# DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGY
# COURSE SYLLABUS

| Course Details | | | | |
|---|---|---|---|---|
| **Code** | **Academic Year** | | | **Semester** |
| EBT304 | 3 | | | 6 |
| **Title** | **T** | **A** | **L** | **ECTS** |
| Wind Energy | 2 | 1 | 1 | 6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Language** | German | | | | | |
| **Level** | **Undergraduate** | **X** | **Graduate** | | **Postgraduate** | |
| **Department / Program** | Energy Science and Technology | | | | | |
| **Forms of Teaching and Learning** | Face-to-face | | | | | |
| **Course Type** | **Compulsory** | **X** | **Elective** | | | |
| **Objectives** | The students are taught how the wind occurs, its formation processes, and its effects. Information about the design, structure, production, and operation of wind turbines is given. It is aimed at teaching the power generation calculations of wind turbines, wind speed statistics, and the calculation of the loads on the turbine. The course aims to provide students with a basic understanding of wind energy economics, cost calculations, environmental impacts, and deployment examples by applying wind energy economics, cost calculations, environmental impact assessment, and deployment examples. | | | | | |
| **Content** | This wind energy course includes topics such as wind formation and sources, wind characteristics and wind potential, wind power calculation methods and statistics, turbine installation, structure, and aerodynamics, turbine structure and operational systems, turbine deployment, wind energy economics, and turbine environmental impact assessment. | | | | | |
| **Prerequisites** | None | | | | | |
| **Coordinator** | Dr. Aslı İşler Kaya | | | | | |
| **Lecturer(s)** | Dr. Aslı İşler Kaya | | | | | |
| **Assistant(s)** | Research Assistant Elvan Burcu Koşma | | | | | |
| **Work Placement** | None | | | | | |

| Recommended or Required Reading | |
|---|---|
| **Books / Lecture Notes** | • Burton, T., Jenkins, N., Sharpe, D., Bossanyi, E., 2011. Wind Energy Handbook, John Wiley & Sons. ISBN: 9780470699751.<br>• Jarass, L., Obermair, G.M., Voigt, W., 2009.Windenergie: Zuverlässige Integration in die Energieversorgung. Springer Science & Business Media. ISBN-10:3540852522.<br>• Tong, W., 2010. Wind Power Generation and Wind Turbine Design. WIT Press. ISBN:978-1-84564-205-1. |
| **Other Sources** | • Mathew, S., 2006. Wind energy: Fundamentals, Resource Analysis and Economics. Springer. ISBN-10: 3-540-30905-5.<br>• Hau, E., 2013. Wind Turbines: Fundamentals, Technologies, Application, Economics. Springer. ISBN-10:3-540-24240-6. |

# DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGY
# COURSE SYLLABUS

| | |
|---|---|
| | • Hooft, E. L., Schaak, P., Engelen T.G., 2003. Wind Turbine Control Algorithms, DOWEC-F1W1-EH-03-094/0; ECN-C-03-111. |
| **Additional Course Material** | |
| **Documents** | |
| **Assignments** | 1 Project |
| **Exams** | 1 Midterm + 1 Final |

| **Course Composition** | | |
|---|---|---|
| **Mathematics and Basic Sciences** | 20 | % |
| **Engineering** | 40 | % |
| **Engineering Design** | 40 | % |
| **Social Sciences** | | % |
| **Educational Sciences** | | % |
| **Natural Sciences** | | % |
| **Health Sciences** | | % |
| **Expert Knowledge** | | % |

| **Assessment** | | |
|---|---|---|
| **Activity** | **Count** | **Percentage (%)** |
| **Midterm Exam** | 1 | 30 |
| **Quiz** | | |
| **Assignments** | | |
| **Attendance** | | |
| **Recitations** | | |
| **Projects** | 1 | 25 |
| **Final Exam** | 1 | 45 |
| | **Total** | **100** |

| **ECTS Points and Work Load** | | | |
|---|---|---|---|
| **Activity** | **Count** | **Duration** | **Work Load (Hours)** |
| **Lectures** | 14 | 2 | 28 |
| **Self-Study** | 14 | 4 | 56 |
| **Assignments** | 0 | 0 | 0 |
| **Presentation / Seminar Preparation** | 1 | 25 | 25 |
| **Midterm Exam** | 1 | 3 | 3 |
| **Recitations** | 14 | 1 | 14 |
| **Laboratory** | 14 | 1 | 14 |
| **Projects** | 1 | 25 | 25 |
| **Final Exam** | 1 | 3 | 3 |

# DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGY
# COURSE SYLLABUS

| | |
|---|---|
| **Total Work Load** | **168** |
| **ECTS Points** (Total Work Load / Hour) | **6** |

| **Learning Outcomes** | |
|---|---|
| **1** | The ability to explain the technology and theories used in wind energy systems, create mathematical models, and calculate wind energy will be gained to have basic knowledge about wind energy systems. |
| **2** | The ability to express the historical development of modern wind turbines will be gained. |
| **3** | Knowledge of wind energy terminology and turbine components will be provided. |
| **4** | Information about wind measurement methods and calculations will be provided. |
| **5** | Information will be provided about the dynamics that convert wind energy into mechanical energy. |
| **6** | The ability to interpret blade efficiency and flow characteristics over the blades will be provided. |
| **7** | Application skills will be gained in project planning, management, licensing, economics, and environmental impacts of wind turbines. |
| **Weekly Content** | |
| **1** | Presentation of course content. General introduction to wind energy |
| **2** | Definition of wind energy in terms of fluid mechanics, wind formation, wind types, and characteristics |
| **3** | Analysis of wind regimes, measurement methods, and evaluation |
| **4** | The basic concept of wind energy conversion, some theories, wind turbine types, and characteristics |
| **5** | Wind energy conversion systems and turbine components |
| **6** | Calculation of wind turbine energy production, interpretation of performance curves |
| **7** | Aerodynamics of wind turbines |
| **8** | Aerodynamics of wind turbines, Midterm |
| **9** | Project planning and management of wind power plants |
| **10** | Wind turbine installation and operation, wind power plant permit processes and licensing |
| **11** | WPP economy, comparison with other energy costs |
| **12** | WPP operation and maintenance problems |
| **13** | WPP environmental impacts |
| **14** | Project presentation |
| **15** | Final exam |

**Contribution of Learning Outcomes to Program Objectives (1-5)**

| | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 |
|---|---|---|---|---|---|---|---|---|---|
| **1** | 4 | 4 | 5 | 3 | 5 | 5 | 4 | 3 | 4 |
| **2** | 5 | 5 | 5 | 3 | 5 | 4 | 4 | 3 | 5 |
| **3** | 5 | 5 | 4 | 3 | 4 | 4 | 5 | 3 | 4 |
| **4** | 4 | 5 | 5 | 3 | 5 | 4 | 4 | 4 | 4 |
| **5** | 5 | 4 | 5 | 4 | 4 | 4 | 5 | 4 | 4 |

# DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGY
# COURSE SYLLABUS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **6** | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 4 |
| **7** | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 5 |
| Contribution Level 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High | | | | | | | | | |
| | | | | | | | | | |
| **Compiled by:** | Dr. Aslı İşler Kaya | | | | | | | | |
| **Date of Compilation:** | 04.04.2024 | | | | | | | | |