

## **COURSE Syllabus**

**Course Name: Wind energy systems**

**Course Number: 408431+4084161**

### General Information and Course Details:

Course title	Wind energy systems
Course number	408431+4084161
Credit hours (theory, practical)	2h (theory)
Contact hours (theory, practical)	2h in two times weekly
Prerequisites/corequisites	Dynamics & Vibrations 04083131 + Thermodynamics 04083241
Program title	Renewable Energy Engineering
Program code	REE
Awarding institution	Isra University
Faculty	Faculty of Engineering
Department	Renewable Energy Engineering Department
Level of course	fourth year
Year of study and semester (s)	2022/2023 1st Semester
Final Qualification	B.Sc.
Other department (s) involved in teaching the course	None
Language of Instruction	English & Arabic
Date of production/revision	2022

### Course Coordinator:

Office No.: 4309

Office Hours: Sun: 10:00 – 11:00

Email: [mohanad.alghriybah@iu.edu.iq](mailto:mohanad.alghriybah@iu.edu.iq)

### Other Instructors:

Office No.:

Email:

**Office Hours:**

**Course Description:**

Introduction to power production from wind resources. Historical uses of wind resources.  
The Earth's wind systems. Physics of wind power. Vertical and horizontal axis turbines.  
Aerodynamics of wind turbines. Large-scale turbine farms and siting.  
Commercial development, economics and environmental impacts.

**Text Book:** *Author(s), Title, Publisher, Edition, Year, Book website.*

**Hermann-Josef Wagner · Jyotirmay Mathur, Introduction to Wind Energy Systems, Springer-Verlag Berlin Heidelberg 2009**

**References:** *Author(s), Title, Publisher, Edition, Year, Book website.*

Required book (s), assigned reading and audio-visuals:

1. Wind Power in Power Systems, 2nd Edition, by Thomas Ackermann (Editor), 2012.
2. Wind Energy Handbook, 2nd Edition, by Tony Burton, Nick Jenkins, David Sharpe, Ervin Bossanyi, 2011.

### Course Educational Objectives (CEO):

1.	Explain how wind occurs.
2.	Describe how wind energy is generated.
3.	Identify the conditions required for efficient wind energy.
4.	Identify and describe the component of the wind system and the advantages and disadvantages of wind energy as an energy resource.
5.	Describe the extent of wind energy's impact on the environment.
6.	Determine the potential of wind energy as a worldwide energy resource.

### Intended Learning Outcomes (ILO's):

After successful completion of this course, you should be able to: Intending Learning Outcomes (ILO's)		Relationship to CEO	Contribution in Program PLOs
<b>A</b>	<b>Knowledge and Understanding</b>		
<b>A1</b>	Identify the fundamentals of wind energy formation	1+2	1+2
<b>A2</b>	Describe the factors that affect the generation and movement of wind.	2+3	1+2
<b>A3</b>	Describe the component of the wind energy converter for the various wind power machines	4+5+6	1+2
<b>B</b>	<b>Intellectual skills</b>		
<b>B1</b>	Analyze wind power, wind energy, and the design of the turbines.	4+5+6	1+2
<b>B2</b>	Analyze and design considerations of a wind machine.	4+5+6	1+2

<b>C</b>	<b>Subject specific skills</b>		
<b>C1</b>	Improve the efficiency of the recent available wind turbines in terms of the design parameters	4+5+6	1+2

**Topic Outline and Schedule:**

<b>Topic</b>	<b>Weeks</b>	<b>Achieved ILOs</b>
Fundamentals of wind energy.	2 weeks	<b>A1+A2+A3</b>
factors affect the wind generation	2 week	<b>A1+A2+A3</b>
Energy Content in Wind.	2 weeks	<b>A1+A2+A3</b>
Energy Conversion at the Blade and Wind Variations	2 weeks	<b>A1+A2+A3+B1</b>
Components of a Wind Energy Converter	2 weeks	<b>A2+A3+B1+B2</b>
Design Considerations of a wind machine	3 weeks	<b>B1+B2+C1</b>
Horizontal and Vertical Axis Turbine design and modifications	2 weeks	<b>A2+B1+B2+C1</b>
<b>Final exam</b>	<b>16<sup>th</sup></b>	

**Teaching Methods and Assignments:**

Development of ILOs is promoted through the following teaching and learning methods:

Lectures	
Lab hands on	
Lab hands on & on line	
<b>DELIVERY</b> <i>Face-to-face, Distance learning, etc.</i>	Distance learning
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b> <i>Use of ICT in teaching, laboratory education, communication with students</i>	<b>Use of ICT teaching for notes, references communication with students.</b>
<b>TEACHING METHODS</b>  <i>The manner and methods of teaching are described in detail.</i>  <i>Lectures, seminars, Quizzes, laboratory practice, fieldwork, YouTube videos, study and analysis of bibliography, tutorials, art workshop, interactive teaching, educational visits, project, essay writing, etc.</i>	<ul style="list-style-type: none"> <li>Online exams (Mid + Final)</li> </ul>
	<ul style="list-style-type: none"> <li>Quizzes</li> </ul>
	<ul style="list-style-type: none"> <li>Videos</li> </ul>
	<ul style="list-style-type: none"> <li>Homework including analysis of Of some engineering problems</li> </ul>
	<ul style="list-style-type: none"> <li>Projects</li> </ul>

### Evaluation Methods and Course Requirements:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

#### Attendance

Students should attend every class meeting for the entire course period. If you miss class, it is your responsibility to obtain announcements and assignments.

How to success – *Active sharing and cooperation, on time, prepared.*

#### Grading Policy:

1. Midterm	35%
2. Assignments and technical reports	15%
3. Final Examination	50%

#### Academic Assistance

- Homework is due to the beginning of class on the due date.
- At least one project during the term.

- Any potential conflicts have to be discussed before the exam dates.
- Quizzes in-class will be given and there will be no make-up quizzes.
- Final Exam (50%).
- Copying of assignments or other means of duplicating materials that is turned for grading is **forbidden**.
- Cheating on exams will result in a zero grade for the exam or the whole course.

At any point in the semester, if you encounter difficulty with the course or feel you could be performing at a higher level, consult with me.

**Academic support for Students with Disabilities – Students who may need assistance due to a disability are encouraged to ask for a support.**

### Course Policies:

- A- Attendance policies:  
15% of 48 lecturing hours
- B- Absences from exams and handing in assignments on time:  
Exam can retake based on approval of excuse from dean  
Not handing assignment on time will result in zero mark
- C- Health and safety procedures: NA
- D- Honesty policy regarding cheating, plagiarism, misbehavior:  
Cheating, plagiarism, misbehavior may result in zero grade
- E- Grading policy:
  - All homeworks are posted on line
  - All quizzes and exams are provided with solution for perfect score
- F- Available university services that support achievement in the course: Labs, Software, Simulation programs

### Required equipment:

**Labs: None**

**Software:**

**Hardware: Later on.**

### Assessment Plan for the Course Learning Outcome (just select):

- Midterm Online Exam.
- Final Online Exam.
- Quizzes.
- Written Reports.
- Homework.
- Term Projects.
- Case Study.

- Participation in Lecture.
- Illustrative Presentations.
- Oral Exams.
- Others (identify): Active attendance and on-time.

### Program Learning Outcomes (PLOs)

1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

### Responsible Persons and their Signatures:

Course Coordinator	Dr. Mohanad Al-Ghriybah	Completed Date	/ / 2022
		Signature	
Received by (Department Head)		Received Date	/ /
		Signature	