

APPROVED BY

Director of Power Engineering
School

 A.S. Matveev

«30» 06 2020

SYLLABUS FOR

“ENERGY SAVING AND ENERGY AUDIT OF ENTERPRISES”

Field of study: 13.04.02 "Electric Power and Electrical Engineering"

Program name: "Electric Generation and Transportation"

Level of study: Master

Year of admission: 2019

Semester, year: semester - 2; 2020.

ECTS: 5

Total Hours: 180

Contact Hours: 80

- **Lectures:** 16
- **Labs:** 24
- **Practical experience:** 40

Assessment: exam

Type of intermediate certification: Course project

Department: DEPARTMENT OF ELECTRIC POWER AND ELECTRICAL ENGINEERING

Head of Department: of Electric Power and Electrical

Engineering Department

Instructor:


Ivaschutenko A.S.

Rakhmatullin I.A.

2020

Course Objectives	Formation of knowledge and skills in the field of law, organization, science, technics and economics which are focused on effective using of energy resources are the main objectives of the discipline for students. Objectives O3, O4 and O5 of basic educational program (BEP) “Electric Power and Electrical Engineering” will be reached as a result of learning this discipline. Achieved knowledge, skills and experience will prepare the student for: • scientific and research activity including interdisciplinary areas such as mathematical modeling of processes and objects, design of innovation methods increasing effectiveness of designing and operation of electrical energy systems and objects (O3); • industrial activity as an operation, installation, service maintenance of electrical equipment (O4); • self-education and learning new skills for career realization and development (O5).																											
Learning Outcomes	As a result of studying students will be able to analyze and forecast optimal regimes of electrical energy consumptions and energy saving for enterprises, to calculate main indicators of efficiency and reliability of electrical equipment of customers, to understand organization and practical issues of operation and optimization of electrical power supply schemes and will have experience in technical and economic justification. Level of studying the discipline must allow solving typical tasks of choosing reliable, safe, and economical and the most energy effective working regimes of electrical equipment. According to the requirements of BEP and Federal Government Educational Standard (FGES) studying the discipline “Energy saving and energy audit of enterprises” is focused on formation among the students next competences (see table 1): Constituents of the learning outcomes <table><tr><th rowspan="2">Learning Outcomes</th><th colspan="6">Learning outcomes components</th></tr><tr><th>Code</th><th>Knowledge</th><th>Code</th><th>Skills</th><th>Code</th><th>Experience</th></tr><tr><td>LO 4</td><td>K 4.1</td><td>basic methods, approaches and means of acquisition, storage and processing of information;</td><td>S 4.1</td><td>apply computer and informational technologies in professional occupation;</td><td>E 4.1</td><td>use of up-to-date technical means and informational technologies in the professional field</td></tr><tr><td>LO 6</td><td>K 6.1</td><td>up-to-date science achievements and</td><td>S 6.1</td><td>realize the most optimal, effective energy saving</td><td>E 6.1</td><td>planning of the process of engineering problem</td></tr></table>	Learning Outcomes	Learning outcomes components						Code	Knowledge	Code	Skills	Code	Experience	LO 4	K 4.1	basic methods, approaches and means of acquisition, storage and processing of information;	S 4.1	apply computer and informational technologies in professional occupation;	E 4.1	use of up-to-date technical means and informational technologies in the professional field	LO 6	K 6.1	up-to-date science achievements and	S 6.1	realize the most optimal, effective energy saving	E 6.1	planning of the process of engineering problem
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Table 2

	Expected results of acquiring the discipline	
	№	Result
	CO 4	Experience in calculation of energy effectiveness indicators
	CO 6	Knowledge of modern methods for appraising energy effectiveness indicators
	CO 8	Knowledge and experience in using standards and normative and technical data
	CO 9	Experience of technical and economic justification of energy saving measures over projecting of energy systems and objects
	CO 11	Knowledge of methodology for technical and economic comparison of variants and justification of the most effective one
Course Outline	Discipline is relating to the “Professional cycle” of BEP “Electrical power and Electrical engineering” and applicable for such profiles as: Electrical Generation and Transportation”, “Optimization of power supply systems”, “Renewable Energy Sources”. This discipline is one of the major, it is autonomous and also could be a base for special disciplines. For successful learning student must: • know: terms, base concepts and definitions, standards and laws for energy saving in region, methodology of energy audit of industrial enterprises, economic and financial mechanisms of energy saving, procedure for calculating, regulation and approval of tariffs; • be able to: determine indicators of energy efficiency of customers of fuel-energy resources, analyze agreements for energy supply, carry technical and economic justification of energy saving decisions, design energy passports and programs for increasing energy efficiency of customers; • be experienced in: working with reference literature and standard and technical documentation, designing of energy effective power supply schemes and optimization of existing work regimes of electrical equipment.	
Prerequisites	Prerequisites of this discipline are: “Theoretical bases of electrical technique”, “Electrical mechanics”, Electrical machines”. The content of discipline is agreed with the other subjects in program. Corequisites: The bases of calculating and design of power supply for industrial enterprises.	
Facilities and Equipment	• Laboratory of the base course on power supply - Building 8, room 252, 5 units; • Computer class - Building 8, room 121, 12 computers.	
Grading Policy	Evaluating of discipline`s (module`s) studying at current and intermediate certification is realizing due to the “Provision on intermediate certification of students of Tomsk polytechnic university”. Maximum score at current certification in discipline – 80, intermediate certification (exam/assessment test) – 20.	
Course Policy	Class attendance will be taken into consideration when evaluating students` participation in the course. Students are expected to actively engage in class discussions about the assigned readings. Attendance is strictly controlled and all class is obligatory to presence.	

Teaching Aids and Resources	Main literature. 1. Klimova G.N. Energy saving at industrial enterprises: tutorial. –Tomsk, Publishing house of Tomsk polytechnic university, 2014. – P. 180. 2. Practical guide on selection and development of energy saving projects/In 7 parts. Under general redaction of D.t.s. O.L. Danilova, P.A. Kostuchenko. Moscow: ZAO “TECHNOPROMSTROY”, 2010. – P. 76. 3. Anufriev V.N., Andreenko N.A. Energy saving in buildings. Tutorial. Minsk: Altiore-Jivye kraski. 2011. P. 76. 4. Kabyshev A.V. Compensation of reactive power at the electrical installations of industrial enterprises. – Tomsk, Publishing house of Tomsk polytechnic university, 2012. – P. 234. Additional literature. 1. Ilinskiy N.F., Moskalenko V.V. Electric drive: energy and resource saving. – Moscow: Publishing house “Akademiya”. 2008. P. 208. 2. Varnavskiy B.P., Kolesnikov A.I., Fedorov M.N. Tutorial on energy audit of housing and industry enterprises. – Moscow: MIKHIS. 1998. P. 45. 3. Goldstrem V.A., Kuznetsov U.L. Handbook on economy of fuel and energy resources. – Kiev: Tekhnika. 1985. P. 383. Methodical support 1. Kabyshev A.V., Obukhov S.G. Calculation and design of power supply systems for objects and installations. Tutorial. – Tomsk, Publishing house of Tomsk polytechnic university. 2006. P. 248. Internet-resources. 1. Web site on energy saving http://www.energsovet.ru. 2. “Energy saving” journal http://www.rf-energy.ru. 3. Web site on Effective energy saving http://www.portal-energo.ru.
Instructor	Rakhmatullin Ilyas Aminovoch, Riam@tpu.ru