Name of subject	Application of ECM in Energy (ECTS 5)
Subject/module code	EEHM2505
Science taught semester (s).	5th semester
Responsible teacher	Burliyev Abdulla Ubaydullaevich, senior teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	**Total hour - 150.** **Contact hours - 60.** Lecture training hour - 30 Practical training hour - 30 **Independent education -90 hour**
ECTS	5
The purpose and tasks of subject / learning outcomes	**The purpose of teaching the subject** is to develop students' understanding of electrical power systems. To develop skills in improving knowledge in the field of process analysis and independent modeling using existing models, to form the necessary knowledge, skills and competencies in solving various problems in energy systems using electronic computing machines (ECM), that is, computer technologies, software and modeling methods, to ensure the level of knowledge, skills and experience required by the educational standard, in accordance with the profile of the electrical engineering field. **The task of the subject**: To achieve this goal, science provides students with theoretical knowledge, practical skills, event and to processes It performs the tasks of forming a methodological approach and scientific worldview. Introducing the capabilities of computers in the energy sector , teaching the use of software tools such as SCADA **,** AutoCAD **,** Spreadsheet **,** MATLAB , developing skills in drawing, modeling and analyzing power supply schemes , teaching the basics of algorithmization and solving practical problems in the C++ programming language , explaining the creation of interface programs for energy systems based on the MTV architecture , preparing for solving logical and linear problems through modeling and calculation, teaching the creation of dialog-mode programs and their application in the energy environment. **Learning outcomes:** 1. Application of exposure in energy and his/her relevance understanding; Such as SCADA, AutoCAD, Spreadsheet, MATLAB and C++ main software tools with work to take; 3. Electricity supply schemes design and modeling complete to take; 4. Energetic issues for algorithms fix takes and to the program turn to take; 5. Linear and complicated issues matrices using using Spreadsheet or MATLAB to solve use to take; 6. C++ programming language through branching and recurring algorithms program to take; 7. MTV model based on energetic systems programming projects working come out to take; 8. Energetic systems for user interfaces create and them from the test to hold to take.
Course content (topics)	**I. Home theoretical part (Lecture)** **Topic-1.** The relevance of the use of EXM in energy. Basic concepts. Main tasks of the science. Available software. Loading and running DT . **Topic-2.** SCADA system and his/her capabilities **.** Familiarity with

programs used to depict electrical power supply circuits using a computer. Learning to draw 2D electrical power supply circuits in AutoCAD.

Topic-3. In energy applicable schemes types and describe them . Model concept. Electricity in supply issues solution stages. Algorithmization. Spreadsheet formulas department. Logical deeds.

Topic-4. CAD software supplies and from them use. Electricity supply system in design operators. Recursion operators

Topic 5. Representation of interchange and schematic diagrams using CAD software. MATLAB programming environment user interface. Solving linear problems in power supply. Matrix, special types of matrices.

Topic-6. Spreadsheet software supply and his/her possibilities. Electricity supply systems linear situation equations. Matrices add and subtraction and multiplication. Determinant.

Topic 7. Linear problems in energy and the use of "Spreadsheet" software in solving them. In modeling iterative operators. Matrices. Class .

Topic-8. Model in energy . Model. Types of models. Modeling in energy. Modeling stages.

Topic-9. In energy algorithmization. Algorithm. Algorithms types. Algorithms to describe methods. In energy algorithmization.

Topic 10. Using the C++ programming language to solve energy problems . Programming languages. C++ versions. VSC.

Topic 11. Dialogue mode used in energy programs. Existing dialog mode programs. Creating a dialog mode. The print() function.

Topic 12. Developing branching programs in the C++ programming language . Branching programs. If () conditional operator and from it use.

Topic 13. Using recursive operators in programming using the C++ programming language. for, while from operators use.

Topic 14. Complex programs and their preparation structures. Complex programs organization to grow stages.

Topic-15. MTV structure and his/her work mechanism. Models. Templates. Views. MTV structure. How MTV works

II. Practical training instructions and recommendations.

The teacher's preparation for a practical session begins with studying the initial documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical session, as well as the amount of work that each student must perform.

Methodological guidelines are the teacher's main methodological document in preparing and conducting practical classes.

The goal of practical training is to understand theory and acquire skills. Its conscious application in educational and professional activities consists in developing the ability to confidently formulate one's own point of view.

All practical work and exercises are done on computers. Students will be able to from ECM in the power supply system during execution use and ECM issues at solution according to skills they produce

The following topics are recommended for practical training:

1. "Spreadsheet" software in the supply linear issues solution
2. “Spreadsheet” software in the supply branching issues solution.
3. “Spreadsheet” software in the supply recurring issues solution.
4. Energy issues in solution C++ programming language application.
5. C++ programming language through dialogue in mode programs organization to grow.

	6. C++ programming in the language linear programs preparation 7. C++ programming in the language branching programs preparation 8. Using recursive operators when writing programs using the C++ programming language. **IV. Independent learning and independent work.** Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form. **Recommended topics for independent study:** 1. Energy management of programs relevance 2. Electricity supply in the system applicable simulators 3. Modern electricity measurement tools and their application 4. Electricity in the system applicable programs to compose for user-friendly programming languages 5. Industry 4.0 to based simulators 6. Electricity efficiency calculator programs 7. Repeat recovering in sources applicable EXM types 8. SCADA in the system substation management implementation to grow 9. Energy working from issuing, his/her up to consumption was describe a systematic process diagram 10. CAD electrician software supply advantages 11. Electricity supply system principal schemes CAD software imaging 12. Electricity supply in the system applicable replacement schemes Depiction in CAD software 13. Exchange and Principal schemes CAD software supplies describe through 14. Spreadsheet software in supply information base preparation and install automatic filters on it. 15. “Spreadsheet” software supply and his/her opportunities. 16. “Spreadsheet” software supply functions. 17. In energy in modeling applicable software supplies and their advantages 18. In energy occurring in matters branching and using iterative algorithms. 19. C++ programming of the language energy issues in solution the importance of application . 20. In energy applicable dialogue in mode programs and their importance. 21. C++ programming in the language branching and recurring Using operators to solve energy problems. 22. OOP. To the object directed in energy applicable software and their preparation schemes. 23. In energy high level programs preparation structures MTV structure and his/her work mechanism. 24. “Request” send and "Response" acceptance to do structures of processes.
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content

	of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher. In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject

(module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge

5 grade	100 points		Assessment criteria
5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.
4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.
3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.
2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.

Course assessment criteria and procedure

Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
		Student activity (in seminars,	10 points	

		practical, laboratory classes)			
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.				

Recommended Literature	**Main literature:** 1. Master SCADA, Gazieva R.T., Yadgarova D.B., Nigmatov A.M., Ozodov E.O. Tashkent 2020. 2. AutoCAD 2020 Beginning and Intermediate. 3. AutoCAD 2019. A Power Guide for Beginners and Intermediate Users. CADArtifex, John Willis, Sandeep Dogra (2018) 4. Larry Brackney Andrew Parker Daniel Macumber Kyle Benne Building Energy Modeling with OpenStudioA Practical Guide for Students. 5. Data Structure and Algorithmic Thinking with Python Data Structure and Algorithmic Puzzles by Narasimha Karumanchi. **Additional literature:** 6. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 7. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati’yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017–592 b **Internet sources:** 8. www.ziyonet.uz – a search site for national educational materials. 9. www.gov.uz – Government portal of the Republic of Uzbekistan. 10. www.google.com – an international educational materials search site.