

Identification	Subject	ETR466 Electrical Power Supply - 6 ECTS credits
	Department	Physics and Electronics
	Program (Undergraduate, Graduate)	Bachelor
	Term	Fall 2026
	Instructor	Associate Professor, Ph.D Sevda Garibova
	Email:	sevdaqaribova@khazar.org
	Classroom/hours	11 Mehseti Street, AZ1096 Baku, Azerbaijan (Neftchilar campus), room Lectures: 08:30-11:40
Prerequisites	None	
Language	English	
Compulsory/Elective	Compulsory	
Textbooks and course materials	Textbooks: [1] e-book: Keith Billings, Taylor Morey. Switchmode power supply, London 2011. [2] e-book: V.Ramanarayanan. Course on material on Switched mode power conversion. Indian Institute of science. 2008. [3] e-book: Muhammad H. Rashid. Power Electronics. Third edition, USA 2016. Web pages (updated 2023): https://www.electrical4u.com/electrical-engineering-articles/power-electronics/# Additional material [4] J.G. Kassakian, D. J. Perreault, G.C. Verghese, M.F. Schlecht. Principles of Power Electronics, Published 2023 https://doi.org/10.1017/9781009023894	
Course description	The Electrical Power Supply course provides a comprehensive overview of the fundamental principles, design approaches, and operating characteristics of electrical power supply systems. The course covers the main stages of electrical energy generation, transmission, and distribution, as well as different types of power sources, including AC and DC supplies. As an important area of power electronics, the course examines the devices and methods used to convert electrical energy into the required voltage, current, and frequency for various loads. Particular attention is given to the role of power supplies in modern electronic and electrical systems, including computers, electric vehicles, industrial equipment, aircraft, welding systems, and medical devices. The course also considers voltage regulation and methods for maintaining stable output under variations in input voltage and load conditions. With the growing complexity of electronic systems and increasing performance requirements, modern regulation techniques and DC-DC converter technologies are studied in detail. The course covers a range of power supply technologies, including linear and regulated power supplies, switch-mode power supplies (SMPS), high-voltage and bipolar supplies, as well as different converter configurations and their practical applications.	
Course objectives	The main objectives of the Electrical Power Supply course are to: provide students with fundamental knowledge of the development and classification of	

	modern power supply technologies; develop an understanding of the operating principles, main characteristics, advantages, and application areas of AC, DC, regulated, switched-mode, programmable, and uninterruptible power supplies; introduce students to the physical principles and processes that determine the operation of electrical power supply systems; develop the ability to analyze basic power supply circuits, switching processes, and functional block diagrams; provide students with practical experience through laboratory work involving the investigation and analysis of power supply circuits and their operating characteristics; enable students to apply theoretical knowledge to the analysis and selection of appropriate power supply solutions for different electrical and electronic systems.		
Learning Outcomes	By the end of the course, students will be able to: • analyze the structure, operating characteristics, advantages, limitations, and application areas of different power supply systems and converters; • explain the fundamental operating principles of switch-mode, programmable, computer-based, and flyback power supplies; • apply theoretical knowledge to the analysis and design of basic power supply and converter circuits; • identify and explain the functions of key components and stages within power supply systems and converter circuits; • describe the purpose and operating principles of Faraday screens and methods used for controlling inrush current; • analyze switching processes and energy conversion mechanisms in power supply circuits; • apply voltage and current regulation principles to achieve stable and efficient power delivery; • perform laboratory work related to power supply circuits and apply theoretical knowledge in practical tasks.		
Teaching methods	Case analysis		x
	Group discussion		x
	Lecture		x
	Simulation		x
Evaluation Criteria	Methods	Date/deadlines	Percentage (%)
	Midterm Exam	TBA	30
	Quizzes		10
	Practical Assignments		10
	Activity		5
	Attendance		5
	Final Exam	TBA	40
	Total		100
Class Policy	• 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, with practical works 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 three times during the semester, each with three or 4 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. Presentation work Students individually or in a group must prepare a presentation on laboratory work. Students have two months to prepare, and at the end of the semester, each group or individual student must present their presentation report on practical work in laboratory. The work of the students is rewarded with 10 points. Generative AI Policy The use of Artificial Intelligence (AI) is not permitted. Students are required to complete assignments, practical work, and other assessed activities independently and ensure that all submitted work is their own. Work prepared or substantially modified using AI tools will not be accepted.			
Tentative Schedule			
Week	Date/Day (tentative)	Topics	Textbook/Assignments

1	17.09 17.09	Introduction to electrical power supply, various types of power supplies, main classification, application, power diode, converters Oral questions and discussing	e-book [2]: chapter 1, p.1-10
2	24.09 24.09	Power switching devices characteristics: ideal switches, real switches, practical power switching devices. Power supply circuit Discussing and testing	e-book [2]: chapter 1, p. 5-10; [4] chapter 1, p. 1-5
3	01. 10 01.10	Direct –off-line switchmode power supplies. Basic operation of direct –off-line SMPS. SCR Quizze 1	e-book [1]: chapter 1, p.1.3 https://www.electrical4u.com/two-transistor-model-of-scr/
4	08.10 08.10	Line rectification and capacitor input filters for direct – off-line switchmode power supplies. Linear power supply Testing and discussing, practical work (1) in laboratory	e-book [1]: chapter 6, p.1.55
5	15.10 15.10	Inrush control. Inrush current in power supply. Oral questions and discussing	e-book [2]: chapter 3 p.69-80; chapter 4, p. 95-98
6	22.10 22.10	High-voltage DC power supply with charging resistor. Resonance charging, switching converter Practical work (2) in laboratory	e-book [3]: p. 568-570
7	29.10 29.10	High frequency supply of discharge lamps. Ballasts Quizze 2	e-book [3]: p. 568-594
		Midterm exam	
8	05.11 05.11	Linear series voltage regulator Discussing	e-book [3]: p. 603- 606
9	12.11 12.11	Linear shunt voltage regulator. Integrated circuit voltage regulators Activity testing and practical work (3) in laboratory	e-book [3]: p. 606-610
10	19.11 19.11	Switching regulators. Testing for activity point with practical work in laboratory	e-book [3]: p. 610-620
11	26.11 26.11	Thyristor (SCR), two transistor model, operation and structure. Activity testing and practical work (4) in laboratory	https://www.electrical4u.com/two-transistor-model-of-scr/ [4] chapter 17 p.530-540
12	03.12 03.12	Structure of IGBT, switching and transfer characteristics of IGBT, working principle Quizze 3	[3] chapter 5, p. 73 https://www.electrical4u.com/insulated-gate-bipolar-transistor-igbt/ [4] chapter 17, p.524-528
13	10.12 10.12	Buck and boost converters, buck-boost converters, operation and characteristics. Estimation of presentation report	[2] chapter 5, p.135, 159-160 p.208-212

			https://www.electrical4u.com/buck-boost-converter/
14	17.12	Chopper and DC to DC converter, operation and classification	https://www.electrical4u.com/chopper-dc-to-dc-converter/
	17.12	Estimation of presentation report	[4] chapter 2, p.11-20
15	24.12	Flyback transformer design, flyback converter, working principle	[3] chapter 42 https://www.sunpower-uk.com/glossary/what-is-a-flyback-converter/
	24.12	Testing for activity point and prepare to final exam	
		Final exam	

