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

SYLLABUS FOR

“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: 2020

Semester, year: semester - 2**;** 2021**.**

ECTS: 4

Total Hours: 144

Contact Hours: 48

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

Assessment: exam

Subdivision: The Butakov Research Center

Head of Center: _____ Zavorin A.S.

Instructor: _____ Polovnikov V. Yu.

2020

TOMSK POLYTECHNIC UNIVERSITY ТОМСКИЙ ПОЛИТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

<table>
<tr><td>Course Objectives</td><td>Objectives O1, O2, O3 and O5 of basic educational program (BEP) 13.04.02 “Electric Power and Electrical Engineering” will be acquired by master degree students as a result of learning this discipline.
Future specialists will be introduced theoretically and practically to the following:
physical bases of thermal and hydraulic processes in heat supply systems,
calculation method of heat consumption by consumers,
Analysis of heat supply systems, layout of boiler houses and increase in efficiency of their operation for successful work in the direction of development, design and operation of heat engineering systems and individual equipment taking into account the characteristics of industrial plants and enterprises of housing maintenance and utilities.</td></tr>
<tr><td>Learning Outcomes</td><td>According to the requirements of BEP and Federal Government Educational Standard (FGES) studying “Power supply” discipline is focused on formation among the students next competences (see table 1):
Table 1
Constituents of the learning outcomes
<table>
<tr><td rowspan="2">Learning Outcomes</td><td colspan="6">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 development</td><td>S 5.1</td><td>to analyze of obtained information</td><td>E 5.1</td><td>reasoned presentation of personal point of view</td></tr>
<tr><td rowspan="2">LO 6</td><td>K 6.2</td><td>crucial problems of electric power and electrical engineering</td><td></td><td></td><td>E 6.2</td><td>work with technical tools for controlling regimes of electric power and electrical engineering facilities</td></tr>
<tr><td>K 6.3</td><td>modern analytical methods and models of complex engineering analyses</td><td>S 6.3</td><td>to apply modern methods and research tools for specific problems solution</td><td>E 6.3</td><td>work with automatic design software</td></tr>
<tr><td>LO7</td><td>K7.1</td><td>modern technical software packages</td><td>S 7.1</td><td>to analyze information about items, objects</td><td>E 7.1</td><td>preparation of initial data according to</td></tr>
</table></td></tr>
</table>

		applied in power engineering and problems solved by using these packages		reached using technical software		given object
	K 7.3	economical, ecological and social limitations	S 7.3	to organize and conduct scientific research connected with development of projects and programs	E 7.3	skills in preparation, presentation and defense of research results
LO 9	K 9.1	Structure and content of the production and economic functions of the enterprise (organizatio n, institution), its services and departments	S 9.1	to analyze financial and economic, business functions of the enterprise of the electric power and electrical engineering complex	E 9.1	technical and economic calculations and justification of the variant with the best indicators for the design of facilities and systems in the electric power and electrical engineering industries

Master degree students who have acquired the discipline should be achieved results listed in Table 2.

Table 2

Expected results of acquiring the discipline

№	Result
CO 1	To apply deep advanced scientific, mathematical, social economic and professional knowledge of physical principles in the field of energy supply and energy conservation.
CO 2	To set and solve innovative problems of engineering analysis in the field of heat supply with minimum energy costs using deep fundamental and special knowledge. To know the basic design and limiting parameters of regimes of coolant consumption, methods of control the released heat.

	CO 3	To carry out engineering projects using standard design methods in heat supply systems to achieve modern results that provide competitive advantages of the heat supply system under the condition of severe economic and environmental constraints.
	CO 4	To conduct a feasibility study of design solutions; use normative materials; perform modern heat and hydraulic calculations in heat supply systems; analyze the heat supply systems and improve their efficiency by solving environmental issues and implementing energy-saving measures and technologies.
Course Outline	The discipline is included into elective part of the "Professional cycle" of BEP "Electrical power and Electrical engineering" and consists of several parts: 1. Heat consumption, power supply systems and their equipment; 2. Methods of heat load control. Hydraulic calculation and regimes of heating networks operation; 3. Heating systems, heat load calculation 4. Hydraulic calculation of water heating systems.	
Prerequisites	Prerequisites of this discipline are: • Additional topics of mathematics; The content of the discipline is agreed with the other subjects in program studied in parallel (co-requisites). Co-requisites: • Philosophical and methodological problems of science and technology; • Energy saving and energy audit of the enterprise; • Integration of renewable energy setups into power supply systems; • Special issues of electricity supply; • Computer technologies for solving power supply problems.	
Facilities and Equipment	• Class with setups including all basic elements of standard independent heating system - Building 4, room 107A, 2 setups; • Class with setups for studying the basics of hydraulics - Building 4, room 29, 3 setups;	
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". Current assessment during the term accounting the quality of mastering of theoretical material, the results of practical activities and laboratory works: max score is 80 points, min – 44 points. Course final assessment (exam): max score is 20 points, min – 11 points. The maximum overall rating corresponds to 100 points; min pass score is 55 points.	
Course Policy	Every student is expected to attend all scheduled class sessions, including final exams. Class attendance will be taken into consideration when evaluating students` participation in the course. Students will be rewarded with an additional score as long as they actively contribute to the class discussion about addressable tasks.	
Teaching Aids and Resources	**Compulsory reading:** 1. Sokolov E.Ya. Power-and-heat generation and heating networks. – Moscow. MEI, 2009. – P. 472. 2. Lyalikov B.A. Sources and systems of heat supply of industrial enterprises. – Tomsk, Publishing house of Tomsk polytechnic university, 2008, part 1. – P.155. 3. Lyalikov B.A. Sources and systems of heat supply of industrial enterprises. – Tomsk, Publishing house of Tomsk polytechnic university,	

	2008, part 2. – P.171. 4. International District Heating Association. District heating handbook. – 4th edition. – 1983. – P.516. 5. Frangopoulos C. A. Cogeneration: Technologies, Optimisation and Implementation. – IET, 2017. – P. 360. 6. Greene A. M. The elements of heating and ventilation; a Text-book for students, engineers and architects. – Hard Press Publishing, 2012. – P. 349. 7. Heat supply, a handbook, ed. by V.E. Kozin. – Moscow, Integral, 2013. – P.408. 8. Bespalov V.E. Systems and sources of power supply. – Tomsk, Publishing house of Tomsk polytechnic university, 2011. **Additional reading:** 1. Rosen M. A., Koohi-Fayegh S. Cogeneration and District Energy Systems: Modelling, Analysis and Optimization. – IET, 2016. – 344. 2. Advanced District Heating and Cooling (DHC) Systems, ed. by Robin Wiltshire. – Woodhead Publishing, 2015. – P.364. 3. J. Marecki. Combined heat & power generating systems. – Peter Peregrinus Ltd., London, 1988.
Instructor	Polovnikov Vecheslav Yuryevich., polovnikov@tpu.ru