European Wind Energy Master
Erasmus Mundus MSc Programme

www.windenergymaster.eu

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International Education and Research

- EWEM as a vehicle for international research and education

- More North-American content in EWEM or even a North-American Msc in Wind Energy
Storyline

• Description of why and how EWEM has been built

• Examples of impact in cooperation and opportunities

• Future possibilities
200k new jobs in European Wind by 2030
Largest increase in Offshore Wind Energy

Forecast of Wind Energy direct employment in EU

Source: European Wind Energy Association ‘Wind at work 2009’
Global demand for qualified wind workers

Forecast of Wind Energy global employment (inc. indirect)

Source: GWEC 2010 Global Wind Energy Outlook
35,000 new Engineers/Academics needed in Wind Energy

Forecast of new direct employment in EU 2010-2030
(assuming renewal of current workforce, approx. numbers)

- Non-specific: 95,000
- Technicians: 150,000
- BSc: 120,000
- MSc/PhD: 350,000

Source: Power Cluster project
Stronger together

- Over 250 researchers dedicated to Wind Energy
- Over 100 PhD students in Wind Energy
- Over 200 publications per year in Wind Energy
- Over 110 MSc students every year in Wind Energy
Objective: educate top 2% Wind Energy MSc

- World’s best curriculum
- International environment
- Train advanced specialists, with four specialization tracks
- In partnership with the most relevant research institutions and industrial partners
Erasmus Mundus - supporting excellence

“The Erasmus Mundus is designed to foster cooperation between higher education institutions and academic staff in Europe and Third Countries with a view to creating poles of excellence and providing highly trained human resources.”
Erasmus Mundus Scholarships
BE OUR GUEST SCHOLAR!

<table>
<thead>
<tr>
<th>Students</th>
<th>Tuition</th>
<th>Living costs</th>
<th>Travelling costs</th>
<th>Health insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-EU</td>
<td>Full tuition</td>
<td>1000€/month</td>
<td>8000€</td>
<td>Full</td>
</tr>
<tr>
<td>EU</td>
<td>Full tuition</td>
<td>500€/month</td>
<td>3000€</td>
<td>Full</td>
</tr>
</tbody>
</table>

**Guest scholars: 1200€/week**

- From institutions outside EU to be guest scholars at EWEM
- EWEM universities scholars to go outside EU
Guest scholars

• Minimum scholarship per visit 2,400€ up to 14,000€

• Take part at any of the four partner universities

• Flexible participation: give a lecture, develop curriculum, web-lecture, supervision of MSc thesis, etc…

• Send Carlos an email c.j.simaoferreira@tudelft.nl
Four specializations:
Wind, Rotor, Electro, Offshore
Structure and mobility

- Wind Physics
- Rotor Design
- Electric Power Systems
- Offshore Engineering

4th semester
- DTU
- MSc thesis free mobility

3rd semester
- DTU
- TUDelft
- NTNU
- Innovation and Entrepreneurship
- Internship

2nd semester
- UniOl
- TUDelft
- NTNU
- TUDelft
- Summer School

1st semester
- DTU
- Introduction to Wind Energy Technology
- Technology, Economics, Management and Organisation
- www.windenergymaster.eu
Students receive a double-degree

<table>
<thead>
<tr>
<th>Wind Physics</th>
<th>Rotor Design</th>
<th>Electric Power Systems</th>
<th>Offshore Engineering</th>
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</thead>
<tbody>
<tr>
<td>MSc in Engineering Wind Energy (DTU)</td>
<td>MSc in Engineering Wind Energy (DTU)</td>
<td>MSc in Technology - Wind Energy (NTNU)</td>
<td>MSc in Technology - Wind Energy (NTNU)</td>
</tr>
<tr>
<td>Engineering Physics (Uni. Oldenburg)</td>
<td>MSc in Aerospace Engineering (TUDelft)</td>
<td>MSc in Electrical Engineering (TUDelft)</td>
<td>MSc in Offshore Engineering (TUDelft)</td>
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</tbody>
</table>

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### Associated partners

| Wind Energy Associations | European Wind Energy Technology Platform  
|                         | European Wind Energy Association  
|                         | European Energy Research Alliance  
|                         | European Academy of Wind Energy  
| Wind Turbine Manufacturers | Vestas Wind Systems • Siemens Wind Power  
|                         | General Electric Wind Energy • Suzlon • REPower  
|                         | Kenersy • XEMC Darwin • Mitsubishi Heavy Industries  
| Utilities and (Offshore) Wind Farm Developers | Statoil Hydro • Dong Energy • RWE Offshore Nederland  
|                         | Vattenfall • E.ON Benelux  
| Offshore Wind industry | BARD Engineering • Ballast Nedam Offshore  
| Wind Energy R&D centres | National Renewable Energy Laboratory • CENER  
| Consulting | Institut für Windenergie und Energiesystemtechnik  
|            | Energy Research Centre of the Netherlands  
|            | Sandia National Laboratories • SINTEF • GL Garrad Hassan  
|            | Centro Nacional de Energias Renovables • Heinkel Group  
| Universities | University of Victoria • Indiana University • Nankai University  
|               | South China University of Technology • Politecnico di Torino  
|               | Uni Magdeburg • Aalto University • Uni Hannover • TU Munchen  
|               | Universidad Carlos III de Madrid • University of Massachusetts  

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## Tuition

<table>
<thead>
<tr>
<th>EU/EFTA</th>
<th>Non-EU/EFTA</th>
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</thead>
<tbody>
<tr>
<td>1.800€ per year</td>
<td>13.500€ per year</td>
</tr>
</tbody>
</table>

- Estimated living costs: 1.000 € per month
Student applications

- 2012-2014
  - 180 applications; 100 students accepted; 35 students enrolled

- 2013-2015
  - 220 applications; 120 students accepted; 45 enrolled

- Objective 2017-2019: 120 student enrolled
Example: Björn’s curriculum
Rotor Design track – Aerodynamics profile

<table>
<thead>
<tr>
<th>Course name</th>
<th>ECTS</th>
<th>Semester</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Turbine Technology and Aerodynamics</td>
<td>10</td>
<td>1</td>
<td>DTU</td>
</tr>
<tr>
<td>TEMO-Technology, Economics, Management and Organisation</td>
<td>10</td>
<td>1</td>
<td>DTU</td>
</tr>
<tr>
<td>CFD</td>
<td>10</td>
<td>1</td>
<td>DTU</td>
</tr>
<tr>
<td>Planning and Development of Wind Farms</td>
<td>5</td>
<td>1</td>
<td>DTU</td>
</tr>
<tr>
<td>Research Methodologies</td>
<td>2</td>
<td>2</td>
<td>TUDelft</td>
</tr>
<tr>
<td>Design and Manufacturing of Wind Turbine Rotor Blades</td>
<td>3</td>
<td>2</td>
<td>TUDelft</td>
</tr>
<tr>
<td>Wind Turbine Aeroelasticity</td>
<td>6</td>
<td>2</td>
<td>TUDelft</td>
</tr>
<tr>
<td>Rotor Aerodynamics</td>
<td>3</td>
<td>2</td>
<td>TUDelft</td>
</tr>
<tr>
<td>Wind and Site Conditions</td>
<td>3</td>
<td>2</td>
<td>TUDelft</td>
</tr>
<tr>
<td>Experimental aerodynamics</td>
<td>3</td>
<td>2</td>
<td>TUDelft</td>
</tr>
<tr>
<td>Wind Turbine Design</td>
<td>5</td>
<td>2</td>
<td>TUDelft</td>
</tr>
<tr>
<td>Fluid structure interaction</td>
<td>3</td>
<td>2</td>
<td>TUDelft</td>
</tr>
<tr>
<td>Programming in C</td>
<td>3</td>
<td>2</td>
<td>TuDelft</td>
</tr>
</tbody>
</table>
Example: Björn’s mobility
Björn’s mobility – 1st semester courses
Björn’s mobility – 2nd semester courses
Björn’s mobility – MSc thesis
Björn’s mobility – MSc thesis
Future steps

- Fifth track: Asset management and operations in Wind Energy
- Reach target 120 new students per year
- Erasmus Mundus Joint PhD in Wind Energy
- Expand consortium to non-EU institution
- MOOC - massive open online course