APPROVED BY
Director of Power Engineering School
_____ A.S. Matveev
«30» 06 2020

SYLLABUS FOR

“ADVANCED TOPICS OF POWER SUPPLY”

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: 4

Total Hours: 144

Contact Hours: 48

- **Lectures:** 8
- **Labs:** 16
- **Practical experience:** 24

Assessment: exam

Type of intermediate certification: Course work

Department: DEPARTMENT OF ELECTRIC POWER AND ELECTRICAL ENGINEERING

Head of Department of Electric Power and Electrical Engineering Department _____Ivaschutenko A.S.

Instructor: _____Rakhmatullin I.A.

2020

TOMSK POLYTECHNIC UNIVERSITY ТОМСКИЙ ПОЛИТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

<table>
<tr><td>Course Objectives</td><td>
Formation of knowledge and skills in the field of calculation and design of power supply systems based on renewable energy sources are the main objectives of the discipline for students.
Objectives O1, O3 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:

design and engineering activity in the field of electro energy and electro technic and to be able to choose modern equipment, design new world competitive electro technical objects, systems and units using modern automated design soft, to be able evaluate technical and economical effectiveness (O1);
scientific and research activity including interdisciplinary areas such as mathematical modeling of processes and objects, to be able to do experimental research and analysis of the results, design of innovation methods increasing effectiveness of designing and operation of electrical energy systems and objects (O3);
self-education and learning new skills for career realization and development (O5).

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<tr><td>Learning Outcomes</td><td>
According to the requirements of BEP and Federal Government Educational Standard (FGES) studying the discipline “Advanced topics of power supply” is focused on formation among the students next competences (see table 1):
Constituents of the learning outcomes
<table>
<tr><td rowspan="2">Learning Outcomes</td><td colspan="5">Learning outcomes components</td></tr>
<tr><td>Code</td><td>Knowledge</td><td>Code</td><td>Skills</td><td>Code</td><td>Experience</td></tr>
<tr><td>LO 5</td><td>K 5.1</td><td>basic models of science and technology developing</td><td>S 5.1</td><td>analysis of obtained information;</td><td>E 5.1</td><td>reasoned presentation of one's own point of view</td></tr>
<tr><td>LO 6</td><td>K 6.3</td><td>modern analytical methods and models of complex engineering analyses</td><td>S 6.3</td><td>apply modern methods and research tools for specific problems solution</td><td>E 6.3</td><td>working with automatic design software</td></tr>
<tr><td>LO7</td><td>K7.1</td><td>modern technical soft that are used at the field of electro energy and problems</td><td>S 7.1</td><td>analysis of information about object, reached using technical soft</td><td>E 7.1</td><td>preparing of initial data according to chosen object</td></tr>
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			that are solved using those soft;				
	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

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

Table 2

Expected results of acquiring the discipline

№	Result
CO 5	Ability to use in-depth knowledge of physical science, mathematics, social, economic and professional activity as interdisciplinary approach of innovations at the field of electro energy and technic;
CO 6	Setting and solving tasks of engineer analysis at electro energy and technic using fundamental and special knowledge, analytical methods and complex models under conditions of uncertainty;
CO 7	Carrying out engineering projects with using original methods of design to achieve new results that give competitive advantages at electro energy and technic producing under hard economic and ecological limitations;
CO 8	Carrying out innovative engineering research at the field of electro energy and technic including analysis of world data.

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. It consist of next parts:

- Reactive power;
- Relations of energy supplier and consumer at the field of generation and consumption of reactive power;
- Reactive power sources at industrial enterprises;
- Consumption of reactive power at industrial enterprises;
- Transverse compensation of reactive power;
- Longitudinal compensation of reactive power;
- Technical and economical calculations of compensation of reactive power.

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 special course on power supply - Building 8, room 245, 5 units;
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. Kabyshev A.V. Compensation of reactive power at electro units of industrial enterprises.–Tomsk, Publishing house of Tomsk polytechnic university, 2011. – P. 237. 2. Ponyatovskiy V.A. Power coefficient and factors influencing on it at energy systems of enterprises and harbors. – Moscow. Transmit, 2012. – P. 54. 3. Gujov N.P. Power supply systems. – Rostov-na-Dony. Feniks, 2013. – P. 382. **Additional literature.** 1. Jelezko U.S. Electro energy consumptions. Reactive power. Quality of electro energy. Guide for practical calculations. – Moscow. ENAS, 2010. – P. 456. 2. Kochkin V.I., Nechaev O.P. Application of static compensators of reactive power electric networks of energy systems and enterprises. – Moscow. ENAS, 2010. – P. 248. 3. Karpov F.F. Compensation of reactive power at distributive electric networks. – Moscow. Energoatomizdat, 2012. – P. 184. 4. Kabyshev A.V., Klimova G.N. Advanced topics of power supply at industrial enterprises.–Tomsk, Publishing house of Tomsk polytechnic university, 2010. – P. 184.
Instructor	Rakhmatullin Ilyas Aminovoch, Riam@tpu.ru