

SYLLABUS

General information	Title and code of subject, number of credits	ETR466 Energy conversion- 8ECTS credits	
	Department	Physics and Electronics	
	Program	Master	
	Academic semester	2023 spring	
	Lecturer	Associate Professor, Ph.D Sevda N. Garibova	
	E-mail:	sevdaqaribova@khazar.org	
	Phone number:		
	Lecture room/Schedule	11 Mehseti Street, AZ1096 Baku, Azerbaijan(Neftchilar campus), room Lectures:	
	Consultations	Saturday 12:00 -13:20	
Prerequisites	EENG 245		
Course language	English		
Type of the subject	Major		
Textbooks	<p>Textbooks: 1. Energy conversion. Kenneth C. Weston 1992. E-book.</p> <p>Web pages: https://www.electrical4u.com/electrical-engineering-articles/power-electronics/# https://web.archive.org/web/20190805111248/http://www.personal.utulsa.edu/~kenneth-weston/</p>		
Teaching methods	Lecture	15	
	Group discussions at seminars	15	
Assessment	Components	Date/ Deadline	Percent (%)
	Tests		
	Active participation, oral questions and discussion	At each lesson. Participation 5 point, 3 absence losses 1 point. Activity during the semester 5 point	10
	Assignment and quizzes	2 quizzes during the semester (each 5 point)	10
	Presentation work	Prepare project (with presentation) on the topics given by the teacher. Due by the end of the semester.	10
	Midterm exam		30
	Final exam		40
	Final		100
Course description	<p>Energy conversion is important in the development of the engineering branches which also combines heat - power. Energy conversion is concerned with the concept of transformation of energy from energy sources such as fossil, nuclear fuels and the sun into the forms of electrical energy, rotational energy, heating and cooling. The development of industry and technology in the 19th century before the establishment of the basis of thermodynamics and electromagnetism was slow. And the development of nuclear energy in the 20th century has grown due to theoretical and experimental scientific achievements. Since energy conversion is related to thermodynamics, fluid mechanics and heat transfer, understanding, analyzing and designing in the field of energy conversion requires knowledge in the relevant fields of science, such as the concepts of heat and work, the transformation of energy, entropy and enthalpy, the laws of thermodynamics, etc.</p>		
Course objectives	<p>There are various types of energy such as mechanical, thermal, electrical, chemical, nuclear energy find their application in industry and technology. The possibilities for the transformation and use of energy are an indicator of the technical development of mankind. Due to the progress of energy conversion in the modern world of technology, such as the conversion of sunlight and wind into electricity, alternative energy sources have been created. Because of this, we define the process of energy conversion as the change energy from one form to another, such as conversion of sunlight to electrical and thermal energy, conversion of nuclear and chemical energy to the heat and light, conversion of</p>		

	mechanical energy to heat and work. Whole process is based on the knowledge of physical laws and work as drivers, nuclear and heat machines, generator, sensors, converter and transducers. Due to the energy conversion it became possible to transmit energy over long distances in the form of electricity, and a whole branch of energy industry was created. The students will be able to analyze the base physical principles of energy conversion by using various mechanisms.
Learning outcomes	<p>What students should know by the end of the course:</p> <ul style="list-style-type: none"> - to analyse the energy conversion schemes; - be able to analyze the proses of energy conversion with various methods; - understand thermal scheme; - apply law of thermodynamics, law of electricity and magnetism to energy conversion.
Rules (Educational policy and behavior)	<ul style="list-style-type: none"> • Lesson organization General information on the subject will be provided for the students during lectures. Student's knowledge on the previous topics will be evaluated and new topic will be explained by mins of visual aids during seminars. Student's knowledge level will be tested orally and in written forms (quizzes) before midterm and final exams. Submission of the individual works by the end of course is obligatory. • Exams (pass/fail) In accordance with the University rules the overall success rate to complete the course should be 60% or above. The students who failed the exam would be to take this subject next semester or next year. All the issues related to the participation and admission to the exam are regulated by the faculty dean. Topics of midterm and final exams are provided for the students before the exams. The questions of midterm exam are not repeated in the final exam. Students who got 57% can retake the exam. • Violation of the rules of the exams Disrupting the test and taking copy during midterm and final exams is forbidden. Test papers of the student who do not follow these rules are canceled and the students are expelled from the test by getting 0 (zero). • Rules of conduct for Students Disruption of the lesson and not following ethical norms during the lesson, as well as conduction of the discussions by the students without permission and using mobile phones is forbidden. • Attendance Participation of students at all classis is important. Students should inform dean's office about missing lessons for particular reasons (illness, family issues and etc.). Students, missing more than 25% of lessons, are not allowed to take the exam. Students who attend the whole classes will get 5 marks. For three absences student loses 1 mark. • Quizzes There will be quizzes per two weeks. The quizzes will be announced in the classroom two weeks before and will relate to homework. Depending on the difficulty of the lesson, quizzes can be two or three times during the semester, each with three or five points. • Activity For activity during lessons in the whole semester, students are rewarded with 5 points. The activity of students is assessed by the preparation of home questions, which is given by the teacher after the lessons; it can also be oral discussions.

This program reflects the comprehensive information about the subject and information about any changes will be provided in advance.

Week	Dates (planned)	Subject topics	Textbook/ Assignments
1	14.02	Fundamental of energy conversion: basic concepts, mechanical energy, types and sources of energy. Energy conversion scheme and thermal circuit. Heat and temperature, internal energy and I law of thermodynamics, cyclic process.	[1] chapter 1, p 1-9 https://www.electrical4u.com/
	16.02	<i>Oral questions and discussing</i>	
2	21.02	Entropy and enthalpy. II law of thermodynamics. Heat capacity, ideal gas and fluid flow. Energy classification and efficiencies, Carnot engine.	[1] chapter 1, p. 10- 25 https://www.electrical4u.com/
	23.02	<i>Discussing and testing, solve problems</i>	
3	28. 02	Irreversibility, Second-Law of efficiency, III law of thermodynamics. Power plant model. Types, advantages and disadvantages of power plants.	[1] chapter 1, p. 26-30
	02.03	<i>Oral questions and discussing</i>	https://www.ele

			ctrical4u.com/power-plants-types-of-power-plant/
4	07.03 09.03	Electromagnetic principles. Generation of power energy. MHD configuration. MHD generation or Magneto Hydro Dynamic Power Generation. <i>Testing and discussing</i>	[1] chapter 11, p. 437-446, 477-484 https://www.electrical4u.com/mhd-generation-or-magneto-hydro-dynamic-power-generation/
5	14.03 16.03	Electric power generation, batteries and cells. Electric power generation systems, model, advantages and disadvantages. <i>Testing</i>	[1] chapter 11, p. 447-465. https://www.electrical4u.com/electric-power-generation/
6	28.03 30.03	Thermoelectric power generators or Seebeck power generation. <i>Testing and discussing</i>	https://www.electrical4u.com/thermoelectric-power-generators-or-seebeck-power-generation/
7	04.04 06.04	Solar energy system, photovoltaic cell, principle of solar energy system. <i>Quizze 1</i>	[1] chapter 11, p. 487-491. https://www.electrical4u.com/what-is-photovoltaic-effect/
8	11.04 13.04	Components of solar electric generating system. AC chopper and voltage controller. <i>Midterm exam</i>	[1] chapter 11, p.491- 497. https://www.electrical4u.com/components-of-a-solar-electric-generation-system/
9	18.04 20.04	Solar cells, construction, working principle and parameter of solar cells. <i>Activity testing</i>	[1] chapter 11, p. 497-511. https://www.electrical4u.com/solar-cell/
10	25.04 27.04	Primary Sources of Electrical Energy, natural gas, biomass energy, thermal power generation plant. <i>Presentation work</i>	https://www.electrical4u.com/thermal-power-generation-plant-or-thermal-power-station/

11	02.05 04.05	Nuclear power station, advantages and disadvantage, nuclear reactor. <i>Presentation work</i>	https://www.electrical4u.com/nuclear-power-station-or-nuclear-power-plant/
12	11.05 13.05	Alternator. Alternator synchronous generator and the types of alternators, working principle. <i>Quizze 2</i>	[1] chapter 9, p. 334-410. https://www.electrical4u.com/working-principle-of-alternator/
13	16.05 18.05	DC generator, Working Principle of DC Generator, construction of DC <i>Testing for activity point</i>	https://www.electrical4u.com/principle-of-dc-generator/
14	23.05 25.05	Wind and hydroelectric energy, working principle of wind turbine. <i>Presentation work</i>	[1] chapter 8, p. 283-300. https://www.electrical4u.com/basic-construction-of-wind-turbine/
15	27.05 30.05	Carnot cycle, Rankine cycle and regenerative feed heating <i>Testing for activity point and prepare to final exam</i>	https://www.electrical4u.com/rankine-cycle-and-regenerative-feed-heating/
		<i>Final Exam</i>	

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