

Match of the vacancy within the Strategic Goals of the Department

Global Strategic Goals of the Faculty of Engineering and Architecture at Ghent University

New members of the Professorial Staff (i.e. Assistant Professors, Associate Professors, Full Professors and Senior Full Professors) are expected to develop (research) activities aimed at engineering applications or architecture and to join, as far as is possible, existing research groups rather than to separately create (very) small new and isolated research groups.

The research activities within the Faculty of Engineering and Architecture are only partially realized by employees that are funded directly by the government (Professorial Staff, Assisting Academic Personnel, and Administrative & Technical Personnel) or through research funds provided by the university itself. Indeed, a considerable share of research activities within the Faculty of Engineering and Architecture is realized by researchers that are funded through external national/Flemish or international resources (e.g., FWO-Flanders/Research Foundation-Flanders, VLAIO-Flanders/Flanders Innovation & Entrepreneurship, EU, contract research in cooperation with companies). While the latter concerns external funding, the research activities are in fact managed by internal Professorial Staff members that succeed in acquiring external funding based on their expertise and experience.

If the Faculty of Engineering and Architecture wants to safeguard its competitive position (internationally and nationally), it will continuously have to succeed in acquiring the necessary external funding. It is therefore the Faculty's strategy to preferably create vacancies in domains in which chances are high that such external funding can be acquired. This aspect is explicitly considered during the appointment procedure of Professorial Staff members within the Faculty of Engineering and Architecture.

Strategic Goals of the Department - match with the vacancy

The Department of Civil Engineering consists of five research units, which perform research and provide teaching and services: Hydraulics Laboratory, UGent Geotechnical Institute, the research unit Coastal Engineering, Bridges and Roads, Center for Mobility and Spatial Planning and the research unit Ships and Marine Technology. Due to the diversity of the research fields of the different research units, each unit is quite self-reliant.

Traditionally, the research group UGent Geotechnical Institute (founded in 1939 as the first and largest academic geotechnics laboratory in Belgium) has been carrying out research in the field of pile foundations, soil reinforcement, and environmental geotechnics. To reinforce this research and connect with the research questions currently being considered in this field, Prof. Mahya Roustaei was recently appointed to advance the research in Onshore Geotechnics. The geotechnical institute will upgrade its research infrastructure in the coming five years to offer the possibility for advanced soil mechanical tests, 1-g testing and geotechnical data analysis to its researchers.

Research is carried out in collaboration with other national and international groups, dredging and building contractors, the geotechnical division of the Flemish Ministry of Public Works (MOW) and the Belgian Building Research Establishment (BuildWise). Over the past five year period, the research group was involved in offshore wind research through the ETF WINDSOIL and VLAIO SOILTWIN projects. Fundamental research into the behavior of stiff fissured clay for offshore foundation applications is currently underway (ETF FISSCK).

The research group UGent Geotechnical Institute provides teaching in the curricula of both the Bachelor and Master of Science in Civil Engineering focusing on soil mechanics, geotechnics, groundwater flow, offshore foundations and dredging. Furthermore, it provides courses on soil mechanics and groundwater flow in the curriculum of the Master of Science in Engineering: Architecture and one course on Dredging and Offshore Constructions in the curricula of the Master of Science in Geology and Master of Science in Environmental Science and Technology. The course on Offshore Foundations is also offered to the newly created International Master of Science in Advanced Design of Sustainable Ships and Offshore Structures (Erasmus Mundus program).

The Department of Civil Engineering wants to strengthen its position in research in Offshore Geotechnical Engineering, by new initiatives such as an increasing cooperation with the coastal engineering and maritime engineering research groups on theoretical aspects and to study research topics with geotechnical aspects in the new Coastal and Ocean Basin facility, and with the Magnel-Vandepitte Laboratory on the structural aspects. Within UGent, the UGent Geotechnical Institute aims to contribute to the Energhentic Community, a cluster of research groups active in the field of (offshore) energy. Through OWI-Lab, the research group wants to continue the collaboration with VUB and Sirris on the impact of geotechnics on structural health monitoring. Further engagement with the Belgian offshore industry is targeted to increase the number of externally funded research projects and provide contract research to industrial partners. Furthermore, cooperation with other international research groups in this field needs to be initiated, for example IFSTTAR in Nantes, Delft University of Technology, Imperial College London and Oxford University.

To achieve this, a new ZAP position is created to study and teach this fast-developing part of Geotechnics. Collaboration with the Department of Public Works (MOW) of Flanders and Belgian industry partners working in this field (contractors, consultancy firms) will be essential to acquire sufficient field data and to discuss the most relevant topics. Both MOW and industry partners have shown interest in this initiative and want to contribute.

Research topics in Offshore Geotechnical Engineering can be: further optimizing wind turbine foundations and anchoring systems for floating offshore structures. To be able to reduce the CO₂ emission considerably, still thousands of wind turbines and wave energy converters have to be built worldwide. In the EU, 34 GW of wind

power is currently installed offshore (WindEurope, 2023) and it is expected that this will increase to 120 GW by 2030. This means that optimized offshore foundation designs will be necessary in the near future. This requires a good understanding of the current geotechnical design practice for offshore wind turbine foundations and expertise on the use of in-situ monitoring data for optimization of these design methods. In addition to an excellent knowledge of soil mechanics for characterization of sites in new frontier areas, a familiarity with data management techniques and machine learning applications is considered to be an asset. As offshore geotechnical engineering is part of a broader multi-disciplinary approach to site characterization and structural design and monitoring, familiarity with the interfaces to other offshore disciplines (geology, geophysics, hydrodynamics, steel design, mooring system design, monitoring, ...) will also be appreciated.

The successful candidate is expected to become a member of the research group of the UGent Geotechnical Institute, and to contribute to the teaching (in particular with reference to the topics listed above), research and services (e.g. for government or industry) of this group. The successful candidate is expected to focus initially on the following particular research objectives:

- to perform state of the art research in the field of offshore geotechnics and to translate the results of this research in a way that these can be used by government and the industrial partners in this way bridging the gap between academic research and practice.
- topics to be studied will be: offshore wind turbine foundations, foundations of wave energy converters, offshore power cable and pipeline installation and long term stability. In most topics cyclic loading and lateral loading will be important because wind and waves impose both cyclic and lateral loading.
- writing a research plan, with budget estimation, together with the Department of Civil Engineering and industry, to select the priorities on the topics that have to be studied and taught in the coming 5 years with respect to offshore geotechnics. This plan has to take into account the facilities of the university and the available budgets. At the moment the idea is that offshore wind and tidal energy foundations will be important in this plan,
- collaborate with industry and academic research partners (in and outside UGent) to realize this plan,
- to contribute to the further development of the physical and numerical tools in the field of offshore geotechnics and validate results of calculations with the results of laboratory tests.

Candidates are therefore expected to have experience with physical, numerical modelling and/or full-scale tests in the field of Offshore Geotechnical Engineering. Proven experience in working in research consortia with academic and non-academic partners is essential.

For a successful fulfilment of this vacancy, it is essential that an intense cooperation with industry partners in Belgium will be achieved. Therefore, the successful candidate has to be a team player. Next to that, an intensive research collaboration with the research groups in the Department of Civil Engineering is of importance as well as collaboration with other academic groups working on the same topic. This collaboration should lead to common research projects, European funded projects or joint industry projects.