



THE UNIVERSITY OF  
MELBOURNE

# Mechanical Engineering PhD Completion Seminar

SEMINAR SERIES 2008

## Mr Nader Karimi

PhD Candidate  
Department of Mechanical Engineering  
The University of Melbourne

Thursday 4th December, 3.30pm  
Theatre C2  
Level 4, Civil Engineering, Block C,  
Building 174

## On interaction of sound with the combusting flows.

Thermo-acoustic instability is a major barrier acting against a further reduction in emissions from gas turbines. A fundamental understanding of the interaction between sound and combusting flows is central to the development of the design tools required to avoid this problem. This work attempts to advance this understanding in two areas. First, the unsteady energetics of heated and cooled flows interacting with acoustic and entropic disturbances are studied theoretically and numerically. A new criterion for determining when acoustic and entropic modes decouple is put forward. This study also finds that the strength of sound generation by steady heat addition is comparable to other known sound generating mechanisms in combusting flows. Second, an experimental study was conducted to determine the dynamic response of a laminar premixed flame to acoustic excitation. This involves simultaneous measurement of the flame's heat release fluctuations and the forcing velocity over a range of forcing frequencies and excitation levels. Both linear and non-linear flame dynamics are observed, and their origins are further investigated using high speed photography of the excited flame.

### MORE INFORMATION

For more Mechanical Engineering seminar information contact:

Professor Ivan Marusic  
Department of Mechanical Engineering  
E: [imarusic@unimelb.edu.au](mailto:imarusic@unimelb.edu.au)