

Identification	Department	Chemical Engineering	
	Program	Undergraduate	
	Subject	CHE 490 Renewable Energy – 3KU credits (6ECTS credits)	
	Term	Spring, 2015	
	Instructors	Dr.Hassan Niknafs hniknafs@khazar.org Associate Professor Leyla Muradkhanli, leyla@khazar.org Associate Professor Nuru Safarov nsafarov@khazar.org Associate Professor Gasham Zeynalov gzeynalov@khazar.org	
	Classroom/hours	11 Mehseti, Room # 403	
Prerequisites	None		
Language	English		
Compulsory/Elective	Compulsory		
Text books and course materials	Main Textbook : Godfrey Boyle, Renewable Energy : Power for a Sustainable Future, 3 rd edition, Oxford University press, 2012		
Teaching methods			
	Case analysis		x
	Group discussion		x
	Lab		x
	Lecture		x
	Course Paper		x
	Presentation		x
	Problem Solving		x
Evaluation Criteria	Methods	Date/deadlines	Percentage (%)
	Midterm Exam		30
	Case studies		10
	Class Participation		
	Quizzes		
	Project		
	Paper Presentation		10
	Laboratory Work		10
	Final Exam		40
	Total points		100
Course objectives	Course objective is to introduce students with a wide range of renewable energy technologies, help develop skills useful to the commercial and economic evaluation of renewable energy resources, and examine public policy issues affecting the development of these resources.		
Course outline	The course includes energy conversion, utilization and storage for renewable technologies such as solar, wind, biomass, hydro, tidal, wave, geothermal and hybrid systems. The course also covers the environmental consequences of energy conversion and how renewable energy can reduce air pollution and global climate change.		
Tentative Schedule			
Week	Date/Day	Topics	Textbook/Assignments
1		Introduction Force, Energy & Power Energy conservation: The First Law of Thermodynamics Forms of Energy Conversion and efficiency World energy supplies Fossil fuels and climate change	Chapter 1

2		Introduction to Renewable Energy Renewable energy sources Renewable energy in a sustainable future	Chapter 1
3		Solar Thermal Energy Introduction The rooftop solar water heater The nature and availability of solar radiation The Magic of glass Low-temperature solar energy applications Active solar heating Passive solar heating Daylighting Solar thermal engines and electricity generation Economics, potential and environmental impact	Chapter 2
4, 5		Solar Photovoltaics Introducing photovoltaics PV in silicon: basic principles Crystalline PV: reducing costs and raising efficiency Thin Film PV Other innovative PV technologies Electrical characteristics of silicon PV cells and modules PV systems for remote power Grid-connected PV systems Costs of energy from PV Environmental impact and safety PV integration, resources and future prospects	Chapter 3
6		Bioenergy Bioenergy past and present Biomass as a solar energy store Biomass as a fuel Primary biomass energy sources: plant materials Secondary biomass sources: wastes, residues and co-products Physical processing of biomass	Chapter 4

		<p>Thermochemical processing</p> <p>Biochemical processing</p> <p>Environmental benefits and impacts</p> <p>Economics</p> <p>Future prospects for bioenergy</p>	
7		<p>Hydroelectricity</p> <p>Small-scale hydro</p> <p>Stored energy and available power</p> <p>A brief history of water power</p> <p>Types of hydroelectric plant</p> <p>Types of turbine</p> <p>Hydro as an element in a system</p> <p>Environmental considerations</p> <p>Economics</p> <p>Future Prospects</p>	Chapter 5
8		<p>Midterm Exam</p>	
9		<p>Tidal Power</p> <p>Power generation from barrages</p> <p>Environmental considerations for tidal barrages</p> <p>Integration of electrical power from tidal barrages</p> <p>The economics of tidal barrages</p> <p>Tidal barrages: potential projects</p>	Chapter 6
10, 11		<p>Wind Energy</p> <p>History of Wind Energy</p> <p>Modern Wind Turbines</p> <p>Wind Characteristics and Resources</p> <p>Aerodynamics of Wind Turbines</p> <p>Mechanics and Dynamics</p> <p>Electrical Aspects of Wind Turbines</p> <p>Wind Turbine Materials and Components</p> <p>Wind Turbine Design and Testing</p> <p>Wind Turbine Control</p> <p>Wind Turbine Siting, System Design, and Integration</p> <p>Wind Energy Applications</p> <p>Wind Energy System Economics</p>	Chapter 7

		Wind Energy Systems: Environmental Aspects and Impacts	
12		Wave Energy Wave Power: overview History Wave Energy Technologies Constraints and advantages Assumptions Wave power: potential	Chapter 8
13		Geothermal Energy Worldwide Electricity generation Types of geothermal resources Geothermal Energy Technologies Heat pumps	Chapter 9
14		The Future of Renewable Energy	Chapter 10
15		Paper Presentation	
		Final Exam	