On a global scale, to ease the scarcity of land, hydrocarbons, minerals and rare metals and to reduce the impact on the environment and society, the reclamation of land for industrial purposes, the exploration of hydrocarbons and minerals and using new technologies to generate green renewable energy, is moving more and more offshore into deeper waters. To open new horizons and to meet the challenges of the near future requires the development of new, innovative, interdisciplinary technologies and methodologies. The exploration of hydrocarbons at 3000 m water depth, floating airports, trailing suction hopper dredges of 50,000 m³, diamond mining at the sea and ocean floor with remote/autonomous operated vehicles, floating offshore wind turbines, largescale ocean thermal gradient power plants, arctic engineering and deep sea mining will all be possible in the near future, but require a lot of fundamental research.

Offshore and Dredging Engineering comprises the design and operation of semi stationary floating systems in a marine environment, with the purpose of exploring, exploiting, generating, storing and transporting/lifting (valuable) materials, like hydrocarbons, minerals and rare metals. ODE also deals with auxiliary systems and equipment for the construction, placement and decommissioning of these systems.

Programme
Offshore & Dredging Engineering is a multidisciplinary programme offered by the Faculty of Mechanical, Maritime and Materials Engineering and the Faculty of Civil Engineering & Geosciences. As a participant in the programme, you will pursue both theoretical and applied studies, including a multidisciplinary project and your final thesis project.
The core curriculum for the master degree Offshore Engineering consists of the following courses. These courses total 75 ECTS, including the thesis. For each of the specialisations there is a supplement core curriculum, these can be found on the Offshore Engineering website.

### Curriculum Design

**First Year**
- Introduction to Offshore Engineering (3ECTS)
- Probabilistic Design (4ECTS)
- Ocean Waves (6ECTS)

**Second Year**
- Survey of Offshore Engineering Project OR Research Exercise* (6ECTS)
- Motion & Loading of Structures in Waves (5ECTS)
- Thesis (30ECTS)

* In the second year of the programme, students will be given the choice of taking either the surveying project, or to do a research exercise. The surveying project is to be done in large groups of students, whereas the research exercise is to be done individually. This research exercise has been introduced to allow students to pursue an internship abroad.

1 ECTS = 28 hrs, study, according to the European Credit Transfer System (ECTS). Total number of credits in the MSc programme = 120 EC.

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**Specialisations**

- **Floating Offshore Structures**
  - In extremely deep waters, the only practical choice of structure is a floating structure. Floating structures are also favoured when the activity in a particular location will be temporary. Many forms of floating structures have been developed over the years, including ship-like forms when speed is important, and semi-submersible or spar platforms, when greater stability is an important factor. The Floating Structures – Offshore Hydromechanics specialization includes courses in Floating Structures, Drive Systems Design Principles, Offshore Moorings and Dynamic Positioning.

- **Dredging Engineering, Trenching & Deepsea Mining**
  - Dredging Engineering focuses on the design and maintenance of dredging equipment with the goal of durable implementation of dredging projects. The sea-mining industry is also moving to deeper and deeper waters. Although operation depths do not currently exceed 150m, it is expected that within 10 years dredging and sea-mining will reach 500m to 3000m, requiring new technologies for resource recovery, as well as monitoring and control systems. Dredging Engineering includes courses in Dredging Processes I & II and Pumps & Slurry Transport.

- **Bottom Founded Structures**
  - Fixed, Bottom-Founded Structures include fixed towers with piled foundations, as well as jack-up structures and monopole structures commonly used for offshore wind energy applications. The dynamics of floating & fixed structures and arctic engineering become more and more important. Developing designs for cost effectiveness over the entire life cycle of the structure is a priority addressed in the programme. Courses offered in this specialization include Bottom Founded Structures, Structural Dynamics, Finite Element Methods and Offshore Soil Mechanics. Students in this track are eligible for the European Wind Energy Master. The European Wind Energy Master consortium is composed of four Universities, world leaders in Wind Energy and Offshore Wind Energy research and education. Delft University of Technology, Technical University of Denmark, Norwegian University of Science and Technology, Carl von Ossietzky Universität Oldenburg.

- **Structural Design & Analysis**
  - Structural Design and Analysis is the youngest specialisation focusing on mastering and advancing your knowledge when applied for design and analysis of steel and composite floating structures used by the maritime, offshore, dredging and renewable energy industries. Think here about floating wind structures, tidal energy structures, “Pioneering Spirit” of Allseas, “Prada” an FLNG of Shell, or the “Stenpris” a new generation semi-submersible largest crane vessel in the world which is designed for worldwide offshore heavy lifting by HMC. But before these structures can be designed and analysed a lot of new knowledge is needed.

**Thesis opportunities**

Within each specialisation, there is the opportunity to conclude the master with a thesis in more subject areas than the specialisations alone. As of 2018 it is possible to choose a topic within Ocean Energy Technology. Ocean Energy Technology considers the generation of energy by waves, thermal gradients, tides or aquatic biomass. It is expected that Ocean Energy will be a large energy source in the coming future. The thesis opportunities within the Offshore & Dredging Engineering master are in abundance. Feel free to approach the professors to ask them for more information.

**Graduation projects**

- Design and modelling of a 10MW OTEC plant using a transition leg platform
- Integrated modelling of offshore wind turbines
- Deep sea mining applicability
- Managed ice loads on a four-legged structure
- The design of a quick-disconnect system for an arctic FPSO

**Career prospects**

The MSc programme Offshore Dredging Engineering in its current setting is unique in the world, due to the availability of a broad range of offshore and dredging companies and research institutes, especially in the Netherlands. New developments in the fields of offshore and dredging engineering are Arctic Engineering, (Floating) Offshore Wind Turbines, Ocean Energy Technology, Deep Sea Mining and Sub Sea Engineering. Due to the close contact between the staff and the industry, the MSc programme ODE is following the new developments closely and offers the MSc graduates a broad range of MSc thesis assignments. The majority of graduates work together with Offshore companies to complete their thesis. Some of the companies offering opportunities to graduates of the programme includes Shell, BP, Heerema, Allseas, Bluewater, IBM, Gusto, Damen, Huisman, Boskalis Dredging, IHC, and Van Oord Dredging.

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**Nick Sanders (The Netherlands)**

My name is Nick Sanders and I’m from Zaandam, The Netherlands. Although my name sounds very Dutch I am actually half Spanish, half Dutch, currently I am following the MSc programme in Offshore & Dredging Engineering at the TU Delft. Before I started this master, I studied the Civil Engineering bachelor at the TU Delft. I have always been interested in the renewable section and large scale projects, so for me Offshore Engineering offers a combination of two things I really enjoy. Working on billion dollar projects related to oil & gas and then trying to stimulate the offshore wind industry with innovative projects and solutions to new challenges. The offshore & dredging industry is still very large. There has been a dip recently due to the drop in oil prices, but offshore engineering is still a very versatile and important industry that works in many sectors apart from oil and gas. For my specialization I chose Bottom Founded Structures. Within this specialization there are many interesting elective courses related to wind farms and wind energy. Also, this will allow me to find a thesis project related to wind energy.

The TU Delft is the only university that offers Offshore Engineering as a specific MSc programme. Therefore, there are a lot of opportunities. Since the start of the Master we have been introduced more and more to the different ways of harvesting energy from the ocean. The ocean energy concepts are still very much in the research phase, but have a huge potential to become the main energy resource in the near future. This fuels my interest and could be a very interesting area for research in the future or possibly even for my upcoming thesis. The enthusiasm from the Dutch offshore industry is also very encouraging. There are many open days with the companies, info market days, sponsored networking events that include drinks and often dinners. The companies are really going out of their way to encourage students and motivate them within offshore.

I am very happy with my choice for the Offshore & Dredging Engineering MSc programme. The opportunities are huge, the master is challenging, the industry is still very much booming and the people within offshore are great company.
Admission requirements and application procedure

Dutch BSc degree
A Dutch BSc in Mechanical Engineering, Civil Engineering, Marine Technology, Aerospace Engineering or Physics. If the Master’s programme does not follow directly from your undergraduate programme, you will be required to take additional courses in what is called a bridging programme. This may be a standard programme, or it may be tailored to your specific situation.

To see which Master’s programmes are open to you on completion of your Bachelor’s degree Dutch university, go to www.doorstroommatrix.nl.

Application goes through Studielink: www.tudelft.studielink.nl

Dutch HBO degree
An HBO Bachelor’s degree does not qualify you for direct admission to a TU Delft Master’s degree programme. To start a Master’s degree programme, you will first need to complete a supplementary programme in order to bring your knowledge to the required level. You can do this during your HBO programme by completing a bridging or by means of a bridging programme after securing your HBO diploma. Entrance requirements for mathematics and English (some exceptions) apply for both the bridging minor and the bridging programme. See www.hbodoorstroom.tudelft.nl for detailed information.

Application goes through Studielink: www.tudelft.studielink.nl

International applicants
To be considered for admission to a MSc Programme you’ll need to meet TU Delft’s general admission requirements.

1. A BSc degree(or a proof that you have nearly completed a BSc programme) in Mechanical Engineering, Civil Engineering, Marine Technology, Aerospace Engineering, Physics or Ocean Engineering. Others have to meet the requirements of Mechanical Engineering or Civil Engineering.
2. A BSc Cumulative Grade Point Average (CGPA) of at least 75% of the scale maximum.
3. Proof of English language proficiency:
   • TOEFL with a minimum score of 21 for each section and an overall band score of at least 90 (internet-based test). Please note that we only accept the TOEFL internet-based test.
   • or IELTS (academic version) with a minimum score 6.0 for each section and an overall Band score of at least 6.5.
   • or proof that you have passed the University of Cambridge ‘Certificate in Advanced English’ with a minimum grade B or the University of Cambridge ‘Certificate of Proficiency in English’.

For international students, the application period starts in October and closes on 1 April. To start an MSc application, fill in the online application and pay the refundable application fee of €100. Then send hard copies of the application documents to TU Delft’s International Office. Please note that you should apply early when you want to be considered for a scholarship as well!

For more information about the application procedure and studying at TU Delft in general, go to: www.admissions.tudelft.nl.

Further information
Please visit the webpage for all details, complete requirements, deadlines and contact information: www.offshore.tudelft.nl

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