Wolfson School of Mechanical, Electrical and Manufacturing Engineering

Loughborough University

Research Associate - Automotive Electric Powertrain Whistling and Whining NVH (Fixed-term for 36 months)

REQ210544

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

School/Department summary
A full-time Research Associate is required to undertake research on investigating the Noise, Vibration and Harshness (NVH) of electric (e-) powertrains. The project is funded by EPSRC with industry partners Arrival Ltd, AVL List GmbH and Vispiron Rotec.

An important NVH concern in Electric Vehicles is the e-motor whistling noise generated by the electromagnetic force, which excites the e-motor and the driveline housing. In addition to this, e-motor torque variation and introduced misalignments in the system act as mechanical excitation on the drivetrain, leading to gear meshing oscillations and emitted noise known as whining. The above e-powertrain NVH landscape requires various interrelated disciplines to be considered under the same framework (electromagnetics, component flexibility, transient dynamics and noise radiation).

The proposed research aims to identify the root causes behind the coupling of e-motor whistling and drivetrain whining NVH in e-powertrains and develop novel design solutions to reduce their severity in the following ways: i) analysing the root causes of the coupling between the e-motor and drivetrain transient dynamics that leads to aggressive NVH (developing 3D e-powertrain models), ii) developing and validating a methodology for high frequency e-powertrain NVH, iii) setting new NVH metrics for use in future e-powertrain investigations and iv) developing novel and fast reduced-order methods for e-powertrain NVH studies.

The Research Associate will join the vibrant Dynamics Research Group (https://www.lboro.ac.uk/departments/meme/research/research-groups/dynamics-and-tribology/) at the Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough University, and also collaborate closely with the project industry partners (in the use of commercial software to model e-powertrains and experimental testing to validate the numerical modelling work).

The research outcomes will serve as a driving force to boost the development of e-powertrains, especially for addressing complex NVH behaviour.

Job Description

Job Grade: Research Grade 6

Job Purpose
To model NVH whistling and whining of e-powertrains by carrying out multidisciplinary analysis (electromagnetics, component flexibility, transient dynamics and noise radiation) and experimental testing.

Job Duties

- Carry out e-powertrain NVH whistling and whining modelling studies as required by the project supervisors (Prof. S. Theodossiades and Dr M. Mohammadpour) including:
  - Analysing the root causes of the coupling between e-motor whistling and drivetrain whining NVH by developing 3D e-powertrain models using commercial software;
  - Developing and validating a methodology to study high frequency e-powertrain NVH;
  - Setting new NVH metrics for use in future e-powertrain investigations;
  - Developing novel and fast reduced-order methods for e-powertrain NVH studies;
  - Experimental testing in e-powertrains to validate the above modelling work
- Keep accurate records of work, other research work and meetings (in written and/or electronic format).
- Search for and study research publications related to the research topics.
- Analyse modelling and experimental results and prepare reports.
- Present the results of the research at project meetings, seminars and International Conferences.
- Publish the research findings in International Journals.
- Maintain confidentiality of results and other confidential information until authorised to disclose them.
- Comply with University Health and Safety Policy.
- Comply with all University Rules and Regulations.
- Engage in training programmes in the University (e.g. through Staff Development) which are consistent with the needs and aspirations of the post holder and those of the project team and the host department.
- Carry out specific other duties as may be reasonably requested by the project leader and that are commensurate with the nature and grade of the post.

Points To Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed.

Special Conditions

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Respecting Diversity and, where appropriate, Recruitment and Selection.

Organisational Responsibility

Reports to the Professor of Non-Linear Dynamics.

Person Specification

Your application will be reviewed against the essential and desirable criteria listed below. Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application. Stages of assessment are as follows:

1 – Application
2 – Test/Assessment Centre/Presentation
3 – Interview

Essential Criteria

Area	Criteria	Stage
Experience	Recent experience in an academic or Industrial environment	1, 2, 3
	Experience of multidisciplinary dynamics modelling	1, 2, 3
	Experience of dynamics experimental measurements	1, 2, 3
Skills and abilities	Ability to work accurately and precisely and to record information gathered	1, 3
	Self-motivated and able to work without close supervision	1, 3
	Ability to work to deadlines	1, 3
	Good report writing and presentation skills	1, 2, 3
	Ability to work independently and as part of a team	1, 3
	Ability to maintain confidentiality at all times	1, 3
Training	A willingness to undertake further training as appropriate and to adopt new procedures as and when required	3
Qualifications	PhD in automotive, mechanical engineering, physics or related discipline	1
Other	Evidence a good working knowledge of equal opportunities and understanding of diversity in the workplace	1, 3

Desirable Criteria

Area	Criteria	Stage
Experience	Electromagnetics (electric motor) modelling	1, 2, 3
	Transient dynamics and acoustics modelling for powertrain NVH	1, 2, 3
	Powertrain NVH experimental measurements	1, 2, 3
Skills and abilities	Knowledge of relevant Health & Safety issues	1, 3
	Ability to collaborate with industrial partners	1, 3
Qualifications	PhD in NVH of automotive powertrains	1

Conditions of Service

The position is FULL TIME and FIXED TERM until 30 September 2024. Salary will be on Specialist and Supporting Academic Research AND GRADE 6, SALARY BAND (£30,942 - £35,845) per annum, at a starting salary to be confirmed on offer of appointment.
The appointment will be subject to the University's normal Terms and Conditions of Employment for Academic and Related staff/Operational and Administrative staff, details of which can be found here.

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which are available at http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html.

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html

In addition, the University is supportive, wherever possible, of flexible working arrangements.
We also strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see http://www.lboro.ac.uk/services/hr/athena-swan/

Applications

The closing date for receipt of applications is **29 July 2021.** Interviews will be held on **6 August 2021**.