

APPROVED BY

Director of Power Engineering
School

 A.S. Matveev

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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: 2020

Semester, year: semester - 2; 2021.

ECTS: 5

Total Hours: 180

Contact Hours: 80

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

Assessment: exam


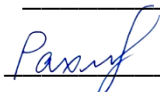
Type of intermediate certification: Course project

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	<p>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.</p> <p>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:</p> <ul style="list-style-type: none">• 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	<p>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.</p> <p>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.</p> <p>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):</p>						
	Constituents of the learning outcomes						
	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	

			innovation technologies in Energy saving;		choice in specific conditions		solution;
		K 6.3	modern analytical methods and models of complex engineering analyses	S 6.3	apply modern methods and research tools for specific problems solution	E 6.3	working with automatic design software
	LO 8	K 8.1	standards and normative documents focused on effectiveness of energy consumption	S 8.1	development of methodological and normative data	E 8.1	working with technical documentation and standards
	LO 9	K9.1	structure and content of industrial and economic functions of enterprise	S9.1	analyze financial, economic activity of electrical energy enterprise	E9.1	technical and economical calculations and justification of projects in electrical energy and technique area
	LO 11	K11.1	state and tendencies of developing modern domestic and foreign electrical energy and technical equipment	S11.1	choose new equipment for replacement existing during operation, appraise its advantages and disadvantages	E11.1	studying new electrical energy and technical equipment
		K11.2	methods and ways of technical service of electrical equipment	S11.2	controlling technical condition and appraise residual resource of electrical equipment	-	-

Masters that have acquired the discipline should be achieved results, listed in Table 2.

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	<p>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”.</p> <p>This discipline is one of the major, it is autonomous and also could be a base for special disciplines. For successful learning student must:</p> <ul style="list-style-type: none"> • 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	<p>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.</p> <p>Corequisites: The bases of calculating and design of power supply for industrial enterprises.</p>	
Facilities and Equipment	<ul style="list-style-type: none"> • Laboratory of the base course on power supply - Building 8, room 252, 5 units; • Computer class - Building 8, room 121, 12 computers. 	
Grading Policy	<p>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”.</p> <p>Maximum score at current certification in discipline – 80, intermediate certification (exam/assessment test) – 20.</p>	
Course Policy	<p>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.</p>	

<p>Teaching Aids and Resources</p>	<p>Main literature.</p> <ol style="list-style-type: none"> 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. <p>Additional literature.</p> <ol style="list-style-type: none"> 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. <p>Methodical support</p> <ol style="list-style-type: none"> 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. <p>Internet-resources.</p> <ol style="list-style-type: none"> 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.
<p>Instructor</p>	<p>Rakhmatullin Ilyas Aminovoch, Riam@tpu.ru</p>