

## Fully-funded 4-year PhD Project at Loughborough University – Improving the modelling of overheating in UK homes

<b>Project Title</b>	Improving the modelling of overheating in UK homes
<b>Supervisor(s)</b>	Prof. Kevin Lomas, Dr Arash Beizae
<b>Context (what is the wider social, political and technical context that leads to this work, why is it important)</b>	Overheating in dwellings is a serious threat to health and wellbeing. It is estimated that 8,500 people died during the hot summer of 2018. New, well-insulated homes, especially flats in the SE of England are especially at risk. Whilst there are guidelines about how to assess overheating risk (e.g. TM59), the reliability of the predictions of dynamic thermal models is uncertain. Dynamic predictions are however the only realistic approach to assessing if, as yet unbuilt, dwellings will overheat.
<b>Project Description</b>	The PhD will build on a large body of prior work in this area by Loughborough staff. This includes techniques of model validation as well as the data sets that can enable model to measurement comparisons. Sensitivity analysis enables the model parameters that are most influential in making reliable predictions to be isolated such that appropriate approaches to modelling these parameters can be sought. The metrics by which overheating is defined are crucial in the assessment of proposed dwelling designs. Comparisons with measured overheating will identify whether models produce the correct patterns of overheating both in large stocks of dwellings and/or in individual homes. The outcomes will inform architects and designers and, importantly, provide robust support to CIBSE and others' guidelines that recommend modelling as a route to overheating assessment.

<p><b>Aims and Objectives</b></p>	<p>This research aims to advance the modelling of overheating risk for new UK homes. Objectives might include:</p> <ol style="list-style-type: none"> <li>1. Develop an ability to use the main dynamic models used by the UK modelling community.</li> <li>2. Evaluate the effects of modelling methods on overheating prediction.</li> <li>3. Devise and recommend the most appropriate approach to modelling frequently found features in homes that influence indoor temperatures.</li> <li>4. Provide clear guidance on how to model and the reliability possible for models.             <ol style="list-style-type: none"> <li>1. 5. Produce at least one journal paper and a thesis.</li> </ol> </li> </ol>
<p><b>Methods: (Measurements, data sources, methods of analysis, etc)</b></p>	<p>Modelling combined with mode out put analysis. Acquisition of monitored temperature and weather data. Data analysis and (simple) statistical analysis.</p>
<p><b>Expected Outcomes</b></p>	<p>New guidelines on how to model overheating in UK homes and the reliability that can be expected.</p>
<p><b>Multidisciplinary Aspects (what different skills and knowledge will this project develop)</b></p>	<p>Building physics, computer simulation and modelling and data analysis.</p>
<p><b>Budget, Stakeholder and other support (Any financial or in-kind industry support offered, costs of T&amp;S and materials if substantial):</b></p>	<p>Suitable project partners include CIBSE, large engineering firms that rely on modelling.</p>
<p><b>Skills and Interest Required of Student</b></p>	<p>An interest in building physics especially modelling.</p>