Politechnika Łódzka

Annex no. 1
to The OTM-R POLICY - OPEN TRANSPARENT MERIT-BASED RECRUITMENT

Assistant professor for research

(PostDoc researcher in project funded by National Science Centre, Poland)

Department of Automation, Biomechanics and Mechatronics

Lodz University of Technology is one of the finest universities of technology in Poland. Its tradition and experience in training professionals and conducting research date back 80 years. It is an attractive partner for business. It cooperates with the largest national and international corporations. It conducts research of a European standard, develops new technologies and creates innovation in collaboration with the leading research centers all over the world. One of the pillars of Lodz University of Technology management is equal treatment of staff regardless of their gender, age, race or other demographic and social characteristics. In 2016, TUL was the first technical university in Poland to receive the HR Excellence in Research award certifying that the University adheres to the principles of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.

1. The requirements to be met by the candidate

Formal requirements:

- PhD in one of the following branches of science: mechanics, classical physics, applied mathematics, computer physics obtained within last 7 years;
- Do not have contract employment or will take an unpaid leave for the duration of employment in project;
- Do not receive any other form of renumeration from Polish National Science Centre;
- PhD degree awarded by entity other than Lodz University of Technology or completed at least a 10-month continuous internship after obtaining a doctorate in a country other than Poland;
- The Principal Investigator was not the supervisor (or assistant supervisor) of their doctoral dissertation.

Additional requirements:

- Fluent English language – allowing for communication and writing of research documents (obligatory); knowledge of Polish at a communicative level is welcome.
- Documented experience in scientific research related to modeling, dynamic analysis, damping, and energy harvesting from vibrations in mechanical/mechatronic systems as indicated in the application, confirmed by publications.
- Knowledge in the field of:
  - ✓ Physical and mathematical modeling of vibrating mechanical, electronic, and mechatronic systems with one or multiple degrees of freedom;
  - ✓ Programming numerical procedures in script languages and block-based formats, solving nonlinear differential equations;
  - ✓ Phenomena such as resonance, bifurcation, damping, chaos, synchronization, friction, magnetic interactions, and energy harvesting in vibrating mechatronic systems;
  - ✓ Performing experimental measurements and recording results;
  - ✓ Developing research results and publishing them in scientific journals.
- A publication in a journal with an Impact Factor related to scientific research on modeling, dynamic analysis, damping, and energy harvesting from vibrations in mechanical/mechatronic systems as indicated in the application.

2. Specification of the terms and conditions of employment

- Full-time position
- Expected employment duration up to 12 months
- Expected date of employment: December, 2024

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Authority associated with the position.

- the possibility of developing a scientific career;
- participation in national and international conferences;
- publishing scientific articles in journals with a high citation index.

3. Description of the expected responsibilities and duties

- conducting research related to the subject of the project;
- documenting the results in the form of publications in renowned scientific journals.

4. List of the required documents

1) Application letter addressed to the Rector of Lodz University of Technology;
2) Personal questionnaire for a person applying for employment at Lodz University of Technology, as provided in Annex no. 1;
3) List of Scientific Achievements with main focus on those related to projects topic;
4) Data Privacy Statement as provided in Annex no. 2;
5) Consent to the processing of personal data, as provided in Annex no. 3;
6) True copies/copies of PhD, Master and Bachelor (if applicable) diplomas;
7) Other documents proving the qualifications.

5. The place, manner, and deadline for submitting the documents

Applications should be sent in form of PDF files by email to Secretariat of Department of Automation, Biomechanics and Mechatronics w1K11@adm.p.lodz.pl by *Novemebr 9, 2024*. For easier identification please use the following notation in the topic of email **„OPUS26_PD_R24"**

6. Contact person: Magdalena Jastrzębska w1K11@adm.p.lodz.pl

7. The expected date of the announcement of the decision: *15.11.2024*

8. Information materials for the candidate:

This job offer concerns employment for PostDoc researcher position in the project funded by National Science Centre - OPUS 26: „Vibrations suppression and energy harvesting of nonlinear oscillators: novel ideas, modelling, control and experimental investigations" (project description available in Annex no 4). The main research focus of will be on the following research tasks:

- ✓ Mathematical modelling, analysis, and control of bifurcation dynamics of mechanical systems with impacts;
- ✓ Analysis and control of bifurcation dynamics of mechanical/mechatronic systems subjected to nonlinear friction and parametric excitations;
- ✓ Parametric and self-excited vibrations of mechanical systems exposed to electric and magnetic fields;
- ✓ Modelling and dynamics of the system of oscillators coupled by the electromagnetic field and its application to passive/active control (mitigation and suppression) of vibrations, and energy harvesting;
- ✓ Dynamics of the systems with nonlinear stiffness and controllable damping effects coming from magnetic spring and eddy current damper;
- ✓ Modelling and analysis of spring and variable-length pendulum systems forced by periodic magnetic excitation and energy harvesting constant-length pendulum systems;
- ✓ Dynamics of horizontal magnetic oscillators with special nonlinear spring mechanisms;
- ✓ Tuneable magnetic pendulum for energy harvesting and vibration mitigation;
- ✓ Energy harvesting using electromagnetic double pendulum configurations.

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Annex no. 1.1
to The OTM-R POLICY - OPEN TRANSPARENT MERIT-BASED RECRUITMENT

PERSONAL INFORMATION FORM FOR APPLICANTS FOR EMPLOYMENT AT LODZ UNIVERSITY OF TECHNOLOGY

1. First name(s) and family name .....
2. Date of birth .....
3. Contact details .....
4. Education (where required for specific duties or jobs) .....

   .....

   (name of school and graduation date)

   .....

   .....

   (occupation, specialisation, degree, professional title, academic title)

5. Professional qualifications (where required for specific duties or jobs) .....

   .....

   .....

   (courses, postgraduate education, other forms of further development of knowledge and skills)

6. Employment history (where required for specific duties or jobs) .....

   .....

   .....

   .....

   .....

   (employment periods and jobs held at previous employers')

7. Additional personal information, where the right or the duty to disclose it exists under specific regulations .....

   .....

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   .....

....

(place and date) (signature of the applicant)

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Annex no. 1.2
to The OTM-R POLICY - OPEN TRANSPARENT MERIT-BASED RECRUITMENT

Data Privacy Statement for job candidates

1. The administrator of your data processed as part of the recruitment process is Lodz University of Technology (address: 90-924 Lodz, 116 Żeromskiego St., phone: +48 42 631 29 29), represented by the Rector as the employer.
2. At the Lodz University of Technology you can contact the Data Protection Officer at: iod@adm.p.lodz.pl, phone: +48 42 631 20 39.
3. Lodz University of Technology will process your personal data to the extent indicated in the labor legislation for the purpose of the current recruitment procedure (Article 6(1)(b) of the GDPR), while other data, including contact data, on the basis of consent (Article 6(1)(a) of the GDPR), which may be revoked at any time.
4. Lodz University of Technology will process your personal data, also in subsequent recruitment of employees, if you give your consent (Article 6(1)(a) GDPR), which may be revoked at any time.
5. If the documents include data referred to in Article 9(1) of the GDPR, your consent to their processing will be required (Article 9(2)(a) of the GDPR), which may be revoked at any time. (Article 22 of the Labor Code and §1 of the Regulation of the Minister of Family, Labor and Social Policy of December 10, 2018 on employee records).
6. Personal data will be disclosed to persons acting under the authority of the controller and having access to personal data, processing them only on the instructions of the controller, unless required by European Union or Member State law.
7. Your data collected in the current recruitment process will be stored until the end of the recruitment process. In the case of your consent to the use of personal data for future recruitment, your data will be used until the end of the calendar year in which the recruitment process for which your application was submitted ended.
8. You have the right to:
    a) the right to access your data and to receive a copy of it;
    b) the right to rectify (correct) your personal data;
    c) the right to restrict the processing of your personal data;
    d) the right to delete your personal data;
    e) the right to lodge a complaint with the President of the Personal Data Protection Office (to the address of the Personal Data Protection Office: 2 Stawki St., 00 - 193 Warsaw)

Information on data requirement: Your submitting personal data to the extent of Article 221 of the Labor Code is necessary to participate in the recruitment procedure. Your provision of other data is voluntary.

.....
(date and signature of the candidate)

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Annex no. 1.3
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Consent of the candidate to the processing of personal data (pursuant to Article 7 GDPR)

I consent to the processing of my personal data by Lodz University of Technology, the Controller of the data included in the following documents that I have submitted:

……

……

for the purpose of recruitment/employment*.

I hereby declare that I have been informed of the right to withdraw my consent at any time, effective as of the date of submission of the withdrawal of consent.

The Controller (or an authorised representative) has also informed me that the withdrawal of consent does not affect the lawfulness of the processing performed on the basis of the said consent prior to its withdrawal.

.....
(date and signature of the candidate)

* delete as appropriate

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Annex no. 1.4

Project description

The scientific project concerns mathematical modelling, experimental, numerical and analytical studies of complex mechanical/mechatronic systems that may also be present in various types of machine components and mechanisms in industry. The aim of the project is to develop new concepts of limiting (damping) vibrations of mechanical systems using originally designed sensors/vibration exciters employing magnetic and electromagnetic elements and obtaining energy from vibrations. Mathematical modeling is a mathematical approach devoted to a previously created physical model, i.e. some idealized conception of a real physical phenomenon. The correct physical model allows the study, explanation and prediction of phenomena occurring in a real system without conducting costly and sometimes impossible experimental research. It also allows the testing and design of technical devices, including control systems, before they are made and employed in real systems. In the project, we study mechanical systems with friction, impacts, subjected to electric and magnetic fields, i.e. configurations often found in industrial practice. In particular, these are mechatronic systems, i.e. mechanical systems with advanced control and magneto-electric elements, developed and built on the basis of knowledge in mechanics, physics, mechatronics, electronics and computer oriented science. In systems of this type, there may be hitherto unknown non-linear dynamic phenomena (preliminary research indicates their existence), including various bifurcation scenarios, i.e. sudden changes in dynamic behavior under the influence of very small changes in the parameters of the system or small changes in the surrounding environment. These can be dangerous phenomena that should be avoided, for example by appropriate design of the device or its control. However, they can also be used, for example, in systems that recover energy from vibrations. For this reason, they require good knowledge and understanding, which is possible through the development of their mathematical models and then their experimental validation. The project includes the following research tasks:

(1) Mathematical modelling, analysis, and control of bifurcation dynamics of mechanical systems with impacts;
(2) Analysis and control of bifurcation dynamics of mechanical/mechatronic systems subjected to nonlinear friction and parametric excitations;
(3) Parametric and self-excited vibrations of mechanical systems exposed to electric and magnetic fields;
(4) Modelling and dynamics of the system of oscillators coupled by the electromagnetic field and its application to passive/active control (mitigation and suppression) of vibrations, and energy harvesting;
(5) Dynamics of the systems with nonlinear stiffness and controllable damping effects coming from magnetic spring and eddy current damper;
(6) Modelling and analysis of spring and variable-length pendulum systems forced by periodic magnetic excitation and energy harvesting constant-length pendulum systems;
(7) Dynamics of horizontal magnetic oscillators with special nonlinear spring mechanisms;
(8) Tuneable magnetic pendulum for energy harvesting and vibration mitigation;
(9) Energy harvesting using electromagnetic double pendulum configurations.

The subject of the project was undertaken due to its potential cognitive and purely scientific values, but also possible industrial applications. The development of science and technology requires matching and mutual feedback of both latter areas to guarantee a high standard of living for our civilization. Nowadays, the complexity of the dynamic behavior of systems and processes in the real world still requires novel methodological approaches involving interdisciplinary exchange of ideas and dedicated techniques and technologies aimed at in-depth, high-level modeling of process dynamics. The review of existing scientific research and its results devoted to the problems covered by this project indicates the need for a critical review of existing research methods and the continuation and extension of knowledge with the research proposed in the project.