NTNU
Kunnskap for en bedre verden

Jobbnorge ID: 298227
Deadline: 4/6/2026
Website: http://www.ntnu.no
Scope: Fulltime
Duration: Temporary

The Department of Mechanical and Industrial Engineering has a vacancy for a

PhD Candidate in Fatigue of Francis Turbine Runners under Flexible Operation

This is NTNU

NTNU is a broad-based university with a technical-scientific profile and a focus in professional education. The university is located in three cities with headquarters in Trondheim.

At NTNU, 9,000 employees and 43,000 students work to create knowledge for a better world.

You will find more information about working at NTNU and the application process here.

Video: https://youtu.be/Xt-yHCN5QS0

About the position

Are you motivated to take a step towards a doctorate and open up exciting career opportunities? As a PhD Candidate with us, you will work to achieve your doctorate, and at the same time gain valuable experience that qualifies you for a further career in higher education and research, in and outside academia.

The Norwegian Research Centre for Renewal of Hydropower Technology, RenewHydro, has a vacancy for a PhD Candidate at the Department of Mechanical and Industrial Engineering with the Materials & Manufacturing research group.

Your immediate leader will be the Head of Department. You will be supervised by Associate Professor Nima Razavi and co-supervised by Professor Ole Gunnar Dahlhaug.

About the project

Hydropower plants are increasingly operated in a flexible manner to balance variable renewable energy production. This results in complex variable-amplitude loading histories in Francis turbine runners, including start-stop cycles, rapid load changes, dwell periods and mixed high-low stress sequences. Such loading conditions influence fatigue damage development in critical blade regions.

The objective of this PhD project is to establish a mechanistically based understanding of how realistic operational loading drives fatigue initiation, cumulative damage and crack evolution in modern and vintage Francis turbine runner steels. The work combines systematic experimental fatigue testing under representative variable-amplitude loading with local fatigue modelling and fracture-mechanics-based crack growth analysis.

The candidate will investigate load-sequence effects, small-crack behaviour and the transition from stable to critical crack growth. Comparative testing of contemporary and vintage runner materials will be performed to assess the influence of ageing, microstructural variability and service history. A purpose-designed model specimen will be developed to reproduce representative multiaxial stress states relevant for runner blades, thereby bridging material-level testing and component-level behaviour.

The resulting material parameters and modelling approaches will be formulated for integration into a turbine-scale simulation framework developed in a parallel PhD project within RenewHydro.

This position is financed through the Research Council of Norway and the Norwegian hydropower industry as part of the Norwegian Research Centre for Renewal of Hydropower Technology (RenewHydro), hosted by NTNU in Trondheim, Norway, in collaboration with leading hydropower producers and technology suppliers.

Duties of the position

- Complete the doctoral education until obtaining a doctorate
- Carry out research of good quality within the framework described above
- Academic publications and popular science dissemination

- Participate in the research group for Materials & Manufacturing
- Participate in international activities such as conferences and/or research stays at foreign educational institutions

Be prepared for changes to your work duties after employment.

Required selection criteria

- You must have a relevant Master's degree in Mechanical Engineering, Material Engineering, Solid Mechanics or equivalent. Your course of study must correspond to a five-year Norwegian course, where 120 credits have been obtained at master's level. Master students can apply, but the master's degree must be obtained and documented before starting the position.
- You must have a strong academic background from your previous studies and have an average grade from your Master's degree study, or equivalent education, which is equal to B or better compared to NTNU's grading scale. If you do not have letter grades from previous studies, you must have an equally good academic foundation. If you have a weaker grade background, you maybe considered if you can document that you are particularly suitable for a PhD education.
- You must meet the requirements for admission to the faculty's Doctoral Programme
- You must have an academically relevant background within mechanics of materials, solid mechanics or fatigue and fracture mechanics
- Documented strong background in experimental mechanics, solid mechanics, and mechanics of materials
- Experience from numerical simulations, preferably finite element analysis
- Excellent written presentation skills and oral English language skill

PLEASE NOTE: For detailed information about what the application must contain, see paragraph “About the application”.

The appointment is to be made in accordance with NTNUs guidelines for recruitment positions and Regulations for the degrees philosophiae doctor (ph.d.) and philosophiae doctor (ph.d.) in artistic development work at the Norwegian University of Science and Technology (NTNU)for general criteria for the position.

Preferred selection criteria

- Good knowledge and experience in mechanical testing of materials or components
- Good understanding of fatigue and fracture mechanics
- Experience in using Finite Element Codes such as ABAQUS, ANSYS, etc. for numerical analysis of fatigue and fracture mechanics
- Knowledge of basic turbomachinery principles
- Oral and written proficiency in Norwegian/Scandinavian languages

Personal characteristics

To complete a doctoral degree (PhD), it is important that you are able to:

- Work independently
- Work in a structured way, set goals and make plans to achieve them
- Present and discuss your research with other professionals
- Get involved and contribute constructively with feedback
- Work constructively under pressure or in the face of adversity
- Show curiosity and a strong motivation for the subject
- Analyze data, assess different perspectives and draw well-founded conclusions
- Be flexible and open to adjusting the plan for the project as needed

Emphasis will be placed on personal qualities.

We offer

- An exciting job with an important mission in society
- Developing tasks in a strong and international professional environment
- Career guidance and follow-up during the PhD period
- Open and inclusive working environment with committed colleagues
- Working capital that can be used to implement the project
- Mentor programme as a new employee at NTNU
- Favorable terms as a member of the Norwegian Public Service Pension Fund (SPK)
- Free Norwegian language training at a basic level (A2)

As a PhD Candidate at NTNU, you will have access to employee benefits.

Diversity

Diversity is a strength, and at NTNU we aim to be an employer that reflects the diversity in society and that makes use of the potential of the population's collective skills. Our vision is Knowledge for a better world and our values are creative, critical, constructive and respectful. We believe that an organization that is equal, diverse and gender-balanced is essential for us to achieve our goals.

We strive to attract employees with different skills, life experiences and perspectives to contribute to even better problem solving of our societal mission in research and education.

If you think this position is relevant and interesting, we encourage you to apply, regardless of gender, functional ability and cultural background, or whether you have been out of work for a period of time.

At NTNU we want to increase the proportion of women in scientific positions. We have a number of measures to promote equality.

Salary and conditions

In the position of PhD Candidate, code 1017, your gross salary will normally be NOK 550 800,-per annum depending on qualifications and seniority. A 2% statutory contribution to the State Pension Fund is deducted from the salary.

The employment period is 3 years.

For employment as a PhD Candidate, it is a prerequisite that you gain admission to the PhD programme in Engineering within three months of your employment contract start date, and that you participate in an organized doctoral programme through out the period of employment.

The position is conditional on external funding from the Research Council of Norway as part of the RenewHydro center.

As an employee at NTNU, it is important that you keep yourself up to date with academic and organizational changes and adapt to them.

For the necessary professional and social interaction, it is a prerequisite that you are physically present and available to the institution on a daily basis.

The appointment is carried out in accordance with the principles of the State Employees Act, and Export control (legislation that regulates the export of knowledge, technology and services). Candidates who, after assessment of the application and attachments, are considered to bein conflict with the criteria in the latter act, will not be able to be employed.

About the application

The attachments (including a description of your scientific work) must accompany the application as these documents form the basis of the application assessment. The documents must be in Norwegian/a Scandinavian language or English.

Please note: the application will only be assessed on the basis of the information we have received by the application deadline. Therefore, make sure that your application clearly shows how your skills and experience meet the criteria described above. The application and all attachments must be sent electronically via Jobbnorge.no. If you are invited to an interview, you must bring certified copies of certificates and diplomas upon request.

The application must include:

- Transcripts and diplomas for Bachelor's and Master's degrees
- CV
- Copy of Master's thesis. If you have recently submitted your Master's thesis, you can attach a draft of the thesis. Documentation of a completed Master's degree must be presented before taking up the position.
- Project outline containing proposals for an overall description of research questions, theoretical perspectives, methodological design for the project and progress plan (maximum 1500 words/4 pages)
- Short letter of motivation (400 words/1 page). The motivation letter must be aligned with the subject of this call and why the candidate finds themselves suitable for this position.
- Possibly publications or other relevant research work (the candidate’s contribution to each work must be clarified (performed tasks and percentage of contribution))
- Possibly certificates
- Names and contact information of three relevant referees, their relation to the applicant, and their recommendation letters for your application for this position (Note: the referees will also be directly contacted for shortlisted candidates for the position)
- documentation of the required criteria

If all, or parts, of your education has been taken abroad, we also ask you to attach documentation of the scope and quality of your entire education, both Bachelor's and Master's education, in addition to other higher education. If your institution uses “diploma supplement” (normal for most European institutions), you must attach this. A description of the documentation required can also be found here. If you already have a statement from Norwegian Directorate for Higher Education and Skills (HK-dir), please attach this as well.

Joint work will be considered. If it is difficult to identify your contribution to joint work, you must attach a brief description of your participation.

When assessing the best qualified, we emphasize necessary qualifications such as education, experience and personal suitability. Motivation for the position, ambitions, and potential for research will also count when assessing the candidates.

NTNU recognizes a wide range of academic contributions and has committed itself to The San Francisco Declaration on Research Assessment and CoARA (responsible assessment of research and recognition of a greater breadth of academic contributions in accordance with NTNU's social mission).

General information

A public list of applicants with name, age, job title and municipality of residence is prepared after the application deadline. If you wish to be exempt from entry on the public applicant list, this must be justified. Assessment will be made in accordance with current legislation. You will be notified if the exemption is not granted.

If you think this position looks interesting and in line with your qualifications, you are welcome to apply.

If you have any questions about the position, please contact Associate Professor Nima Razavi, e-mail: nima.razavi@ntnu.no.

If you have any questions about the recruitment process, please contact HR Senior Consultant Hedda Winnberg, e-mail: hedda.winnberg@ntnu.no.

Application deadline: 06.04.2026

For practical information about working at NTNU, please visit this webpage.

The city of Trondheim is a modern European city with a rich cultural scene. Trondheim is the tech capital of Norway with a population of 200,000. The Norwegian welfare state, including healthcare, schools, kindergartens and overall equality, is probably the best of its kind in the world. Professional subsidized day-care for children is easily available. Furthermore, Trondheim offers great opportunities for education (including international schools) and possibilities to enjoy nature, culture and family life and has low crime rates and clean air quality.

NTNU - knowledge for a better world

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The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.

Department of Mechanical and Industrial Engineering

We educate graduates who can create new products, operate and maintain products, and manage projects. The Department has a variety of bachelor's and master's degree programmes. We conduct wide-ranging research in fields such as technology, energy, product quality and development, and productivity. The Department of Mechanical and Industrial Engineering is one of eight departments in the Faculty of Engineering.

Additional information

Place of service:

Høgskoleringen 1 7491 Trondheim (Trondheim Municipality)