

Identification	Subject (code, title, credits)	ETR 250 Materials of electrical and electronic equipment-6 ECTS	
	Department	Physics and Electronics	
	Program (undergraduate, graduate)	Undergraduate	
	Term	Spring 2023	
	Instructor	Ahmad Asimov ph.D	
	E-mail:	<a href="mailto:fizikasimov@gmail.com">fizikasimov@gmail.com</a>	
	Phone:	+994124211093 (daxili255)	
	Classroom/hours	302N Monday/Wednesday	
	Office hours	Tuesday: 15:00-16:00/ Thursday: 15:00-16:00	
Prerequisites	Basic electrical engineering, Physics, Chemistry		
Language	English		
Compulsory	Compulsory		
Required textbooks and course materials	1. Principles of Electronic Materials and Devices. Kasap, S.O. McGraw-Hill 2. Advanced Electrical and Electronics Materials Processes and Applications K.M. Gupta and Nishu Gupta 3. Material Science for Electrical & Electronics Engineers: Ian P. Hones, Oxford University Press.		
Course description	The purpose of this course is to teach undergraduate students the materials of electrical and electronic equipment. Structure of materials; electronic structure of solids; thermal, electrical, dielectric, and magnetic properties of materials; semiconductors processing.		
Course objectives	The course aims to : 1. Explain classification, properties, and characteristics of electrical and electronic engineering materials. 2. Analyse and predict future directions in the use of electronic materials and design of electronic devices. 3. Illustrate solving of simple problems based on dielectric, magnetic and conducting materials. 4. Impart knowledge of Nano-technology to electrical engineering. 5. Understand and explain the fundamental principles underlying the operation of various electronic devices 6. Provide an introduction to the processing methods for materials used in the semiconductor industry.		
Learning outcomes	On successful completion of this course students will be able to: 1. Describe the characteristics of conducting and semiconducting materials 2. Apply knowledge of Nano-technology to electrical engineering 3. Classify and describe different insulators and to explain the behaviour of dielectrics in static and alternating fields 4. Solve simple problems based on dielectric, magnetic and conducting materials 5. Classify and describe Solar energy materials and superconducting materials 6. Discuss classification, properties and characteristics of different electrical engineering materials		
Teaching methods	Lecture		<input checked="" type="checkbox"/>
	Group discussion		<input checked="" type="checkbox"/>
	Experiential exercise		<input checked="" type="checkbox"/>
	Quiz, Classroom Exams		<input checked="" type="checkbox"/>
Evaluation	<b>Methods</b>	<b>Date/deadlines</b>	<b>Percentage (%)</b>
	Midterm Exam		30
	Activity	At each lesson	5
	Quizzes	4 quizzes during the semester	20
	Attendance	During the semester	5
	Final Exam		40
	Others		
	Total		100

<b>Policy</b>	<ul style="list-style-type: none"> <li>▪ <b>Preparation for class</b> The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes and work relevant problems and cases from the end of the chapter and sample exam questions.</li> <li>• <b>Withdrawal (pass/fail)</b> This course strictly follows grading policy of the School of Science and Engineering. Thus, a student is normally expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year.</li> <li>▪ <b>Cheating/plagiarism</b> Cheating or other plagiarism during the Quizzes, Mid-term and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations.</li> <li>▪ <b>Professional behavior guidelines</b> The students shall behave in the way to create favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited.</li> <li><b>Quizzes</b> <ul style="list-style-type: none"> <li>▪ There will be a quiz examination per two weeks. The quizzes will be announced in the classroom two weeks before. Quiz is from homework problems. The homework problems will be selected from questions and problems in the end of each chapter. The No. of homework problems will be announced after finishing each chapter.</li> </ul> </li> <li>• <b>Attendance</b> Students who attend the whole classes will get 5 marks. for two absence student loses 1 mark.</li> <li>• <b>Activity</b> Students who will be active during discussion of past lessons will be awarded with one activity mark.</li> </ul>
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<b>Tentative Schedule</b>			
<b>Week</b>	<b>Date/Day (tentative)</b>	<b>Topics</b>	<b>Textbook</b>
1	17.02.23 21.02.23	Classes of Engineering Materials: Metals & alloys, organic polymers and composite material. Classification of solids from electrical Engineering point of view.	Chapter 1
2	24.03.23 28.03.23	Conducting material – properties of conductors, characteristics of good conductor material, commonly used conducting materials, Thermal conductivity of matter, super conductivity.	Chapter 2
3	03.03.23 07.03.23	Dielectric Materials and Insulators: Dielectric strength, factors affecting dielectric strength, dielectric loss, dissipation factor, factors affecting dielectric loss.	Chapter 3
4	10.03.23 14.03.23	Application of dielectric, different types of capacitors and materials used for them. Insulating materials, their properties – thermal, chemical, mechanical & electrical.	Chapter 4
5	17.03.23 21.03.23	Classification of magnetic materials: Dia-magnetism, Para magnetism, Ferro-magnetism, Anti ferromagnetism,	Chapter 5
6	24.03.23	Ferrimagnetism, Magnetic resonance, ferromagnetic materials, soft and hard magnetic materials, ferrites. Fiber optic materials	Chapter 6

7	28.03.23 04.04.23	Semiconductors Materials: Basic Concept- types characteristics-applications: type of semi conductors, working and applications of semiconductors, Temperature sensitive elements.	Chapter 7
8		Midterm	
9	07.04.23 11.04.23	Solar Energy Materials: Photo thermal conversion. Solar selective coatings for enhanced solar thermal energy collection – Photovoltaic conversion – Solar cells -Silicon, Cadmium sulphide and Gallium arsenic – Organic solar cells.	Chapter 8
10	14.04.23 18.04.23	Special purpose materials: Nickel iron alloys, high frequency materials, permanent magnet materials.	Chapter 9
11	21.04.23 25.04.23	Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar selective coatings	Chapter 10
12	28.04.23 02.05.23	Nanomaterials In Modern Technology: Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes,	Chapter 11
13	05.05.23 16.05.23	Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials	Chapter 12
14	19.05.23 23.05.23	Modern Techniques for materials studies: Optical microscopy – Electron microscopy – Photo electron spectroscopy –	Chapter 13
15	26.05.23 30.05.23	Atomic absorption spectroscopy – Introduction to Biomaterials and Nanomaterials	Chapter 14
		Final Exam	