Identification	Subject	CHE 490 Renewable Energy, 6 ECTS	
	Department	Mechanical Engineering	
	Program	Undergraduate	
	Ferm Fall, 2023		
	Instructor	Dr. Mehdi Kiyasatfar	
	E-mail:	mkiyasatfar@khazar.org	
	Phone:		
	Classroom/hours	Friday 15:20 - 16:50 & 17:00 - 18:30	
	Office hours		
Prerequisites			
Language	English		
Compulsory/Elective	Compulsory		
Required textbooks	1- Photovoltaic Systems 2nd Edition .2009, by James P. Dunlop, ISBN-13: 978-		
and course materials	0826013081_ISBN_10: 0826013083		
	2- Wind Energy:	An Introduction by Mohamed A El-Sharkawi CRC Press	
	2- White Energy.	1 En energy Systematic Analysis and Design by John D. Hervell	
	5- Solar-Therma	i Energy Systems: Analysis and Design by John R. Howell.	
Course website			
Course outline	The pressing issues of carbon emissions and climate change, both on a national and		
	global scale, have in	tensified the sense of urgency surrounding our energy systems.	
	Finding solutions to these challenges is far from straightforward. This course delves		
	into the exploration of a wide spectrum of energy sources encompassing both		
	traditional and renewable options, while examining their profound impacts on our		
	utautional and renewable options, while examining their protound impacts on our		
	environment and society. Furthermore, it delves into the intricate ethical dilemmas that		
	arise in the context of global, national, and local shifts in energy production and		
	consumption patterns.		
	The course's primary aim is to empower students to become informed and engaged		
	consumers of energy, encouraging them to think critically rather than passively about		
	their energy choices. Through this course, students acquire the knowledge necessary to		
	communicate effectively in their careers, communities, and personal lives about		
	renewable energy resources Additionally they develop the ability to assess and adapt		
	to ongoing and future technological advancements that influence their energy usage		
	whether in the workn	lace at home or within their communities	
	This second service as	ace, at nome, or within their communities.	
	I his course serves as an introductory exploration of renewable energy technologies and		
	their potential impact. It seeks to acquaint a general audience interested in engineering		
	and science with the fundamental concepts of renewable energy. Each lecture is		
	enriched with real-wo	orld examples and insights into ongoing industrial developments,	
	providing students wi	th a comprehensive understanding of the subject matter.	
Course objectives	Understanding	g basic characteristics of renewable sources of energy and	
	technologies f	for their utilization	
	• To give review	w on utilization trends of renewable sources of energy	
	• To give revie	aw on legislative and regulatory rules related to utilization of	
		areas of apergy	
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Learning outcomes	• Define basic	properties of different renewable sources of energy and	
	technologies	for their utilization,	
	• to understand	the role of solar energy in the context of regional and global	
	energy system	ns, its economic, social, and environmental connotations, and the	
	impact of tech	nnology on a local and global context.	
	• to understand	the physical principles of the photovoltaic (PV) solar cell and	
	what are its so	ources of losses.	

	 to know the most important characteristics of the elements within a PV system and how they work: battery and charge controller, DC/DC converter, DC/AC converter (inverter) and loads. to list the relevant organizations, major projects at the international level, the main sources of information and regulations related to solar photovoltaic technology. to carry out a basic engineering project related to energy supply using solar photovoltaic technology. to know the main lines of research in the field of photovoltaic technology and solar energy to bring innovative ideas in the field of solar photovoltaic energy. Understand the equations used to convert the air kinetic energy into mechanical energy, Able to know the different types of wind turbines, Understand the main components of wind energy system and its functions, Understand the first attempts of electrical power generation from wind, Able to deal with residential, commercial, and industrial applications, 		
Teaching methods	Lecture		x
reaching methous	Group discussion		X
	Case analysis		X
Evaluation	Methods Date/deadlines		Percentage (%)
	Midterm Exam		25
	Participation At each lesson		5
	Seminar	weekly	10
	Project	During the semester	20
	Final Exam	6	40
	Total		100
Daltar	- Ethiog		100
	 Copy of other students' work is highly discouraged. All assignments must be handled by the student himself. This is a university policy and violators will be reprimanded accordingly. Preparation for class The structure of this course demands your individual effort outside the classroom for extra practice of many problems within the textbook. After each session, every student needs to put sufficient time to practice and finish the assignments by the predetermined date 		
	 Preparation for class The structure of this course de for extra practice of many prob student needs to put sufficient predetermined date 	f. This is a university po emands your individual eff plems within the textbook. time to practice and finis	licy and violators will be Fort outside the classroom After each session, every sh the assignments by the

• Professional behavior guidelines The students shall behave in a way to create a favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly discouraged.
• Attendance Students who attend the whole classes will get 5 marks. for three absence student loses 1 mark.
• Project There will be a design project after finishing each topic. You will be asked to present a final presentation and submit a project report.
• Seminar There will be weekly seminar discussion of research papers led by students.

Tentative Schedule			
Week	Date/Day (tentative)	Topics	Textbook/Assignments
1		Introduction to renewable energy and historical overview of solar cells, Functioning of the photovoltaic cells and Efficiency of solar cells	Relevant materials will be provided to students weekly.
2		Types of solar photovoltaic cells and Energy depreciation of photovoltaic cells, Photovoltaic system types, conversion, and specifications	Relevant materials will be provided to students weekly.
3		Charge regulators, Power factor Energy, Network-connected photovoltaic systems (on-grid)	Relevant materials will be provided to students weekly.
4		Standalone systems (off-grid) or isolated systems, Hybrid systems, Independent, systems for economic purposes	Relevant materials will be provided to students weekly.
5		Project	Relevant materials will be provided to students weekly.
6		Introduction of solar thermal energy, residential, commercial, and industrial applications	Relevant materials will be provided to students weekly.
7		Solar radiation, heat transfer, Solar thermal power	Relevant materials will be provided to students weekly.
8		Review Midterm	
9		Plane and concentrated collectors, water heating applications, heating and cooling the buildings, Thermal industrial applications, Water desalination, Solar thermal energy system,	Relevant materials will be provided to students weekly.
10		Project	Relevant materials will be provided to students weekly.
11		Historical applications of wind energy, Electrical Power from the Wind and the batteries	Relevant materials will be provided to students weekly.
12		Wind energy system (rotor blades, the tower, Mechanical Drive, Electrical System, etc.)	Relevant materials will be provided to students weekly.

13	Physical Principles of Wind Energy Conversion Basic concepts of wind energy Converters (turbines)	Relevant materials will be provided to students weekly.
14	Aerodynamics of turbines Computer software for wind energy analysis	Relevant materials will be provided to students weekly.
15	Project	Relevant materials will be provided to students weekly.
16	Final Exam/ Delivery of assignments	

This syllabus is a guide for the course and any modifications to it will be announced in advance.