Wind Power Technology and Systems hp 10

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1. Wind power

2. Wind Power; Course Packets
The wind energy industry is expanding. Globally, generation more than quadrupled between 2000 and 2006 and still increasing. In the United States, a single megawatt is enough electricity to power about 250 homes.

Some prediction states that if this pace of growth continues, by 2050 upto one fourth of the world’s electricity needs will be found blowing in the wind. More than 8 million jobs have been created. 5.4 GW in Sweden; 370 GW in the world. Sweden has large surface area to population with good wind resources.

The technology is getting more mature and reliable. Strong competition between turbine manufacturers. Manufacturers are getting more specialized.
Solid mechanics; 1TE654
Empirical Modelling; 1RT890
Electric Circuit Systems; 1TE213
Power Electronics; 1TE046
Generator Design; 1TE065
Environmental Impact Assessment; MX0112
Geographical Information Systems; TE0005
Wind Power Technology and Systems; 1TE038

Uses the following concepts from other disciplines

- Physics (Fluids, Solid mechanics, Kinematics, Magnetism)
- Mathematics (Computational, Statistics, Calculus)
- Technology of power systems, mechanics, civil engineering
- Economy
- Environment

Laboratory, projects, study visits
Wind Power Technology and Systems; 1TE038

Outline from course reference

- Introduction: Modern Wind Energy and its Origins
- Wind Characteristics and Resources
- Aerodynamics of Wind Turbines
- Mechanics and Dynamic
- Electrical Aspects of Wind Turbines
- Wind Turbine Materials and Components
- Wind Turbine Design and Testing
- Wind Turbine Control
- Wind Turbine Siting, System Design, and Integration
- Wind Energy Applications
- Wind Energy System Economics
- Wind Energy Systems: Environmental Aspects and Impact
Solid mechanics; 1TE654

Outline from course reference

- Rods in tension and compression: simple trusses. Turbine towers..
- Torsion of circular shafts. Rotor shaft..
- Bending of beams: stresses and deformations. Turbine blades..
- Stress and strain analysis. All components..
- Fatigue. Blades, tower, gearbox..
Empirical Modelling; 1RT890

Outline from course reference

- Linear regression, the least squares method
- Probability density, cumulative distribution
- Weibull, Rayleigh, Normal distributions

Global Mean Wind Speed at 80m
Electric Circuit Systems; 1TE213

Outline from course reference

- Reactive, Active Power, Harmonics
- Network losses, Short circuit
- Grid integration codes
Outline from course reference

- Power semiconductor devices.
- AC-DC conversion, Capacitors
- Grid integration codes
Generator Design; 1TE065

Outline from course reference

- Induction and Synchronous generators of wind turbines
- SCIG, PMSG, DIFG, WRIG
- Economy of these generators
Environmental Impact Assessment; MX0112

Outline from course reference

- Sounds, Shadows, Visual impacts
- Stakeholders, permissions
Geographical Information Systems; TE0005

Outline from course reference

- Geo-statistical calculation methods (spatial analysis)
- Management of geodatabases
- Interpretation of satellite image materials
References

- Manwell James F., McGovan Jon G., Rogers Anthony L.d
  1948- Wind energy explained : theory, design and application
  2. ed.: Chichester: Wiley, 2009