ForWind – Zentrum für Windenergieforschung

Moses Kärn
ForWind / Carl von Ossietzky Universität Oldenburg

European Wind Energy Master (EWEM), Erasmus Mundus Master Programme

Windenergietage, Potsdam, 8.-10. November 2016
University of Oldenburg: Energy Systems Research at the Forefront of the Energy Transition

Renewable Energy Sources
- Wind Energy Systems, Turbulence
- Energy Meteorology
- Photovoltaics, Solar Cell Materials

Energy Efficiency
- Fuel Cells
- Energy Saving, IT

Energy Systems
- Energy Economics, Sustainability
- Storage Technology & Systems
- Energy Management, Smart Grids, IT

Study Programmes, Teacher Training

Turbulent Wind Tunnel operative in 2016:
ForWind Cooperates with Federal Institutions to form the German Research Alliance Wind Energy

- **ForWind**: 30 institutes at 3 universities in Oldenburg, Hannover, Bremen (state)
- **Fraunhofer** Institute for Wind Energy and Energy System Technology (IWES) (federal)
- **German Aerospace Center (DLR)**: 6 institutes (federal)

- 11 locations in 6 German states
- ~ 600 researchers and staff
- Share large research infrastructure
- Industry advisory board

www.forschungsverbund-windenergie.de
University of Oldenburg: Over 30 Years of Experience in Teaching Renewable and Wind Energy

1980
Physics
BSc / MSc / PhD

1987
Postgrad. Progr. Renewable Energies (PPRE)
MSc

2002
European Master in Renewable Energy by EUREC
MSc

1998 / 2011
Engineering Physics
BSc / MSc / PhD

2012
EWEM – European Wind Energy Master
MSc

since 2011:
Wind Physics
Engineering Physics

- In cooperation with University of Applied Science, Emden
- Master of Science in English language.
- 4 semesters / 120 ECTS
- Physics, Mathematics, Engineering Sciences
- Specialisations:
  - Renewable Energies → **Wind Physics**
  - Lasers & Optics
  - Biomedical Physics and Acoustics
- Wind Energy: up to 75 ECTS + thesis
- 140 students per year in program /
  around 40 in Wind Energy
European Wind Energy Master (EWEM)

- 4 world-leading Wind Energy universities join forces
- Building on long-standing cooperation in research and local master programs
- 2 year program, 4 tracks, double degree
- Erasmus Mundus Scholarships for students
- Mobility funding for staff and students
- Associated partners: major industry, business & associations involved: guest lectures, summer schools, internships, or MSc thesis
- Aim: 50-60 graduates per year (today around 40)
- Wind Energy: 90 ECTS + thesis (=100%)
# EWEM: Program Structure

<table>
<thead>
<tr>
<th>First year (60 ects)</th>
<th>Second year (60 ects)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wind Physics</strong></td>
<td><strong>UniOl</strong></td>
</tr>
<tr>
<td><strong>Rotor Design</strong></td>
<td><strong>TU Delft</strong></td>
</tr>
<tr>
<td><strong>Electric Power Systems</strong></td>
<td><strong>Summer school</strong></td>
</tr>
<tr>
<td><strong>Offshore Engineering</strong></td>
<td><strong>TU Delft</strong></td>
</tr>
<tr>
<td><strong>DTU:</strong> general introduction to wind energy</td>
<td><strong>NTNU</strong></td>
</tr>
<tr>
<td><strong>MSc Thesis:</strong> with 2 EWEM partners, and possible participation of industry or other research institute</td>
<td></td>
</tr>
</tbody>
</table>

- TU Delft = Delft University of Technology, DTU = Technical University Denmark, NTNU = Norwegian University of Science and Technology, UniOl = Carl von Ossietzky University of Oldenburg
- 1 ects = 28 hours of study according to the European Credit Transfer System
## EWEM: Awarded Degrees

<table>
<thead>
<tr>
<th>Track</th>
<th>Degree 1</th>
<th>Degree 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Physics</td>
<td>MSc Wind Energy Engineering from DTU</td>
<td>MSc Engineering Physics from UniOl</td>
</tr>
<tr>
<td>Rotor Design</td>
<td>MSc Wind Energy Engineering from DTU</td>
<td>MSc Aerospace Engineering from TU Delft</td>
</tr>
<tr>
<td>Electric Power Systems</td>
<td>MSc Electrical Engineering from TU Delft</td>
<td>MSc Technology-Wind Energy from NTNU</td>
</tr>
<tr>
<td>Offshore Engineering</td>
<td>MSc Offshore Engineering and Dredging from TU Delft</td>
<td>MSc Technology-Wind Energy from NTNU</td>
</tr>
</tbody>
</table>
# Wind Physics Track: Courses

## Mandatory Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Micro Meteorology for Wind Energy</td>
<td>5</td>
</tr>
<tr>
<td>Wind Turbine Technology and Aerodynamics</td>
<td>10</td>
</tr>
<tr>
<td>Planning and Development of Wind Farms (3 weeks, January)</td>
<td>5</td>
</tr>
<tr>
<td>Diffusions and Stochastic Differential Equations *</td>
<td>5</td>
</tr>
<tr>
<td>Turbulence Theory *</td>
<td>5</td>
</tr>
<tr>
<td>Advanced Research Project</td>
<td>9</td>
</tr>
<tr>
<td>Wind Physics Measurement Project</td>
<td>3</td>
</tr>
<tr>
<td>Aeroelastic Simulation of Wind Turbines</td>
<td>3</td>
</tr>
<tr>
<td>Wind Energy Meteorology</td>
<td>3</td>
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<tr>
<td>Computational Fluid Dynamics, CFD I</td>
<td>3</td>
</tr>
<tr>
<td>Computational Fluid Dynamics, CFD II</td>
<td>3</td>
</tr>
<tr>
<td>Seminar Advanced Topics in Engineering Physics</td>
<td>3</td>
</tr>
<tr>
<td>Fluid Dynamics II</td>
<td>3</td>
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</table>

## Elective Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>ECTS</th>
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</thead>
<tbody>
<tr>
<td>Physics of Sustainable Energy</td>
<td>5</td>
</tr>
<tr>
<td>Time Series Analysis</td>
<td>5</td>
</tr>
<tr>
<td>Stochastic Processes</td>
<td>5</td>
</tr>
<tr>
<td>Offshore Wind Energy</td>
<td>10</td>
</tr>
<tr>
<td>Energy Systems 2</td>
<td>3</td>
</tr>
<tr>
<td>Stochastic Processes in Experiments</td>
<td>3</td>
</tr>
<tr>
<td>Optimization and Data Fitting</td>
<td>5</td>
</tr>
<tr>
<td>Wind Turbine Measurement Techniques</td>
<td>10</td>
</tr>
<tr>
<td>Probabilistic Methods in Wind Energy</td>
<td>5</td>
</tr>
</tbody>
</table>
Required BSc Background

**Wind Physics:**
Mechanical Engineering
Aerospace Engineering
Mathematics
Physics

**Rotor Design:**
Mechanical Engineering
Aerospace Engineering
Physics

Similar backgrounds accepted if proven relevant.
Required BSc Background

Electric Power Systems
Electrical Engineering
Physics

Offshore Engineering
Civil Engineering
Structural Engineering
Mechanical Engineering
Physics

Similar backgrounds accepted if proven relevant.
## Number of Students

<table>
<thead>
<tr>
<th></th>
<th>Rotor Design</th>
<th>Wind Physics</th>
<th>Electrical Power Systems</th>
<th>Offshore Engineering</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; cohort</td>
<td>17</td>
<td>5</td>
<td>4</td>
<td>11</td>
<td>37</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; cohort</td>
<td>19</td>
<td>1</td>
<td>9</td>
<td>7</td>
<td>36</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; cohort</td>
<td>17</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>37</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt; cohort</td>
<td>14</td>
<td>8</td>
<td>8</td>
<td>11</td>
<td>41</td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt; cohort</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>22</td>
</tr>
</tbody>
</table>
Associate Partners
Engagement within EWEM:

- Host students for internships or Master’s Thesis.
- Host visiting scholars for teaching purposes.
- Give guest lectures at EWEM universities.
- Give guest lectures at the Summer School.
- Promote PhD and Post-Doc positions.
ASE ‘Aeolus’ aims to be the default go-to organisation
• for students of EWEM and
• for the European wind energy industry to engage with EWEM students.

Activities:
• Educational and career-oriented events: field trips, lunch lectures, fair visits…
• Provide application and study guidance
• Encourage social cohesion and networking
• Quality control of EWEM (student board member)

Partner & Sponsors:
Kontakt

www.windenergymaster.eu

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