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
Study to the program connection	Elective
Training hours (this including independent education)	**Total hour - 150.** **Auditory training 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.
Student assessment	Assessment of student knowledge is based on the mastery of teaching materials (tests, assignments, written and oral work results) during the semester and final examination. During the Electrical Networks and Systems course, students are assessed on a 100-point scale. Of these, 50 points are allocated to the current and intermediate results (60% of the 50 points are current control, independent study and 40% intermediate control), and 50 points

	are allocated to the final control result. Students whose total current and intermediate scores are less than 30 points are not admitted to the final control exam. A student who scores 30 or more points in the final control is considered to have mastered the subject.
Requirements for exams	The student must have fully mastered the theoretical and practical concepts of the subject, be able to correctly reflect the results of the analysis. The student must have completed the tasks given in the current and intermediate forms of independent work, assessment. At the same time, he must have received the necessary points from the current, intermediate, independent education and final tests in the relevant subject within the specified time. A student who has not submitted current control, intermediate control and independent education tasks, as well as who has scored less than 30 points on these tasks and types of control, will not be included in the final type of control. Also, a student who has missed 25 or more percent of the classroom hours allocated to the subject without an excuse will be expelled from this subject, will not be allowed to take the final exam and will be considered as not having mastered the relevant credits in this subject. A student who fails the final exam or scores less than 30 points on this type of exam is considered academically indebted.
Recommended Literature	**Main literature:** 1. Steven W. Blume. Electric Power System Basics. USA.: Wiley – Interscience A John Wiley&Sous, INC Publication, 2014, 260 p. 2. Master SCADA, Gaziev RT , Yadgarova DB, Nigmatov A.M. , Ozodov EO Tashkent 2020. 3. SCADA system. Andreev Ye.B., Kutsevich N.A., Sinenko OV RTSoft- 2014. 4. AutoCAD 2020 Beginning oath Intermediate 5. AutoCAD 2019. A Power Guide for Beginners oath Intermediate Users. CADArtifex, John Willis, Sandeep Dogra (2018) 6. A Python Book: Beginning Python, Advanced Python, and Python. 2013.Dave Kuhlman. 7. Larry Brackney Andrew Parker Daniel Macumber Kyle Benne Building Energy Modeling with OpenStudioA Practical Guide for Students and 8. Data Structure and Algorithmic Thinking with Python Data Structure and Algorithmic Puzzles by Narasimha Karumanchi. **Additional literature:** 9. Mirziyoyev Sh.M. Let's live freely and prosperously in the new Uzbekistan. –T.: “TASVIR Publishing House”, – 2021.– 50 p. 10. Mirziyoyev Sh.M. We will continue our path of national development with determination and take it to a new level.– T.:“Uzbekistan”, 2017–592 p. 11. Uzbekistan Republic of "From energy" rational "On the use of" Law. April 25, 1997. 12. Uzbekistan Republic of "Electricity" energy "about" Law. September 30, 2009. 13. Allaev KR Energy myrrh I To Uzbekistan. Analytical review. – T.: Finance, 2007 – 388 p. 14. Rafikova GR, Ru'zinazarov MR Methodological guide for practical work on the subject “Mathematical problems of energy”. T.; 2014. **Internet sources:** 16. www.ziyonet.uz – a search site for national educational materials. 17. www.gov.uz – Government portal of the Republic of Uzbekistan.

	17. www.google.com – an international educational materials search site. 19. www.energystrategy.ru – information portal “Energy Policy and Strategy” 20. www.twirpx.com – a search site for international educational materials.