

## EDUCATION

- **PhD.**, Middle East Technical University (METU), Department of Mechanical Engineering, Ankara, Turkey (September 2015)  
**Thesis Topic:** Implementation of Metal-Based Microchannel Heat Exchanger in a Micro Refrigeration Cycle, and Numerical and Experimental Investigation of Surface Roughness Effects on Flow Boiling  
*Awarded Thesis of Year 2015 by METU Mustafa Parlar Education and Research Foundation*
- **Master of Science**, Urmia University, Department of Mechanical Engineering, Orumiyeh, Iran (March 2004)  
**Thesis Topic:** The Analysis of Corrosion of Marine Steels, A36-212 and EN10225 According to ASTM Standard
- **Bachelor of Science**, University of Tabriz, Department of Mechanical Engineering, Tabriz, Iran (September 2002)

## RESEARCH INTERESTS

Solar energy, renewable energy, vehicle aerodynamics, Lithium-ion thermal management, micro cooling systems

## EXPERIENCE

- **Associate professor, Mechanical Engineering Department, Turkish Aeronautical Association, Feb. 2024-Present**
- Teaching Finite element method, Manufacturing techniques
- **Assistant Professor, Atilim University, May 2016-Feb. 2024**
- Taught Heat Transfer, Thermodynamics, Fluid Mechanics, Fuels and Combustion and Vehicle Aerodynamics courses.

## Researches

- Project coordinator, Sep. 2021-Jan.2023  
Investigating two-phase flow for boiling and condensation in membrane-based microchannel absorber and desorber for compact absorption refrigeration cycle.  
Funded by KOSGEB (Small and Medium Enterprises Development Organization of Turkey).  
Designed, fabricated and tested an absorption refrigeration system, which is integrated to a hybrid solar panel. The Li-Br absorption system is capable to convert the solar thermal energy to air conditioning of a closed space.
- Researcher, Feb. 2021-March 2023  
Investigated experimentally the particle emission from coated brake discs.  
Cooperated by TOFAS (Turkish Automotive Factory) and ICER BRAKES and funded by TUBITAK (The Scientific and Technological Research Council of Turkey).  
Designed and fabricated a test setup to measure the sizes and distribution of formed particles due to friction between the brake disc and pads. Achieving lower brake dust by reduction of PM, environment friendly content in brake dust, cleaner appearance on wheels, preparation to increasingly stricter legislations on emissions by the EU.
- Project coordinator, Feb. 2021-Sep. 2022  
Laser diode cooling system  
Designed and fabricated a micro chiller for laser diode cooling with dimensions of 40 mm × 40 mm and dissipated heat of 250 W.
- Project coordinator, Jan. 2019-March 2021  
Photovoltaic solar panel with cooling system.  
Funded by KOSGEB.  
Designed and fabricated a PV solar panel with geothermal cooling system to improve its efficiency. Circulated coolant dissipates the extracted heat from the heat exchanger of the panel to the ground by buried long life and low-price plastic tubes. Since the earth temperature beyond a depth of 4 m is relatively constant, 10C to 16C, the earth acts as a cooling medium for free.

Thermal management of Lithium-ion battery March 2023-now

Funded by TUBITAK.

Combined thermal, fluid, and electrical computational models to capture the multi-scale and multi-physics phenomena occurring in a lithium battery. The challenge is to develop effective strategies that preserve the thermal and electrical balance of the cells while operating the battery pack on a broad range of environmental and driving conditions. The aim of the proposed project is to investigate and improve the heat dissipation from the lithium-ion battery pack by supply a novel cooling system. The battery pack is kept in optimal temperature level of 15-35 °C with minimum temperature fluctuations across it.

- Researcher, Department of Automotive Engineering, Sep. 2016-Sep. 2017

Thermal performance of braking disc of vehicles

Funded by Atilim University and TOFAŞ

Investigated numerically and experimentally the thermal performance of the braking disc. a brake test setup was designed and fabricated with exactly the same braking components used in a common passenger vehicle as disc, pads, rim, tire, and dust shield to simulate the sequential braking.

- **Lecturer, University of Turkish Aeronautical Association, February 2015- March 2016**

Taught Heat Transfer, Material Science and Manufacturing Techniques, and Finite Element Methods.

- **Research Assistant, Middle East Technical University (METU), Department of Mechanical Engineering, January 2013-June 2015**

Designed, constructed, and tested a microscale vapor compression refrigeration cycle. The heat sink mounted on the back side of an Intel core i7 - 900 desktop processor with the dimensions of 19 mm×14.4 mm× 1 mm was numerically and experimentally investigated of the thermal performance. Collaborated with a PhD student to design microchannel- evaporator and microchannel- condenser. Designed and drew the parts based on the manufacturing restrictions. Constructed a micro- refrigeration cycle instrumented with high accuracy pressure transducers, thermocouples, and thermistors. Conducted experiments to demonstrate the performance of the cycle with various applied heat fluxes and mass flows. Funded and awarded by TUBITAK.

- **Research Assistant, Middle East Technical University (METU), Department of Mechanical Engineering, February 2010 - April 2012**

Investigated MEMS production of microchannel heat sinks with nanofluids as the working fluid and their application in microchip cooling. Constructed a test setup used to measure microchannel heat transfer and fluid flow, which used water and immersed silver nanoparticles in water used as coolants. Funded by TUBITAK.

- **Lecturer, Azad University of Marageh, 2007-2009**

Taught Heat Transfer, Material Science, Manufacturing, and Technical Drawing courses.

- **Production Manager, Machine Sazi Talari Co., Manufacturer of Automatic Band Saw Machines and Automobile spare parts, 2003-2005**

Planned the production of tractor disk brakes. Designed and fabricated gauges used for quality control. Collaborated on the design and fabrication of automatic band saws in different sizes.

## JOURNAL PUBLICATIONS

Recep Akyüz, Kaan T. Erkılıç, Eegün Keleşoğlu, **Rahim Jafari**, Effect of the coating of brake disc on airborne particle emissions, *Journal of Cleaner Production*, submitted

Fadhil Al-Malaki, Hasanen Al-Saedi, Göker Türkakar, **Rahim Jafari** (2023), Investigation of the effectiveness of PCM on the energy saving, thermal comfort and indoor air quality in overcrowded area, *Energy and Buildings*, 299, 113583

**Rahim Jafari** (2021), Optimization and energy analysis of a novel geothermal heat exchanger for photovoltaic panel cooling, *Solar Energy*, 226, 122-133 (ELSEVIER)

**Rahim Jafari**, Kaan T. Erkılıç, Doruk Uğurer, Yunus Kanbur, Murat Ö. Yıldız, Ege B. Ayhan (2020), Enhanced Photovoltaic panel energy by mini-channel cooler and natural geothermal system, *International Journal of Energy Research*, 45 (9), 13646-13656 (Wiley Online Library)

**Rahim Jafari**, R. Akyüz (2022), Optimization and thermal analysis of radial ventilated brake disc to enhance the cooling performance, *Case Studies in Thermal Engineering*, 101731. (ELSEVIER)

**Rahim Jafari**, Kaan T. Erkiş, Recep Akyüz, Mehmet Güler (2020), Experimental and numerical study of turbulent flow and thermal behavior of automotive disc brake under repetitive braking, *Institute of Mechanical Engineers, Journal of Automobile Engineering*, 236 (6), 1092-1100 (SAGE journals)

**Rahim Jafari**, Müge Kahya, Samad Nadimi, Özgür Hakkı Ünver, Tuba Okutucu-Özyurt (2017), Modeling and analysis of surface roughness of microchannels produced by  $\mu$ -WEDM using an ANN and Taguchi method, *Journal of Mechanical Science and Technology*, 31(11), 5447-5457 (Springer)

**Rahim Jafari**, Tuba Okutucu-Özyurt, Hakkı Özgür Ünver, Özgür Bayer (2016), Experimental Investigation of Surface Roughness Effects on the Flow Boiling of R134a Refrigerant in Microchannels, *Experimental Thermal and Fluid Science* 79, 222-230 (ELSEVIER)

**Rahim Jafari**, Tuba Okutucu-Özyurt (2016), Numerical Simulation of Flow Boiling from an Artificial Cavity in A Microchannel, *International Journal of Heat and Mass Transfer* 97, 270-278 (ELSEVIER)

**Rahim Jafari**, Tuba Okutucu-Özyurt (2015), 3D Numerical Modeling of Boiling in a Microchannel by Arbitrary Lagrangian- Eulerian (ALE) Method, *Applied Mathematics and Computation* 272, 593–603 (ELSEVIER)

**Rahim Jafari**, Tuba Okutucu-Özyurt (2015), Phase Field Modeling of a Vapor Bubble Growth in a Microchannel, *Journal of Computational Multiphase Flows* 7(3), 143-158 (SAGE journals)

Aziz Koyuncuoğlu, **Rahim Jafari**, Tuba Okutucu-Özyurt, Haluk Külâh (2012), Heat transfer and pressure drop experiments on CMOS compatible microchannel heat sinks for monolithic chip cooling applications, *International Journal of Thermal Sciences* 56, 77-85 (ELSEVIER)

Samad Nadimi, **Rahim Jafari** Khoushemehr, Babak Rohani, Amir Mostafapour (2008), Investigation and Analysis of Weld Induced Residual stresses in Two Dissimilar Pipes by Finite Element Modeling, *Journal of Applied Sciences* 8 (6), 1014-1020 (Science Alert)

## CONFERENCE PUBLICATIONS

**Rahim Jafari**, Thermal Simulation of Vehicle Brake Disc during Successive Braking, *5th International Conference on Modern Approaches in Science, Technology & Engineering*, Berlin, Germany, 29-31 August 2019

**Rahim Jafari**, Simulation of R134a flow boiling in microchannels, *5th micro and nano flows conference*, Milan, Italy, 11-14 September 2016

**Rahim Jafari**, Tuba Okutucu-Özyurt, CFD Modeling of Boiling in a Microchannel Based On Phase-Field Method, World Academy of Science, Engineering and Technology Conference, Paris, France, April 2015, *Proceeding International Journal of Mechanical, Aerospace, Industrial and Mechatronics Engineering* 9(4), 572-576

Müge Kahya, Hakkı Özgür Ünver, **Rahim Jafari** and Tuba Okutucu-Özyurt, Process Optimization of Micro-WEDM for Micro Channel Manufacturing Using Taguchi Methodology, *The International Conference on Flexible Automation and Intelligent Manufacturing (FAIM)*, Wolverhampton, UK, 23-26 June 2015

**Rahim Jafari**, Tuba Okutucu-Özyurt, The Arbitrary Lagrangian-Eulerian (ALE) Modeling of a Vapor Bubble Growth in a Microtube, International Conference of Numerical Analysis and Applied Mathematics, Rhodes, Greece, September 2014, *American Institute of Physics (AIP) Conference Proceedings DOI:10.1063/1.4912346*

**Rahim Jafari**, Aziz Koyuncuoğlu, Tuba Okutucu-Özyurt, Haluk Külâh, Heat transfer enhancement with nanofluids in CMOS compatible microchannel heat sinks, 8. *Turkey Nanoscience and Nanotechnology Conference*, s.0199, OP-1,2012

Tuba Okutucu-Özyurt, Haluk Külâh, Aziz Koyuncuoğlu, **Rahim Jafari**, Heat transfer enhancement with nanofluids in CMOS compatible microchannel heat sinks, *2nd Annual World Congress of Nanoscience and Nanotechnology Conference*, Qingdao, China, 26-28 October 2012.

**PATENTS**

Hibrit Fotovoltaik Panel Ve Mini Kanallı Soğutucu Güneş Kolektör Birleşimi (PV-T), Türk Patent, 2022

Photovoltaic panel and a minichannel cooler solar collector combination (PV-T), PCT, WO2020068017

**COMPUTER SKILLS**

AutoCAD, Solidworks, COMSOL Multiphysics, FLUENT, LabView

**LANGUAGES**

Azerbaijani (native), Turkish (native), English (advanced), Persian (advanced), Spanish (elementary)