Wind Energy Training Overview

Wind Energy Education at DTU, Denmark

DTU Wind Energy

Tom Cronin and Niels-Erik Clausen
Technical University of Denmark (DTU)

People

- Around 5,000 employees
- 2,500 scientific staff
- Including 1,050 PhD students
- 10,600 students

Study programmes

- 15 bachelor (BSc)
- 28 masters (MSc)
- 10 bachelor (BEng)
Overview – Educational Activities

As a University Department, DTU Wind Energy offers many types of education with a relation to wind energy:

- Individual courses at B.Sc. level
- Masters-level M.Sc. programs
- PhD education and supervision
- Continuing education of professionals
- E-learning courses
- Future digital e-learning masters in wind energy (over 2 years)
Bachelor programme courses

- Introduction to wind energy
- Manufacturing of advanced fibre composites
- Wind turbine racer (course and competition)
MSc Programmes in Wind Energy at DTU

• **MSc in Wind Energy**
  A DTU education, DTU Wind Energy in collaboration with DTU Electro

• **European Wind Energy Master (Erasmus Mundus)**
  In collaboration with TUDelft, UniOldenburg, NTNU

• **Innovative Sustainable Energy Master (Nordic programme)**
  In collaboration with KTH, Chalmers, Aalto and NTNU

• **MSc in Sustainable Energy**
  A DTU education in collaboration with DTU Management Engineering with 5 specialisations – one is wind energy
MSc courses at DTU Wind Energy

<table>
<thead>
<tr>
<th>Course Description</th>
<th>ECTS points</th>
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<tbody>
<tr>
<td>46100 Introduction to micro meteorology for Wind Energy</td>
<td>5</td>
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<tr>
<td>46200 Planning and development of wind farms</td>
<td>5</td>
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<tr>
<td>46211 Offshore wind energy</td>
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<tr>
<td>46230 Power system balancing with large scale wind power</td>
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<tr>
<td>46300 Wind Turbine Technology and Aerodynamics</td>
<td>10</td>
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<td>46310 Projects in Wind Turbine Aeroelasticity</td>
<td>10</td>
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<tr>
<td>46320 Loads, Aerodynamics and Control of Wind Turbines</td>
<td>10</td>
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<tr>
<td>46400 Wind Turbine Measurement Technique</td>
<td>10</td>
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<td>46411 Design of large composite structures</td>
<td>5</td>
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<tr>
<td>46415 Structural analysis and design optimisation of wind turbine blades</td>
<td>5</td>
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<tr>
<td>46420 Composite Materials and Fibres</td>
<td>5</td>
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<tr>
<td>46430 Experimental Materials Characterization</td>
<td>5</td>
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<tr>
<td>46440 Manufacturing of Advanced Fibre Composites</td>
<td>5</td>
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<tr>
<td>46500 Probabilistic methods in wind energy</td>
<td>5</td>
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<tr>
<td>46800 Research Immersion – wind energy</td>
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MSc in Wind Energy

2-year MSc programme
• 30-60 students per year
• Danish and foreign students
• All courses are given in English

1st Semester
• Wind turbine technology
• Aerodynamics & aeroelasticity
• Measurement techniques

MSc Thesis
• Often in collaboration with industry

2nd & 3rd Semesters
• Aerodynamics and fluid mechanics
• Structural mechanics
• Construction and materials
• Power electronics & grid connection
• Control and regulation
• Prognostics and optimization
• Wind resources & loads on wind turbines
• Projects in aeroelasticity
• Planning & development of wind farms
What do graduates of the DTU Wind Energy MSc do?

Some employment statistics from the last four years:

- 50 students graduate each year from DTU Wind Energy MSc
- Over 90% of students are from outside Denmark
- 60% find first employment in Denmark
- 40% in Danish private companies
- 35% in private companies outside Denmark
- 25% in academia
European Wind Energy Master

- Four tracks
- Double-degree programme

- Diplomas from two universities from:
  - TUDelft (Netherlands)
  - University of Oldenburg (Germany)
  - NTNU (Norway)
  - DTU (Denmark)

- Started 2012
**MSc in Innovative Sustainable Energy Engineering**

**Joint Nordic Masters degree**
- 2 years
- Conventional & renewable energy sources
- Energy utilisation
- Economical & environmental sustainability

**Participating universities**
- Norwegian University of Science and Technology (NTNU)
- Aalto University in Finland
- Chalmers University of Technology (Sweden)
- KTH Royal Institute of Technology (Sweden)
- Technical University of Denmark (DTU)
- University of Iceland (UoI)
MSc Sustainable Energy

Objective

The graduates will be able to combine detailed knowledge about an energy technology area with knowledge about the following:

- Design future energy systems with a high share of renewable energy sources
- Evaluation of energy technologies with regard to environment, economy, security of supply and system integration

Study lines

- Bio fuels
- Electrical energy systems
- Energy savings (in buildings)
- Hydrogen and fuel cells
- Thermal energy
- Wind Energy
Future Wind Energy E-learning Masters

Work load

• Total work load is one full year but runs over two years or longer
• Courses can be taken individually

Requirements for admission:

• B.Sc. degree or higher
• Minimum two years of relevant working experience

<table>
<thead>
<tr>
<th>1st semester</th>
<th>2nd semester</th>
<th>3rd semester</th>
<th>4th semester</th>
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<tbody>
<tr>
<td>Wind Turbine Technology</td>
<td>Economics and Social Acceptance of</td>
<td>Numerical Tools in Wind Energy</td>
<td>Final Project</td>
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<td>(5 ECTS)</td>
<td>Wind Turbines</td>
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<td>Wind Resources</td>
<td>Aerodynamics and Aeroelasticity</td>
<td>Offshore Wind Energy</td>
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<td>Materials in Wind Energy</td>
<td>Integration and System Analysis of</td>
<td>Measurement Techniques in Wind Energy</td>
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Wind Energy Education at DTU, Denmark
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Wind Energy Education at DTU, Denmark

Some links

- [MSc Wind Energy](#) - seen by a student (DTU You Tube 2:56 min)
- [MSc Wind Energy](#) – curriculum and programme details
- [MSc Sustainable Energy](#) – course content and details
- [Innovative Sustainable Energy Engineering](#) – Joint Nordic Masters
- [DTU Homepage](#)