VIRAL K. PATEL

9501 Thornhill Way
Knoxville, TN 37931
(312) 515-4564
patelvk@ornl.gov

EDUCATION

Ph.D., Mechanical Engineering; Thermal and Fluid Sciences March 2015
Worcester Polytechnic Institute, Worcester, MA
Advisor: Dr. Jamal Seyed-Yagoobi

B.S., Aerospace Engineering, B.S., Mechanical Engineering May 2009
Illinois Institute of Technology, Chicago, IL
Graduated Summa Cum Laude

RESEARCH EXPERIENCE

Postdoctoral Research Associate April 2015 - Present
Building Equipment Research Group
Energy and Transportation Sciences Division
Oak Ridge National Laboratory

- Primary role is designing and conducting experiments to evaluate performance of advanced building equipment and equipment design optimization.
- Novel rotating heat exchanger for refrigeration applications: Conducting detailed performance characterization experiments on vapor-compression system with micro-channel baseplate evaporator/rotating fin combination; study of frost formation and removal from heat exchanger fins using high-speed imaging.
- Ultrasonic clothes dryer: Conducting experiments in mechanical extraction of water from clothing using ultrasonic transducers; development of prototype clothes dryer with ultrasonic vibration as the sole drying mechanism.
- Thermoelectric clothes dryer: Development of experimental prototype using thermoelectric elements in place of electric resistance heating, based on thermodynamic modeling; detailed thermodynamic and psychrometric measurements for design optimization of prototype.
- Heat pump water heaters: Conducting experiments for existing CO2 heat pump water heating system.

Graduate Research Assistant May 2010 – March 2015
Multi Scale Heat Transfer Laboratory
Department of Mechanical Engineering
Worcester Polytechnic Institute

- Experimental research involved interaction of fluid mechanics, electro-hydrodynamics and heat transfer, in the presence and absence of phase-change and the presence and absence of gravity.
- Study of heat transport performance, flow boiling and condensation heat transfer coefficients and two-phase flow pressure drop in meso-channel driven by EHD conduction pump at low pressure and very low mass flux (sponsored by NASA).
- Liquid film flow boiling on bare and nanofiber-enhanced surfaces with combined EHD conduction and dielectrophoresis (sponsored by NASA and NSF).
- Study of heat transport performance, flow boiling and condensation heat transfer coefficients and two-phase flow pressure drop in heat exchangers with inserts at high pressure and high mass flux (sponsored by UTRC).
- Performance characterization of meso-scale EHD conduction-driven heat transport system and liquid film flow boiling in microgravity (for the first time) on board a NASA reduced gravity parabolic flight for a total of 230 parabolic maneuvers over two separate flight experiments (sponsored by NASA).

PUBLICATIONS

First-author publications in peer-reviewed academic journals: **6**
First-author publications in peer-reviewed conference proceedings: **7** (full list available upon request)

RELEVANT GRADUATE COURSEWORK

Design of Thermal Systems

- Application of principles of fluid mechanics, heat transfer, and thermodynamics to design of components of engineering systems. Problems in power generation, environmental control, air and ground transportation, and industrial processes, as well as other industries.

Advanced Experimental Methods in Fluid Mechanics

- Design and use of sensor probes to measure multiple velocity components; experimental techniques for hot-wire anemometry. Theory and use of optical transducers, including laser velocimetry and particle tracking. Smoke-wire and hydrogen bubble visualization. Force balance measurements.

Computational Fluid Dynamics

- Classification of partial differential equations. Finite-difference methods. Numerical solution techniques including direct, iterative, and multigrid methods for general elliptic and parabolic differential equations. Numerical algorithms for solution of the Navier-Stokes equations in the primitive-variables and vorticity-stream function formulations. Grids and grid generation.

ENGINEERING SOFTWARE EXPERIENCE

MATLAB/Octave: Extensive experience in analyzing and plotting experimental results; Basic error analysis and regression, curve fitting; Simple computational fluid dynamics (CFD) coding experience using finite difference discretization to solve fluid mechanics and heat transfer problems.

LabVIEW: Programming detailed data acquisition Virtual Instruments for measurement of analog/digital/counter inputs for temperature (TC, RTD, PRT), pressure (absolute, differential transducers), flow (turbine and thermal flow meters), current and voltage (DC, RMS); Analog/digital output for control of motors, pumps, high-voltage power supplies; Real-time data manipulation and recording. Interfacing with external programs such as REFPROP for real-time thermophysical property determination.

Engineering Equation Solver (EES): Solving system of equations for thermodynamic modeling, including determination of psychrometric state points.

Pro/Engineer, SolidWorks: Parametric 3D modeling, creating assemblies and engineering drawings for machining and fabrication of parts for experiments; Design of high-pressure and high-vacuum components. Communication of engineering tolerances and materials selection with lab machinists.

ANSYS Workbench – FLUENT: Basic experience in classical fluid flow problem solutions, i.e. incompressible fluid flow through a pipe, flow over a cylinder. Geometry creation, meshing, grid definition, boundary conditions, convergence criteria and post processing.

COMSOL Multiphysics: Basic experience in combined multiphysics modeling of fluid flow, electrostatics and heat transfer problems.

PROFESSIONAL SOCIETIES

American Society of Mechanical Engineers – Member
American Institute of Aeronautics and Astronautics – Student Member

AWARDS AND HONORS

IEEE Electrostatics Process Committee 2014 and 2015 James Melcher Prize Paper Award
Listed to "Who's Who Among Students in American Universities and Colleges, 2007, 2008". Member of Tau Beta Pi National Engineering Honor Society, 2008.