Zarqa University
Faculty of Engineering Technology
Mechanical Engineering Department

Course Information	0906451 Renewable Energy II (Wind Energy)		
	3 Credits	Compulsory	Winter 2016
	Prerequisites by Course: 0905341 Fluid Mechanics I		
	Co-requisites by Course: -		
	Prerequisites for: 0906451 Wind Energy Lab.		
	Schedule: Lecture, 8:00-9:00, S T Th, L146		
Instructor	Eng. Hussein Al-Sallami		
Contact Information	hsallami@zu.edu.jo, Office T8		
Office hours	9:00-10:00 S T Th 8:00- 9:30 M W or by appointment		
Textbook	J. F. Manwell, J. G. McGowan, and A. L. Rogers, Wind Energy Explained –Theory, Design, and Applications, John Wiley & Sons, 2010, ISBN: 978-0-470-01500-1.		
References and Resources	1. Sathyajith Mathew, Wind Energy Fundamentals, Resource Analysis and Economics, Springer, 2006, ISBN 3540309055 2. T. Burton, N. Jenkins, D. Sharpe and Ervin Bossanyi, Wind Energy Handbook, second edition, John Wiley & Sons, Ltd, 2011, ISBN: 978-0-470-69975-1		
Evaluation Criteria	**Activity**	**Percent (%)**	
	Quizzes and Homework	10	
	First Exam	20	
	Second Exam	20	
	Final Exam	50	
Course Description	An overview of energy sustainability and wind energy history. Characteristics of wind resources. Fundamentals of physical wind, basic meteorology of wind, extraction of energy from wind. Basic introduction to wind energy and energy conversion systems. Various types of wind energy, conversation systems and aerodynamics; blade and tower structural loads, kinematics of blades and meteorology. Wind plant development, and environment and ecological impact of wind energy plants.		
Intended Learning Outcomes	**Course Outcome**		**[%]**
	1. To develop the environmental, societal, economical and historical perspectives regarding the demand for electrical power generation from the renewable wind.		10%
	2. To recognise characteristics of wind resources, calculate the available wind energy, measurement and analysis of wind spectra for energy use, and present the basic principles of wind energy conversion.		40%
	3. To identify the wind rotor aerodynamics and its application in the turbine design and		40%

	mathematically model the wind turbine components, predict mechanical loads based on design, and discuss the generation of electrical power. 4. To evaluate the environmental, political, societal and economic issues associated with wind energy 1.	10%
Relationships to Program Outcomes	1. a give some basic definitions (power curve, overall efficiency, Betz limit, stall and pitch regulation, etc.), understand basic concepts, such as power in the wind, vertical distribution of wind speeds, power production and efficiency of a wind turbine, energy yield of a wind turbine from a site, 2. calculate energy yield of a wind turbine using actual wind speed measurements or approximate data, and describe the main wind turbine design concepts, 3. understand basic concepts from grid integration of wind turbines (voltage at the connection point, active, reactive power, strength of the grid, power quality of a wind turbine), 4. describe effects that wind power has on environment, economical and societal.	
Contribution to the Professional Components	Mathematics and Basic Sciences	20%
	Engineering Topics — Engineering Sciences	40%
	Engineering Topics — Engineering Design	40%
	General Education	-
Course Outline	Subject	Hours
	Introduction: Historical and Recent Developments and Future Prospect	2
	Wind Energy Conversion ▪ Wind Spectra and meteorology ▪ Classification of Wind Turbines ▪ Aerodynamic of Wind Turbines ▪ Wind Rotor Characteristics, Design and Performance	12
	Exam I (up to end of week 6, 13-24/11/2016**)**	
	Wind Regime ▪ Aerodynamics ▪ Measurement of Wind ▪ Analysis of Wind Data ▪ Energy Estimation	8
	Wind Energy Conversion Systems ▪ Wind Electric Generator ▪ Wind Pumps	6
	Exam II (up to end of week 11, 18- 29/12/2016**)**	
	Wind Energy Conversion Systems Integration and Performance ▪ Installation and Operation Issues ▪ Wind Farms, Offshore Wind Farms ▪ Integration in Electric Grids ▪ Wind Turbine Performance	8

	Wend Energy and Environments ▪ Environmental Benefits ▪ Environmental and Ecological Impacts	6
	Final Examination (21/1-2/2 /2016**)**	
Policies:	**Attendance** Attendance will be checked each class. *Students are expected to attend each lecture*. University regulations will be strictly followed for students exceeding the maximum number of absences. **Homework** - Homework assignment are due at the beginning of class the day they are due. - No late homework will be accepted unless prior arrangement has been made with the instructor - *No make-up allowed on homework.* - You can consult each other regarding homework solution s however each assignment must be your own solution. Verbatim or duplicates assignments will be *regarded as cheating*. **Class participation and behavior** - Classroom participation is a part of learning; it is only by asking questions and talking through ideas that you can come to fully understand the material - Please do not engage in behavior which detracts from the ability of other students to learn. Such behaviors include arriving at class late, speaking or whispering while the instructor and students are discussing ideas or asking questions, reading messages newspapers in class, cell-phones ringing, etc.	