* Rationale for project (e.g. from Student feedback, liaison with the Academic Rep Network, curriculum review outcomes, industry input)

*There should be a robust background that underpins the project. This may come from a single or variety of sources, but together should identify how the project directly enhances the curriculum with aspects of current disciplinary research. It may be that his project is linked with other educational development work taking place in the department, in which case the wider context in which the project is situated should be outlined.*

Pedestrian dynamics is a fledgling industry that covers a wide array of different disciplines, including safety, infrastructure design, modelling and psychology. This project will develop a MSc/MEng level course on this industry, for numerous reasons.

To begin with, the Civil Engineering Transport courses T49 AND WHAT are being redesigned to include more rigorous, quantitative methods. Pedestrian dynamics offers the opportunity to include these quantitative methods, as well as develop the Civil Engineering curriculum to include state of the art engineering disciplines.

Furthermore, feedback from a consultancy based in London suggests that there is a significant need for graduates with experience in pedestrian dynamics, as well as the analytical skills to critically appraise the benefits and drawbacks of specific models.

Finally, the development of this course represents an opportunity to ensure that research currently being done at Imperial is incorporated into the undergraduate experience. The Transport Risk Management Centre (TRMC) in Civil Engineering has developed significant expertise in the area of pedestrian dynamics, and is actively researching specific areas within this industry. This course would be the primary method of disseminating this research to the undergraduate and graduate populations at Imperial College.

* Project outline, including how an authentic staff-student partnership will be adopted and how the work aligns with the Learning and Teaching strategy

*A description of the project. Within this it should be made clear how the work will lead to a curriculum development that is commensurate with the learning and teaching strategy. The proposed methods and practicalities of the project should also be covered to demonstrate that aspects of the Guiding Principles for Partnership are adopted:*

* *A partnership approach should equally value the expertise of staff and students*
* *Partnerships should present equal opportunity for all students*
* *Partnerships should achieve an appropriate distribution of power*

This project entails the design and recording of four, hour-long lectures, and the writing of four, hour-long of workshops based on these lectures. These will introduce, develop and expand the concepts of pedestrian dynamics, targeted at a previously naïve student population. There will also be coursework and exam questions set for the students, at an MSc and MEng level.

This course will be developed with an aim to incorporate with the rest of the module, and will include modern methods of improving interaction levels, for instance using a ‘flipped-classroom’ approach, with recorded lectures and reading material, followed by workshops based on the previous week’s work. Further approaches will include Mentimeter polls and discussions, as well as potential guest lectures from a London based engineering consultancy that specialises in this industry.

A basic outlook for the lectures and workshops is provided below:

**Overarching theme: how would you analyse a moving crowd?**

Lectures

1. Pedestrian dynamics introduction
   * Introduction to industry.
   * Emergent properties of human movement behaviour (lane formation, zipper, etc).
   * Hydraulic model example.
   * Current research and application.
2. Evacuation behaviour
   * Theoretical models: how do people act in emergencies?
   * Quantitative evidence: what theories are supported?
   * Modelling examples: how do we model this?
3. Simulation models
   * Types of computer model (e.g. ABM, cellular automata, network, fluid, etc)
   * Benefits and drawbacks of each.
4. Data
   * How data is important for everything in this industry.

Workshops and pre-work

1. Pedestrian dynamics introduction
   * Pre read: Two seminal papers to introduce the concepts.
   * Mentimeter poll to check understanding after lecture.
2. Evacuation behavior
   * Pre read: Two seminal papers, one outdated, one up-to-date.
   * Mentimeter poll to check understanding after lecture
3. Simulation models
   * Pre read: One seminal paper, one flawed paper.
   * Mentimeter poll to check understanding and test interpretation of paper.
   * Presentation of two (or more) simulation models to show different methods of modelling.
4. Data
   * Pre read: Collation of data set paper, and example experimentation paper.
   * Mentimeter poll to check understanding and interpretation of experimental approach.

* Proposed method of progress checking/update; (include whether this will come from multiple sources, student/staff partners, event-based feedback from stakeholders, etc)

*Consider how you will ensure that the project maintains progress; this may involve aspects beyond the final formal phase of the partnership, to ensure that the longer term impacts are sustained.*

*Designed in conjunction with members of staff,*

This project will be checked at various milestones before conclusion, including by members of the Civil Engineering faculty, and by industry professionals.

The primary milestone will be to confirm that the course accurately represents the current state of the pedestrian dynamics, and is of the pre-requisite difficulty for an MSc/MEng course module. In order to pass this milestone, all lectures, pre-reading material and exam level questions will be inspected by faculty academics and industry professionals.

The dedicated staff partner (Dr Arnab Majumdar, Reader) will ensure that the course can continue to run at Imperial after the completion of any PhD research.

The course itself will be included in the department GTA and lecturer feedback processes on SOLE, to allow continuous updating and improvement in subsequent years.

Furthermore, there is scope to extend the development of this course to target an IExplore course. This will be considered after the conclusion of the MSc/MEng course design.