

THERMAL ENGINEERING



DEPARTMENT OF MECHANICAL ENGINEERING



NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA SURATHKAL- 575 025,
INDIA

VISION AND MISSION STATEMENT OF THE DEPARTMENT

VISION

Create globally competent mechanical engineers capable of working in an interdisciplinary environment, contributing to society through innovation, entrepreneurship and leadership

MISSION

- 1) Produce Mechanical Engineers with a strong theoretical and practical knowledge to contribute to society with high moral and ethical values
- 2) Nurture students with a global outlook for a sustainable future and sound health.
- 3) Enable to be productive members of interdisciplinary teams, capable of adapting to changing environments of engineering, technology and society.
- 4) Inculcate critical and deep-thinking abilities among students and develop entrepreneurial skills, innovative ideas and leadership qualities.
- 5) Create facilities for continued education, training, research and consultancy

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, Turbo machines, Renewable & Sustainable energy, 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 technical competency combined with research and complex problem solving ability to generate innovative solutions in thermal engineering
- ✚ 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

- An ability to independently carry out research/investigation and development work to solve practical problems
- An ability to write and present a substantial technical report/document
- Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

FACULTY MEMBERS (THERMAL ENGINEERING)

Ravikiran Kadoli, Ph.D. (IIT Madras)

Professor

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.

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Kumar G.N., Ph.D. (IIT Delhi)

Associate Professor

Research Interests:

Alternative fuels for IC engines, Simulation of I.C. engines, Heat Transfer

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Veershetty Gumtapure, Ph.D. (IIT Madras)

Associate Professor

Research Interests:

Renewable energy, Solar Energy Conversion

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Sathyabhama A., Ph.D. (NITK Surathkal)

Associate Professor

Research Interests: Heat transfer, Refrigeration & Air-conditioning, Energy sources, Energy Audit

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Anish S., Ph.D. (IIT Madras)

Associate Professor

Research Interests: CFD, Turbomachines, Droplet evaporation, Organic Rankine Cycle, Fluid structure interactions

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Arun M., Ph.D. (University of Greenwich)

Associate Professor

Research Interests: CFD, Turbulence, Heat and Mass transfer, Combustion, Multi-phase flows, Fire Safety Engineering

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Vasudeva M., Ph.D. (IIT Bombay)

Assistant Professor

Research Interests:

Gasification of Biomass for Power and CHP, Polygeneration, Environmental impacts and Sustainability assessment of bioenergy

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Ajay Kumar Yadav, Ph.D. (IIT Kharagpur)

Assistant Professor (On Lien IIT Patna)

Research Interests: Heat transfer, Refrigeration & Air Conditioning, Renewable Energy, Bio-fuels, IC Engines, CFD, Bioheat transfer

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N. Gnanasekaran, Ph.D. (IIT Madras)

Assistant Professor

Research Interests:

Inverse Heat Transfer, Optimization in thermal systems,

Microfluidics

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Arumuga Perumal D, Ph.D. (IIT Guwahati)

Assistant Professor

Research Interests: Lattice Boltzmann Method, CFD, Microfluidics (MEMS) and Numerical Heat Transfer.

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Ranjith M, Ph.D. (Dong-A University, Busan, South Korea)

Assistant Professor

Research Interests:

Immersed Boundary Dynamics, CFD, Fluid structure Interaction, Microfluidics, Biological Fluid dynamics, Fluid Flow and heat transfer, Renewable Energy Utilization.

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Parthasarathy P., Ph.D. (KIT Germany)

Assistant Professor

Research Interests:

Fluid Flow and Heat Transfer in Porous Media, Porous media injectors for cryogenic engines, Solar Fuels.

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CURRENT RESEARCH AREA

- Emission Studies on Engines, Combustion of premixed flames
- Micro Channels Flow
- Multi-phase flow, Nanofluids
- Computational Fluid Dynamics
- Alternate Refrigerants and Alternate Refrigeration Methods
- Alternate Fuels
- Renewable Energy Systems, Solar Energy, Wind Energy
- Natural Circulation Loops
- Inverse Heat Transfer, Pool Boiling
- Turbomachines
- Lattice Boltzmann Method
- Immersed Boundary Method
- Microfluidics, Biological Fluid dynamics

CONSULTANCY POTENTIAL

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

FACILITIES

Major Facilities

- Liquid Nitrogen Plant with Nitrogen generator
- 3D Particle Image Velocimetry, Micro PIV
- Computerized IC Engine Test Rigs
- Emission Testing Equipment
- Ref. & A/C test equipment, simulation chamber
- Pool Boiling Setup
- CRDI Engine
- Solar simulator with thermal collectors
- Thermostatic bath (02)

Major Laboratories

- ❖ Heat transfer laboratory
- ❖ I.C. Engines laboratory
- ❖ CFD laboratory (ANSYS 14.5, EES, NIST-REFPROP, AVL FiRE & BOOST, COMSOL)
- ❖ Wind turbine laboratory

ONGOING PROJECTS

Sl. No.	(Principal Investigator/ Coordinator)	Project Title	Grant (INR) Lakhs	Funding Agency
1	Dr.Ajay KumarYadav	Development of cost-effective radio frequency ablation system and magnetic hyperthermia equipment for thermal therapies of cancerous tumors.	48.94	SERB
2.	Dr.Vasudeva Madav	Food Waste to Hydrogen	35.20	Maire Tecnimont S.p.A, Italy
3.	Dr. Anish S	An investigation in to the effects of induced helicity in the carotid bifurcated arteries on patient specific models	16.15	SERB
4.	Dr. Parthasarathy P	Design, analysis and demonstration of the porous injector concept for throttling of liquid rocket engine.	25	ISRO
5.	Dr. Parthasarathy P	Design and testing of robust, highly efficient, low polluting LPG porous burners for household applications.	25.85	DST-SYST
6.	Dr.Vasudeva Madav	Generation of design data for Condenser of Vapor Compression Module (VCM) of AMCA	91.15	Aeronautical Development Agency, Bangalore
7.	Dr. Vasudeva Madav	Feasibility Studies Analysis for the implementation of an organic waste based biogas plant in Paradip: Odisha Project Management	27.02	SERB
8.	Dr. Arun M	Particle migration and margination in bidspersed fluid flow through constricted channel	30	DST-SERB
9.	Dr.Ajay KumarYadav	Design and development of supercritical carbon dioxide based naturally circulated solar thermal collector.	23.81	SERB
10.	Dr. Vasudeva Madav	Experimental Investigation and Optimization of Green Hydrogen Production using biomass (RDF) and Redmud Catalyst	12.53	Tecimont Private Limited
11.	Dr. Parthasarathy P	Evaluation of macroscopic properties of ideal porous media for their use in solar reactors and low emission combustors with help of experiments and CFD simulations	15	SERB

SELECTED PUBLICATIONS (2021-22)

Sl. No.	Title	Journal	Author(s)
1.	Experimental study on the effect of injection timing on a dual fuel diesel engine operated with biogas derived from food waste	Journal of Energy Resource and Technology, ASME, 144 (12) (2022) 122303 (1-11)	Jagadish C and Veershetty Gumtapure
2.	Optimum selection of phase change material for solar box cooker integrated with thermal energy storage unit using multi- criteria- decision- making technique	Journal of Energy Storage, 40 (2021),102807	B. C. Anilkumar, R. Maniyeri, S. Anish
3.	Performance evaluation of partially filled high porosity metal foam configurations in a pipe	Applied Thermal Engineering, Vol. 194, 117081, (2021)	Prakash H. Jadhav, Gnanasekaran N, D.A. Perumal, Moghtada Mobedi
4.	Aerodynamic performance of profiled endwalls with upstream slot purge flow in a linear turbine cascade having pressure side separation	Physics of Fluids, 33 (1), 015119, 2, 2021	S Babu, S Anish
5.	Effect of variable compression ratio and equivalence ratio on performance, combustion and emission of hydrogen port injection SI engine	Energy, 2021.122468	Jayashish Kumar Pandey, G.N. Kumar
6.	Leading edge tubercle on wind turbine blade to mitigate problems of stall, hysteresis, and laminar separation bubble	Energy Conversion and Management Volume 255, 1, 2022, 115337	Jeena Joseph, A. Sathyabhama
7.	CFD and exergy analysis of subcritical/supercritical co2 based naturally circulated solar thermal collector	Renewable Energy, 189 (2022) 865-880	Madagonda K. Biradar, Dipal N. Parmar, Ajay Kumar Yadav,
8.	Experimental investigation of shellac wax as potential bio-phase change material for medium temperature solar thermal energy storage applications”	Solar Energy 231(1), (2022), 1002-1014.	Rudra Murthy B.V., Kumara Thanaiah and Veershetty Gumtapure
9.	Numerical and experimental investigation of modified V-shaped turbine blades for hydrokinetic energy generation	Renewable Energy, 2022	Shashikumar C M, Vasudeva M
10	A numerical study of forced convection in ideal and randomized reticulated porous structures and a proposal for a new correlation	International Journal of Heat and Mass Transfer, Volume 184, 2022, 122292, ISSN 0017-9310	S. Rambabu, P. Parthasarathy, V. Ratna kishore

CONTACT:

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