Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : Berger | Given names : Sébastien

Status (prof., assistant prof., …) : professor

Laboratory : Laboratoire de Mécanique Gabriel Lamé | Website address :

Institution : INSA Centre Val de Loire | Website address : http://www.insa-centrevaldeloire.fr/fr/

Scientific competence of the supervisor:

Mechanical systems, nonlinear dynamics, stability analysis, friction-induced vibrations, nonlinear energy wink, uncertainties, chaos polynomial methods, robust conception, multiple scale analysis

Two major publications in the field proposed for the PhD :

1. Bergeot B, Berger S, Bellizzi S, Mode coupling instability mitigation in friction systems by means of nonlinear energy sinks : numerical highlighting and local stability analysis. Journal of Control, 1 may 2017
2. Snoun C., Bergeot B., Berger S., Robust optimization of nonlinear energy sinks used for mitigation of friction-induced limit cycle oscillations, European Journal of Mechanics - A/Solids 93, (2022), 104529.

Website address of the personal page :

Supervisor's email : sebastien.berger@insa-cvl.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** VI-3

Title : Robust design of nonlinear passive absorbers devices for the mitigation of harmful vibrations in turbomachinery

Subject :

With the tightening of the economic context, industrialists need to design mechanical systems increasingly efficient and respecting a high level of safety. Especially, turbomachinery are extremely complex machines to manufacture, which require manufacturers to have advanced technological skills in a wide variety of fields. Unfortunately, turbomachinery can undergo unwanted harmful structural vibrations due for example to dynamic instabilities (mode coupling or flutter) or to resonance phenomena. Therefore, vibration absorbers may be implemented to reduce these vibrations considering the rotating nature of the turbomachinery. In this work, passive dynamic absorbers are considered which consist in a light mass connected to the primary structure (here the wind turbine) by a linear damper and a linear spring (TMD, Tuned Mass Damper) or a linear and nonlinear spring (NLTVA, Nonlinear Tuned Vibration Absorber) or a strongly nonlinear spring (NES, Nonlinear Energy Sink). Metamaterials based on NES and/or NLTVA will be also considered. The main goal of the PhD work is to investigate the performance of such absorbers by means of numerical simulations and analytical treatments carried out on a reduced scale turbomachinery models coupled to one or several absorbers. Possible uncertain parameters will be considered to propose a robust and optimal design of the absorber.

Keywords :

Mechanical systems, turbomachinery, rotor induced vibrations, tuned mass damper, nonlinear energy sink, nonlinear tuned vibration absorber, stability analysis, uncertainties, chaos polynomial method, robust conception

Expected collaborations :

Laboratoire de Tribologie et Dynamique des systèmes - Ecole Centrale Lyon
Industrial partners

Background required from the applicant :

The candidate should hold an university degree (Master of Science or equivalent) in mechanics including necessarily a research internship. He/she should be comfortable with mathematical developments and program writing (programming languages as Matlab, Mathematica or Python)

Existence of a PDF file detailing the proposal ("yes" or "no") : no

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