OFFSHORE WIND ENERGY

University of Stavanger
2010-2011

UiS Pluss

Etter- og videreutdanning

Universitetet i Stavanger

OFFSHORE WIND ENERGY

Offshore wind energy is a 30sp course package for part-time students. It is special designed for professionals in the offshore industry to meet the demand for further education within wind energy. The course package will cover aspects concerning wind, energy, technology, operations and maintenance.

Prerequisite
Bachelor's degree in Mechanical or Civil Engineering.

Method of work
Active participation at lectures in class is recommended.
All information about the course (including information about time for lectures) will be posted on UiS's learning platform It`s learning.
Lectures and material will be given in English.
Mandatory work demands (such as hand in assignments, projects, etc.) must be approved by course coordinator ahead of examination date.

Timeframe lectures

Fall 2010	Wind loads on structures (5 sp) Wind energy systems (5 sp)	Professor Jasna Bogunović Jakobsen Professor Jonas Thor Snæbjørnsson Professor II Conrad Carstensen
Spring 2011	Marine technology and projecting (10 sp)	Professor Ove Tobias Gudmestad
Fall 2011	Marine operations (5 sp) Operations and maintenance management (5 sp)	Professor Ove Tobias Gudmestad Professor Tore Markeset

Tentative lecture plan for the two courses fall 2010 is two days a week from 14.00-17.00 starting week 34.

Assessment
Four hours written exam
Compulsory exercise work

Price
Price for course package 30sp is 105 000,-
Please contact Hallvor Lyngstad or Marit K. Brandal (see below) regarding price if you plan to send several students or if you are interested in one single course.

Registration
To register please send an e-mail to pluss@uis.no or hallvor.lyngstad@uis.no

Contact

Ole Andreas Songe-Møller,	Principal coord.	51832159	ole.songe-moller@uis.no
Hallvor Lyngstad	Adm. coord.	51833728	hallvor.lyngstad@uis.no
Marit K. Brandal	Director UiS Pluss	95858583	marit.k.brandal@uis.no

Wind loads on structures (5 sp)

Professor Jasna Bogunović Jakobsen
Professor Jonas Thor Snæbjørnsson
Department of Mechanical and Structural Engineering and Materials Science

This course will introduce modelling of static and dynamic wind loads on various types of structures. In particular, wind forces on slender structures and the associated wind-structure interaction will be discussed.

- Wind climate and atmospheric boundary layer. Wind profile. Extreme wind speed. Velocity pressure. Turbulence characteristics. Peak velocity pressure.
- Wind loads on low-rise buildings. Pressure coefficients.
- Wind forces on slender structures. Static loads. Force coefficients. Dynamic loads due to turbulence, vortex shedding and wake effects. Aeroelasticity.
- Wind forces and wind effects on wind turbines.
- Measures for wind-induced vibration mitigation.
- Monitoring of wind speed and structural response.
- Wind tunnel testing.

Wind energy systems (5 sp)

Professor II Conrad Carstensen
Department of Mechanical and Structural Engineering and Materials Science

The lecture on wind turbines covers: Design characteristics, operational performance, and maintenance of wind turbines. Focus is put on big turbines with offshore potential.

- Introduction to wind turbines
  Wind turbine fundamentals, Aerodynamics of Horizontal-axis Wind Turbines, Wind-turbine Performance, The Performance Curves, Estimation of Energy Capture, Wind Turbine Power Control, Turbine classification, Turbine safety systems

- Technical solutions
  Tower, Foundations, Rotor, Blades, The nacelle, Drive train, Drive train configuration, The main drive train, Gearbox, Coupling, Mechanical brake, Control, control mechanisms, Generator, Transformers, Inspection and maintenance, Vibration challenges, resonance (Eigen frequencies),Repairs, material handling

- Offshore wind farms
  Access, Design philosophy, Selection of wind turbine / Due diligence, Integration Farm management and Grid Codes, Beatrice

Marine technology and projecting (10 sp)

Professor Ove Tobias Gudmestad
Department of Mechanical and Structural Engineering and Materials Science

For those who want a thorough introduction to themes in marine technology and want to use this competence for projecting marine structures (as for example oil and gas platforms or offshore wind mills), this course is important for their future career.

- Introduction to and understanding of hydrodynamics.
- Linear wave theory and calculation of wave forces on marine structures, wind towers and pipelines. Both static and dynamic evaluations are carried out and extreme values are being calculated.
- Furthermore an introduction to wind and wind loads is given.
- Principles for the dimensioning of structures are being discussed.
- Stability of floating structures is discussed.
- Introduction to the design of offshore pipelines is given.
- Realistic design of fixed space frame offshore structures is being discussed in details.
- Examples and exercises relevant for design of support structures for offshore wind mills will be discussed.

Marine operations (5 sp)

Professor Ove Tobias Gudmestad
Department of Mechanical and Structural Engineering and Materials Science

- Dynamics of structures exposed to wave loads and modelling of waves as stochastic processes will here be considered.
- An introduction to vessel types and vessel response as well as mooring and dynamic positioning of vessels will be given.
- Different types of marine operations (like wind tower installation aspects) will be discussed.
- Themes as weather windows and marine operations, towing, crane operations and underwater installation works are part of the course.
- Furthermore, risk assessments associated with marine operations will be part of the course.
- A project report shall be prepared with a theme in Marine technology or Marine operations associated with offshore wind tower design or offshore wind tower marine installation work.
- Examples and exercises relevant for marine operations related to installation of support structures for offshore wind mills will be discussed.

Operations and maintenance management (5 sp)

Professor Tore Markeset
Department of Mechanical and Structural Engineering and Materials Science

The course will describe important factors and methods used to optimize activities in development, operations, and maintenance with respect to costs, profits, and acceptable risk level for health, safety and environment (HSE), as well as investments. The context will be on offshore technology (as for example oil and gas platforms or offshore wind farms). A project report shall be prepared with a theme in Operations and maintenance management.

The course will be taught in three modules with the following content:

Module 1: Fundamental theory in operations and maintenance

- Maintenance as a business function and added value process.
- Trends in maintenance management
- Standard definitions and terminology
- Types of maintenance, choice of maintenance strategy and methods
- NORSOK standards, legislative requirements and governmental regulations
- Establishment of goals, requirements, and risk acceptance criteria with respect to HSE

Module 2: Principal concepts, tools and techniques

- Engineering analysis, Coding and function hierarchy of equipment, Failure mode effects and criticality analysis, Fault tree analysis, Event tree analysis, etc.
- Design out/ design for maintenance considering reliability, availability, maintainability, supportability
- Life cycle cost analysis
- Spare parts inventory and logistics
- Data and information management, CMMS

Module 3: Maintenance management and development of maintenance programs

- Reliability centered maintenance (RCM)
- Risk based maintenance (RBM) and Risk based inspections (RBI)
- Maintenance objectives and strategies
- Maintenance management and associated work processes

$(Wind)^2$

Please contact:

pluss@uis.no

51 83 37 28

95 85 85 83

www.uis.no/pluss