

Opening for PhD student position

– destructive and non-destructive analyses of thermo-mechanical degradation processes of additively manufactured composite smart structures with fibre optics sensors

In the frame of OPUS project No. 2025/59/B/ST8/02733

entitled: “Destructive and non-destructive analyses of Thermo-Mechanical Degradation Processes of Additively Manufactured Composite Smart Structures with Fibre Optics Sensors”

funded by the National Science Centre, Poland

Institute of Fluid-Flow Machinery, Polish Academy of Sciences, Gdańsk, Poland

About the project

We are looking for a talented candidate holding an MSc degree who is interested in continuing their scientific research and pursuing a doctoral dissertation. The project will be carried out by a consortium consisting of two Polish research institutions: the Institute of Fluid-Flow Machinery, Polish Academy of Sciences, Gdańsk (project leader), and AGH University of Kraków (project partner).

The aim of the project is to understand and characterise the thermo-mechanical degradation processes occurring in additively manufactured (AM) smart structures. Smart structures are defined as polymer-based materials (with or without fibre reinforcement) incorporating embedded Fibre Optic Sensors (FOSs), including fibre Bragg gratings and distributed sensors based on Rayleigh scattering.

The research focuses on the complex interaction between AM structures and embedded FOSs, particularly in the presence of inherent manufacturing imperfections (e.g. resin-rich regions and distortions of the structural architecture). These imperfections can significantly influence both the thermo-mechanical degradation of fibre-reinforced polymers and the accuracy and reliability of the optical signals measured by the FOSs.

The internal structure and mechanical performance of AM components strongly depend on the additive manufacturing process and its processing parameters. These effects will be investigated using both non-destructive and destructive testing techniques. This experimental approach, combined with theoretical modelling, will provide a comprehensive understanding of the coupling between embedded FOSs and AM structures.

The smart structures will be subjected to mechanical and thermal loading. This comprehensive approach will enable the analysis of the internal structure and thermo-mechanical behaviour of FRP materials, providing critical insights into their durability and performance under varying operating conditions. The combination of non-destructive testing, destructive testing, and theoretical modelling will allow for a comprehensive characterisation of the thermo-mechanical degradation process. Furthermore, it will enable the assessment of how the location of the embedded FOS and the quality of the surrounding material affect the coupling between the AM structure and the sensor, as reflected in the quality of the optical signal.

The offer

We offer a PhD position:

- in the Department of Mechanics of Intelligent Structures, Institute of Fluid-Flow Machinery, Polish Academy of Sciences Gdańsk, Poland (<http://www.imp.gda.pl/en/o4/z1/>).
- with a PhD scholarship offered for 48 months (planned to begin on **October 1, 2026**)
- a monthly PhD scholarship of 5,500 PLN/month gross.
- enrolment in the Tricity Doctoral School Polish Academy of Sciences

Eligibility criteria/ Skills/Qualifications

1. Masters in mechanical engineering, material science, physics or related fields.
2. High average grade obtained during studies.
3. Good knowledge of written and spoken English.
4. High motivation for scientific work and a strong commitment to research work.

Tasks

1. Analyse the influence of discontinuities in additively manufactured smart structures and the location of embedded FOSs on optical signal variations and strain measurements.
2. Develop numerical models and participate in numerical and experimental investigations related to FOSs.
3. Conduct experimental investigations using FOSs techniques.
4. Develop computational codes in MATLAB.
5. Signal processing and results analysis.
6. Collaborate with research team members from the Institute of Fluid-Flow Machinery, Polish Academy of Sciences and AGH University of Kraków to achieve the project objectives.
7. Prepare technical reports based on the analysis of research results.
8. Prepare manuscripts for publication in peer-reviewed journals and presentations for scientific conferences.
9. Present research results at national and international scientific conferences.
10. Communicate research progress and discuss results within the project team.

Specific Requirements

We especially seek candidates who:

- possess knowledge about numerical methods (mostly finite element method) and modelling,
- have experience with MATLAB environment, ability to develop computational codes in MATLAB.
- have experience in experimental measurements using Fibre Optic Sensors (FOSs)
- possess knowledge of mechanical testing, data analysis, and signal processing
- are willing to travel and demonstrate flexibility, as some experimental work will be carried out at the partner university and participation in scientific conferences is expected.

In addition, the following will be assessed:

- the candidates' scientific track record (publications, conferences, participation in projects, scholarships, etc.),
- awards, honours, or distinctions of the candidate resulting from the research carried out.

Selection procedure

Selection process is in accordance to National Science Centre regulations.

1. Submission of applications is possible until **August 28, 2026, 12:00 AM**
2. Form of applications: Applications in English can be sent by e-mail to **tsdpan@imp.gda.pl** with a subject "PhD student in OPUS 30 application".
3. Candidates interested in applying for the position should submit the following documents:
 - cover letter
 - CV / scientific resume
 - copy of the certificate of Master degree
 - the list of scientific achievements (publications, participation in research projects, participation in conferences, awards, scientific stays, etc.)
 - optional: letter(s) of recommendation obtained from people (e.g. supervisors, former managers) directly cooperating with the candidate.
4. The application must contain information about the educational background and work experience.
5. Please, attach the requested documents in the PDF format.
6. The result of the recruitment procedure will be sent to the candidates via email.
7. Please include in the application the following statement:

"I hereby authorize to process my personal data included in my application for the needs of the recruitment process (in accordance with the Act of 08.20.1997 r. on personal data protection - Dz. U. No 133, item 883) "

Selected candidates will be invited for an interview (in person or via online videoconference).

Additional questions could be sent by email to Magdalena Mieloszyk: mmieloszyk@imp.gda.pl