Diesel using Esters of Coconut and Sunflower oil, Funding Agency: MHRD, Investigator: - P. Mohanan.
3. Investigation on enhanced pool boiling methods for cooling of micro-electronic devices, Funding Agency: DST –SERB, Investigator: - Sathyabhama A.

## Ongoing R&D Projects

| Sl. No. | (Principal Investigator/ Coordinator) | Project Title   | Grant (INR) Lakhs | Funding Agency |
|---------|---------------------------------------|---|-------------------|----------------|
| 1.      | Sathyabhama A.                        | Visualization of boiling heat transfer on grooved surfaces  | 18                | CSIR           |
| 2.      | Ajay Kumar Yadav.                     | Numerical and Experimental Studies on Two Phase CO <sub>2</sub> Based Natural Circulation loops                           | 25.84             | DST-SERB       |
| 3.      | Sathyabhama A.                        | Experimental and Numerical Investigation of Effect of Leading edge Protuberances on the Performance of Wind Turbine Blade | 66.0              | DST-SERB (EMR) |
| 4.      | Anish S.                              | An investigation into the aerodynamic and aero elastic behavior of compressor cascade in a droplet laden flow             | 25.85             | DST-SERB       |
| 5.      | Kumar G. N.                           | Study on low temperature combustion in a CDRI Engine using biodiesel  | 5.5               | DST            |

### Major Facilities

- Pool Boiling Setup
- Computerized IC Engine Test Rigs
- Natural circulation loop setups
- Simulation chamber for air conditioner
- Heat pipes
- Emission Testing Equipments
- R&A/C test equipments
- CRDI Engine setup with ECU control
- Thermostatic baths (-40 to 200 °C)
- Turbine and compressor cascade wind tunnel
- Low speed wind tunnel

### Major Laboratories

- Heat transfer laboratory
- I.C. Engines laboratory
- CFD laboratory (ANSYS 14.5, EES, NIST-REFPROP, AVL FIRE & BOOST)
- CAD Lab

### Consultancy Potential

- Engine Performance testing
- Combustion
- Refrigeration and Air Conditioning systems
- Cryogenics
- Micro channels Flow
- Fluid machinery and fluid flow
- Heat Transfer
- Renewable Energy Systems
- Energy Auditing

## MoUs with Institutions Partners

| Sl. No. | Date of Signing MoU Duration   | Organization /Institution  | Domain   |
|---------|--------------------------------|--|--|
| 1.      | April 19, 2016<br>(3 Years)    | WABCO India Limited  | Collaborative research and student Internship                              |
| 2.      | April 5, 2016<br>(5 Years)     | National Institute of Technology Tiruchirapalli, Tamil Nadu                                      | Faculty exchange/ Student exchange, Collaborative research                 |
| 3.      | April 5, 2016<br>(5 Years)     | University of California Berkeley Mechanical Engineering (Combustion Group) Berkeley, California | Faculty exchange/ Student exchange/ Joint Research                         |
| 4.      | February 24, 2016<br>(5 Years) | Manipal University, Manipal  | Faculty exchange/ Joint Research/ Student exchange, Collaborative research |
| 5.      | December 14, 2015<br>(3 Years) | USC Viterbi School of Engineering  | Faculty exchange/ Joint Research/ Student exchange, Collaborative research |
| 6.      | October 14, 2015<br>(3 Years)  | Hexagon Capability Center India Private Limited  | Mechanical Engg. Collaborative research                                    |
| 7.      | March 9, 2015<br>(5 Years)     | Kagoshima University, Japan  | Academic exchange program for students                                     |
| 8.      | February 28, 2015<br>(5 Years) | Faculty of Engineering and Graduate School of Science and Technology, Kumamoto University, Japan | Student exchange Program   |
| 9.      | February 10, 2015<br>(5 Years) | Father Muller Medical College  | Collaborative research   |

## MoUs with Industries and Research labs

1. Larsen & Toubro Limited (L&T Construction)
2. AB Volvo Group Sweden
3. Robert Bosch Engineering and Business Solutions Limited (RBEI), Bangalore
4. Mercedes-Benz Research and Development Indian Private Limited (MBRDI), Bangalore
5. Oil and Natural Gas Corporation Limited (ONGC), Dehradun
6. Mangalore Refinery and Petrochemicals Limited (MRPL)
7. Institut National DE LA Recherche Agronomique (INRA), France
8. CSIR- National Institute of Oceanography, Goa
9. Bhabha Atomic Research Center (BARC), Mumbai
10. National Aerospace Laboratories (NAL), Bangalore
11. Central Power Research Institute (CPRI), Bangalore
12. AVL Austria and NITK for using software AVL FIRE and AVL BOOST

## Awards (2015-16)

- Prof. P. Mohanan received an offer for collaborative research at University of California, Berkley, USA for six months during June to December 2016.
- Best Paper award to S. Balaji and N. Gnanasekaran for a research paper in the International conference on System, Energy and Environmental (ICSEE-16) held at Government College of Engineering Kannur during 5<sup>th</sup>-6<sup>th</sup> August 2016.
- Vijaykumar Hindasageri has received the award of Excellence for his doctoral work at IIT Bombay on 8<sup>th</sup> August 2015.
- Best Paper award to G. Kiran Kumar, S. Saboor and T. P. Ashok Babu for a research paper in the International conference on Advancements in aeromechanical materials for manufacturing (ICAAMM-2016) organized by MLRIT, Hyderabad and Elsevier materials today proceedings held on 7<sup>th</sup> - 9<sup>th</sup> July, 2016.
- Best paper award to Venkatesh T. Lamani, Dr. Ajay Kumar Yadav & Dr. Kumar G.N. for a research paper in an International Conference on Biofuels and Bio energy held on 23<sup>rd</sup>-25<sup>th</sup> February 2016 at MANIT Bhopal, India.
- The best research paper award to Saboor S and Prof. Ashok Babu T P for the Technical research paper in International Conference on New Frontiers in Chemical, Energy and Environmental Engineering (INCEEE-2015), 20<sup>th</sup>-21<sup>th</sup> March, 2015 at NIT Warangal.

## Selected Publications (2015-16)

| Sl. No. | Author(s)  | Title  | Journal (Volume, Year, pages)  |
|---------|--|--|--|
| 1.      | Ajay Kumar Yadav, Souvik Bhattacharyya, M. Ram Gopal | Optimum Operating Conditions for Subcritical/Supercritical Fluid Based Natural Circulation Loops   | ASME Journal of Heat transfer, 138, 2016, 1-9                                      |
| 2.      | Dinesha P., Mohanan P.                               | Evaluation of Combustion, Performance and Emissions of a Diesel Engine fueled with Bio-fuel produced from Cashew Nut Shell Liquid                      | Biofuels (Taylor and Francis online Journal), 6, 2015, 101-106                     |
| 3.      | Saboor Shaik, Ashok Babu Talanki Puttaranga Setty    | Influence of ambient air relative humidity and temperature on thermal properties and unsteady thermal response characteristics of laterite wall houses | Building and Environment 99, 2016, 170-183   |
| 4.      | S. Raviteja, G.N. Kumar                              | Effect of hydrogen addition on the performance and emission parameters of an SI engine fueled with butanol blends at stoichiometric conditions         | International Journal of Hydrogen Energy, 40, 2015, 9563-9569                      |
| 5.      | Sathyabhama, A                                       | Effect of boiling surface vibration on heat transfer   | Heat Mass Transfer, Springer-link publication, available online from March 6, 2016 |
| 6.      | K.S. Reddy, Sendhil Kumar Natarajan, G. Veershetty   | Experimental performance investigation of modified cavity receiver with fuzzy focal solar dish concentrator  | Renewable Energy, 74, 2015, 148-157  |
| 7.      | Sharathkumar, Harsha Kumar, N. Gnanasekaran          | A neural network based method for estimation of heat generation from a Teflon cylinder   | Frontiers in Heat and Mass Transfer, 15, 2016, 1-7                                 |

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| 8.  | Anil. R. Kadam, A. R. Tajik, V. Hinasageri   | Heat transfer distribution of impinging flame and air jets- A comparative study  | Applied Thermal Engg, 92, 2016, 42-49  |
| 9.  | Sureshkumar Saroj, V. Hinasageri, S. V. Prabhu   | Local heat transfer distribution on a flat plate impinged by a swirling jet generated by a twisted tape  | International Journal of Thermal Sciences, accepted (2016)                       |
| 10. | P. M. Patil, H. S. Ramane, S. Roy, V. Hinasageri, E. Momonia                               | Influence of mixed convection in an exponentially decreasing external flow velocity  | International Journal of Heat and Mass Transfer, 104, 2016, 392-399              |
| 11. | V. Hinasageri, Rajendra P. Vedula, Siddini. V. Prabhu                                      | Heat transfer distribution of swirling flame jet impinging on a flat plate using twisted tapes   | International Journal of Heat and Mass Transfer, 91, 2015, 1128-1139             |
| 12. | V. Hinasageri, Pramod Kuntikana, Abdul Raouf Tajik, Rajendra P. Vedula, Siddini. V. Prabhu | Axis switching in impinging premixed methane-air flame jets  | Applied Thermal Engineering, 107, 2016, 144-153                                  |
| 13. | V. Hinasageri, Rajendra. P. Vedula, Siddini. V. Prabhu.                                    | Heat transfer distribution for three interacting methane-air premixed impinging flame jets   | International Journal of Heat and Mass Transfer, 88, 2015, 914-925               |
| 14. | Sangmo Kang, Madhusoodanan Mannoor, Ranjith Maniyeri                                       | Effect of the Reynolds number on two - dimensional electrophoretic motions of a pair of particles under a uniform electric field.  | Mechanical Science and Technology, 30, 2016, 3219-3228                           |
| 15. | D. Arumuga Perumal, Anoop K. Dass  | A review on the development of Lattice Boltzmann Computation of macro fluid flows and heat transfer.   | Alexandria Engineering Journal, 54, 2015, 955-971                                |
| 16. | Suhas. B.G, Sathyabhama, A   | Numerical Analyses of Single-Phase Pressure Drop and Forced Convective Heat Transfer Coefficient of Water-Ethanol Mixture: An Application in Cooling of HEV Battery Module | Heat Transfer Asian Research (Available online)                                  |
| 17. | Ajay Kumar Yadav, M. Ram Gopal, Souvik Bhattacharyya                                       | Effect of Tilt Angle on Subcritical/Supercritical Carbon Dioxide Based Natural Circulation Loop With Isothermal Source and Sink  | ASME Journal of Thermal Science and Engineering Applications, 8, 2016, 1-8       |
| 18. | Sathyabhama, A   | Nucleate pool boiling heat transfer from a flat-plate grooved surface  | Journal of Enhanced heat transfer, Begell house publication 22(3), 2015, 247-265 |

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