1	Foreign Language
2	Philosophy
3	History
4	Fundamentals of Law
5	Higher Mathematics
6	Linear Algebra
7	Chemistry
8	Physics
9	Computer Science
10	Introductory Course in the Field of Study
11	Life Safety
12	Electrical Engineering
13	Special Chapters of Higher Mathematics
14	Technical Thermodynamics
15	Engineering Mechanics
16	Fluid Dynamics
17	Engineering Graphics
18	Metrology
19	Materials Science
20	Fundamentals of Personal and Communicative Culture
20.1	Scientific and Business Speech Culture
20.2	Culture and Personality
21	Conflictology
21.1	Social Technologies
21.2	Organizational Psychology
22	Combustion Physics
23	Nonconventional and Renewable Energy Sources
24	Economics and Basis Management of Enterprise
25	Occupational Safety
26	Heat and Mass Transfer
27	Turbines of thermal electric stations and atomic electrical stations
28	Boiler Units and Steam Generators
29	Automation of Heat Power Processes
30	Coolants and their properties
31	Environmental technologies on thermal power plants
32	Anti-emergency control in power systems
33	Technical Metrology and Devices
34.1	Heat and Atomic Power Stations
34.2	Heat engines and superchargers
35.1	Electrical Equipment of Power Plants
35.2	Heat-shared equipment of enterprises
36.1	Industrial Heat Power Engineering
36.2	technological energy carriers
37.1	Technology of Centralized Power and Heat Production
37.2	Power Use in Power Engineering and Technologies
38.1	Special Power Supply Questions

38.2	Mathematical Modelling of Heat Power Systems
39.1	Water Treatment/Preparation
39.2	Water-chemical modes of thermal electric stations
40.1	Energy Saving in Heat Power Engineering and Heat Technologies
40.2	Modern Energy Problems
41	Physical Training and Sport
41.1	Physical Education
42	Academic Internship: Orientation
43	Curriculum: Practice to receive primary software skills
44	Manufacturing Practice: Technological Practice
45	Pre-Graduation Training: Research Activity
46	Preparation for and Taking the State Examination
47	Modern video systems
48	Public Speech Language and Logic
49	Project Activity

ANNOTATION OF THE PROGRAM
Foreign language

Course: 1 2, semester ы : 1 2 3 4

		Semester			
№	**Kind of activity**	**1**	**2**	**3**	**4**
1	Total credits	2	3	3	2
2	Total hours	72	108	108	72
3	Total classes in the contact form, hours	45	48	48	45
4	Lectures, hours	0	0	0	0
5	Practical lessons, hours	36	36	36	36
6	Laboratory studies, hours	0	0	0	0
7	of them in an active and interactive form, hours	10	28	18	16
8	Consultations, hours	7	10	10	7
9	Independent work, hours	27	60	60	27

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
uses a systematic approach to solve problems
is able to carry out business communication in oral and written forms in the state language of the Russian Federation and foreign language (AH); *regarding the following learning results*:
demonstrates the ability to exchange business information in oral and written forms of at least one foreign language

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
uses a systematic approach to solve problems	
1. MC-1. 2 2. Uses the system approach to solve the tasks of	Seminars; Independent work
demonstrates the ability to exchange business information in oral and written forms of at least one foreign language	
2. UK-4. 2 2. Demonstrates the ability to exchange business information in oral and writing forms of at least one foreign language	Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: Basics of intercultural communication (Crosscultural Communication)				
1. Speech etiquette in interpersonal communication.	2	8	1, 2	Reading, translation of general cultural texts , fulfillment of lexico-grammatical and speech tasks on the topic, discussion of problematic issues, modeling communicative situations, presentation of messages
2. Features of intercultural communication.	4	10	1, 2	reading, translation of the general cultural texts, the implementation of communicative tasks on the topic, discussion of problematic issues, modeling communicative situations, presentation of messages
Didactic unit: Higher education (Higher Education)				
3. Higher education in Russia. NSTU is a major educational center.	2	10	1, 2	reading, translation of the general cultural texts, the implementation of communicative tasks on the topic, discussion of problematic issues, modeling communicative situations, presentation of messages
4. Higher education in the United States and the UK. Educational programs in Russia and abroad.	2	8	1, 2	Reading, translation, listening to audio advertists, performing written vocabulary-grammatical and speech tasks, presentation of information in the form of graphic schemes, modeling of communicative situations, preparation and presentation of messages, their discussion
Semester: 2				
Didactic unit: Science, Technology, Society (Science, Technologiy, Society)				
1. Scientific achievements in the selected industry.	6	8	1, 2	Reading, translation, listening to audio advertists, performing written lexico-grammatical and speech tasks, presentation of information in the form of graphic schemes, modeling communicative situations, preparation and presentation of reports, discussing them

2. Modern Technologies and Innovations in The selected industry.	6	8	1	Reading, translation, listening to audio advertists, performing written lexico-grammatical and speech tasks, presentation of information in the form of graphic schemes, modeling communicative situations, preparation and presentation of reports, discussing them
Didactic unit: Basics of Engineering (Fundamentals of Engineering)				
3. Systems, processes, planning, design.	8	10	1, 2	Reading, translation of textual materials, listening to audio advertists, performing written language and speech tasks, modeling communicative situations, preparation and presentation of messages, their discussion
4. Z-conversion and discrete-temporal transformation Fourier.	8	10	1, 2	Reading, translation, listening to audio advertists, performing oral and written lexico-grammatical, speech tasks, modeling of communicative situations, preparation and presentation of communications, projects, their discussion
Semester: 3				
Didactic unit: Future Profession (Future Profession)				
1. Objectives, tasks. The content of future professional activities, the requirements for a specialist of this direction of preparation, duties.	4	12	1, 2	Reading, translation, listening to audio advertists, execution of written vocabulary -Grammatic and speech tasks, presentation of information in the form of graphic schemes, modeling communicative situations, preparation and presentation of oral messages, their discussion
2. Job search. Device for work.	6	12	1, 2	Reading, translation of text materials, listening to audio advertists, performing written lexico-grammatical and speech tasks, modeling communicative situations, preparation and presentation of communications, Projects, discussion
3. Features of intercultural communication in professional activities. Types of business crops. Business trip. Meetings. Conversation. Projects. Presentations.	8	12	1, 2	Reading, translation of text materials, listening to audio advertists, performing written lexico-grammatical and speech tasks, modeling communicative situations, preparation and presentation of communications, Projects, discussion
Semester: 4				
Didactic unit: English for special purposes (ESP)				

1. Safety of vital activity in the technosphere. Safety of technological processes and industries. Labor safety.	8	18	1, 2	Reading, translation of the texts of professional content, the execution of oral and written lexico-grammatical, speech tasks, modeling of communicative situations, preparation and presentation of reports, messages, their discussion
2. Engineering environmental protection. Protection of the natural environment and resource saving. Fire safety. Protection in emergency situations.	8	18	1, 2	Reading, translation, listening to audio advertists, performing oral and written lexico-grammatical and speech tasks, modeling of communicative situations, preparation and presentation of reports, their discussion

Literary sources

Main literature

1. ЭБС IPRbooks [Электронный ресурс] : электронно-библиотечная система. - [Россия], 2010. - Режим доступа: http://www.iprbookshop.ru/. - Загл. с экрана.

2. ЭБС IPRbooks [Электронный ресурс] : электронно-библиотечная система. - [Россия], 2010. - Режим доступа: http://www.iprbookshop.ru/. - Загл. с экрана.

3. ЭБС IPRbooks [Электронный ресурс] : электронно-библиотечная система. - [Россия], 2010. - Режим доступа: http://www.iprbookshop.ru/. - Загл. с экрана.

4. ЭБС IPRbooks [Электронный ресурс] : электронно-библиотечная система. - [Россия], 2010. - Режим доступа: http://www.iprbookshop.ru/. - Загл. с экрана.

Additional literature

1. ЭБС IPRbooks [Электронный ресурс] : электронно-библиотечная система. - [Россия], 2010. - Режим доступа: http://www.iprbookshop.ru/. - Загл. с экрана.

2. ЭБС IPRbooks [Электронный ресурс] : электронно-библиотечная система. - [Россия], 2010. - Режим доступа: http://www.iprbookshop.ru/. - Загл. с экрана.

Internet resources

1. Мультитран [Электронный ресурс] : электронные словари : сайт. - Режим доступа: http://www.multitran.ru/c/m.exe?a=1&SHL=2. - Загл. с экрана.

2. http://elibrary.nstu.ru/

3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

5. http://znanium.com/

Methodical support and software

Methodological support

1. ЭБС IPRbooks [Электронный ресурс] : электронно-библиотечная система. - [Россия], 2010. - Режим доступа: http://www.iprbookshop.ru/. - Загл. с экрана.

2. ЭБС IPRbooks [Электронный ресурс] : электронно-библиотечная система. - [Россия], 2010. - Режим доступа: http://www.iprbookshop.ru/. - Загл. с экрана.

3. Елфимова Н. В. Active English [Электронный ресурс]. Ч. 1 : электронный учебно-методический комплекс / Н. В. Елфимова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2014]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000202971. - Загл. с экрана.

4. Китова Е. Т. Cross-cultural communication [Электронный ресурс] : электронный учебно-методический комплекс / Е. Т. Китова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2017]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000230335. - Загл. с экрана.

5. Китова Е. Т. Методические рекомендации по организации самостоятельной работы студентов при изучении английского языка [Электронный ресурс] : учебно-методическое пособие / Е. Т. Китова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2016]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000230334. - Загл. с экрана.

6. Polyankina S. Y. Руководство по подготовке презентаций на английском языке [Электронный ресурс] : электронный учебно-методический комплекс / S. Y. Polyankina ; Новосиб. гос. техн. ун-т. - Новосибирск, [2015]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000214342. - Загл. с экрана.

7. Шабунина К. Д. Иностранный язык [Электронный ресурс] : электронный учебно-методический комплекс [направление подготовки: 20.03.01 Техносферная безопасность] / К. Д. Шабунина, Е. С. Рахметова, Е. С. Рожкова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2017]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000234570. - Загл. с экрана.

8. Морозова М. А. Deutsch fur Nutzer von Informations- und Kommunikationstechnologien [Электронный ресурс] : электронный учебно-методический комплекс / М. А. Морозова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2016]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000232913. - Загл. с экрана.

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Philosophy

Course: 2, semester : 4

		Semester
№	**Kind of activity**	**4**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	66
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	12
8	Consultations, hours	10
9	Independent work, hours	42

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
uses a systematic approach to solve problems
is able to perceive the intercultural diversity of society in socio-historical ohm, ethical and philosophical contexts; *regarding the following learning results*:
has practical experience in analyzing philosophical and historical facts, the experience of assessing cultural phenomena.
knows the main categories of philosophy, the laws of historical development, the basics of intercultural communication.

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
knows the main categories of philosophy, the laws of historical development, the basics of intercultural communication.	
1. to know the background of the appearance of philosophical knowledge	Lections; Seminars; Independent work

2. to know the subject, sections and functions of philosophy	Lections; Seminars; Independent work
3. to know the iterative methods for solving real and complex sludge with rarefied matrices; Schemes of the Slane	Lections; Seminars; Independent work
4. to know the doctrine of matter, a modern scientific picture of the world, the doctrine of being, philosophical concept of space and time, relativistic model of reality	Lections; Seminars; Independent work
5. Know the content and problematic in the philosophical theory of knowledge, its main forms and strategies	Lections; Seminars; Independent work
6. Know the philosophical concepts of science and technology	Lections; Seminars; Independent work
7. Know the philosophical content of the problem of occurrence, nature and essence of consciousness	Lections; Seminars; Independent work
8. to know the foundations of philosophical anthropology	Lections; Seminars; Independent work
9. to know the structure of social systems, the doctrine of culture and the doctrine of values ??	Lections; Seminars; Independent work
10. Know the appropriate physico-mathematical apparatus, methods of analysis and modeling, theoretical and experimental research of processes and phenomena underlying the principles of electrical equipment and Systems	Lections; Seminars; Independent work
11. to know the content of historical progress and the philosophical interpretation of global human problems	Lections; Seminars; Independent work
12. to know the specifics of moral, moral and spiritual levels of human existence	Lections; Seminars; Independent work
has practical experience in analyzing philosophical and historical facts, the experience of assessing cultural phenomena.	
13. knows the main, including the Communicative Features of Runet, significant Russian-speaking resources and their role in the communicative processes of Russia	Lections; Seminars; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
14.. To be able to find information in Internet	Seminars; Independent work
uses a systematic approach to solve problems	
15. To be able to apply modern methods of developing mathematical models of objects and processes	Seminars; Independent work
has practical experience in analyzing philosophical and historical facts, the experience of assessing cultural phenomena.	
16. To be able to perform a philosophical ethical analysis of the actions of a person and the behavior of society as a whole	Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Streaming input-output in C ++				
1. Worldview as a subject of philosophy.		2	1, 13	levels of worldview. The content of worldview. Forms of worldview. The relationship of philosophy with mythology, religion, art and science.

2. The subject of philosophy.		2	2	Structure of philosophical knowledge. The main aspects of philosophical knowledge. The main methods of philosophy (metaphysical, dialectical, phenomenological, hermeneutic). Functions of philosophy.
Didactic unit: Information aspects of systems study				
3. The origin of philosophical theoretical thought, its cultural and historical prerequisites.		1	1	axial time in K. Yaspersu. The ratio of the three main centers of civilization of the ancient world - Ancient Chinese, Ancient Indian and European. Formation of Eastern and Western philosophizing styles.
4. Eastern philosophy.		1	3	Major schools and directions of ancient Indian philosophy: Orthodox (Vedanta, Yoga, Nyaya, Wai-Sheshika, Santa, Mimans) and non-sour-cell (Jainism, Buddhism). Major schools and directions of ancient Chinese philosophy: Taoism, Confucianism, Moism, Legherness, School of Names.
5. Antique philosophy.		1	3	Prerequisites of philosophical knowledge in ancient Greece. Miletsky school. Eleate school. Heraklit. EmPedocl. Anaxagor. Pytagoreism. Antique atomism. Softers. Socrates. Plato. Aristotle. Kinism. Hellenistic period of antique philosophy: epicureism, stoicism, skepticism, neoplatonism.

6. Medieval philosophy.		1	3	Backgrounds of Christian worldview. Apologetics (TERTULLYAN), Patriote (Avrellius Augustine), Scholasty (Boeations, Albert Great). Classical medieval philosophy (Thomas Aquinas). Philosophical thought in Byzantium (John Damaskin). Mysticism (Bonaventure, Maister Eckhart). The main philosophical problems of medieval philosophy: the divine predestination and freedom of humans, the theotice, the ratio of the mind and faith, the interaction of the soul and body, the essence and existence, created and the eternal, the problem of evidence of the existence of God, the problem of universal (realism and nominalism). Soteriology
7. The philosophy of the Renaissance.		1	3	the basics of humanism (secularization of public consciousness, anthropocentrism, anti-Ossetism. Hedonism, pluralism, individualism). Religious and naturophilosophical pantheism (N. Kuzansky, D. Bruno). Background of scientific knowledge (L. Da Vinci, B. Telezio, N. Copernicus). Social philosophy (T. Ma, T. Kompanel). Political philosophy (N. Makiavelli). Reformation philosophy (M. Luther, J. Calvin).
8. The philosophy of the new time.		1	3	The scientific revolution of the 20th century and its influence on the features of the consideration of the main fi-losophical problems. Rationalism (R. Descart, B. Spinosa). Sensualism (D. Lokk, D. Yum). Empirism (F. Bacon). Idealism (Labitz, D. Berkeley). Formation of the scientific painting of the world (T. Brage, I. Kepler, Galilee, I. Newton, H. Guigens). Materialism (P. Golbach, J. Lameter, K. Gelving).

9. Philosophy of the era of classicism.		1	3	Transcendentalism I. Kant. Objective idealism and dialectical method of Gegel. Materialism L. Feyerbach. Marxism. Antiscentism (A. Shopenhauer, F. Nietzsche).
10. The main directions of modern philosophy.		1	3	The first positivism (O. Kont, D. Mill, Spencer). Natural scientific agnosticism (I. Muller, Gelmagolz, K. Pirizon). Empiricism (E. Makh, R. Avenairius). Conventmentalism (P. Dugen, A. Poankar). Nezozenism and analytical philosophy (B. Russell, L. Wittgenstein, Viennese circle). Existentialism (S. Kierkegore, K. Yaspers, J.-P. Sartre, A. Kama). Freuddism and Neofreedism (Z. Freud, K. Jung, E. Fromm). Phenomenology (F. Brentano, E. Gusserl). Hermenevics (G.-h. Gadamen, P. Riker). Postmodernism (J. Lacan, J. Derrida, M. Foucault).
11. Russian Philosophy.		1	3	Practical and artistic and figurative orientation of Russian philosophy. The emergence of Russian philosophy (M.V. Lomonosov, A.N. Radishchev). For example, in Russia (Russian idea, Westerners and Slavophiles, fuels, Eurasians). Russian religious philosophy (K.N. Leontiev, F.M. Dostoevsky, L.N. Tolstoy, V.S. Soloviev, N.A. Berdyaev, S.N. Bulgakov). Criticism of rationalism, sensualism and empiricism (L.M. Lopatin, S.N. Trubetskaya). The theory of unity (A.S. Khomyakov, S.N. Trubetskaya, S.L. Frank).
Didactic unit: Functional schemes of automatic control systems.				
12. Teaching about being.		2	4	Genesis, non-existence, invention. Objective and subjective being. The main modes of Genesis (real, virtual, mental, perfect). The doctrine of matter. Models of matter (substrate, substantial, attribute, relational, quantum). Concepts of space and time. The main problems of the philosophy of space and time.

13. Development Decision.		2	4	Determinism and intederism. Locality and nonlocality. Self-organization matter. Chaos and order. The second law of thermodynamics and the problem of the orderness of the universe. Synergetics and anti-satropine forces. Relativistic model of reality (V.V. Kryukov).
Didactic unit: Philosophy Cognition				
14. Cognition as a reflection of reality. Structure of truth (shape and content). Subjective aspects of truth (dispositional, motivational, sociocultural). Objective aspects of truth (existent, axiological, praxiological). Forms of knowledge (sensual and rational).		2	5	The subject and object of knowledge. Cognitive human abilities. Cognition and creativity. Understanding and explanation. Sensual and rational stages of knowledge. Gnoseological models (objectivist, subjectivist, dialectical, symbolic). Cognitive strategies (rationalism, empiricism, sensualism, irrationalism, intuivitism, panochism). Pessimistic doctrines of gnoseology (skepticism, agnosticism). Optimistic doctrines of gnoseology (immanestist, platonic, theological, transcendentalist, realistic, praxiological). Truth criteria (correspondent, coherent, pragmatic, conventional, authoritarian).
15. Scientific knowledge.		2	6	Levels of scientific knowledge (empirical and theoretical). Forms of scientific knowledge (fact, hypothesis, law, principle, theory). Empirical research methods. Theoretical research methods. Scientific knowledge concepts (K. Popper, I. Lakatos, T. Kun, P. Feyebend).
Didactic unit: Philms Consciousness				

16. Consciousness, its origin and essence.		2	7	Consciousness as a substance, attribute , Modeus. Properties of consciousness (ideality, subjectivity, intentionality, apoditicism). Consciousness and knowledge. Topographic structure of consciousness (conscious, preliminary, unconscious, superconscious). Intuition and imagination. Thinking, memory, will, emotions. Language and thinking. The problem of artificial intelligence. Consciousness, self-consciousness and personality. Freed out of the will of man. Consciousness and its importance for human practice.
17. Paradoxes of consciousness (paradox of evidence, paradox of gnoseological closetness, paradox of ontological crigngement, paradox of introspection, unpretentious paradox). Problems of consciousness (ontic, ontological, methodological, psychophysical, genetic).		2	7	Basic philosophical theories of consciousness: idealistic (D. Berkeley, G. Hegel), Dualistic (R. Descartes, N. Malbransh, A. Geylinx), Inactivityist (D. Eccles, K. Popper), modular (D. Fodor, S. Pinker, N. Khomsky), Functionalist (H. Patnham, D. Dennet), Naturalist (D. Serll), Materialist (D. Lewis, D. Armstrong), Epiphenomenist (D. Chalmers).
Didactic unit: human philosophy				
18. Objectivist (natural-objective, ideal-given, sociological) and subjectivist human concepts (psychoanalytic, existential, etc.).		0,5	8	The main philosophical concepts of the essence of human being (comoescentrism, logocentricism, theocentrism, anthropocentrism, naturocentrism, ontocentrism). Anthropogenesis Theories (Evolutionism, Creationism).
19. Natural (biological) and public (social) in person.		2	8	specificity of human activity. Man as a spiritual creature. Spirituality and confusion. Meaning of life. Fate and freedom. Social essence of man. Man, individual, personality, personality. Asymptotes of human existence. Socialization of the personality.
Didactic unit: Culture philosophy				
20. The concept of the social system.		1	9	Culture as the essence of society. Noosphere as a way of life of society. Civilization as a stage in the development of society.

21. values ??as elements of culture in the output file.		1,5	9	Values, their nature and principles of classification. Evolution of values ??(philosophical aspect). Value and goal. Value and truth. Value and evaluation. Value and norm. Morality and morality: general and special. Hierarchy of moral and moral values. Value characteristic of good and evil. The problem of forming or updating moral values. Ethical and aesthetic values.
Didactic unit: Social philosophy				
22. Definition and subject of social philosophy.		2	10	Types of society. Social structure of society. Political life of society. Economic life of society. Spiritual life of society. Society as a self-developing system. Civil society and state. Analytical and synthetic concepts of civilizations. Problems of crisis, decay, take-off and decline of civilizations.
23. Public consciousness.		2	11, 12	driving forces of public life. Objectives of social development. Logic history and its meaning. The concepts of progress and regression. The problem of typology of the historical process (O. Spengler, K. Marx, A. Tynby, M. Weber). Theory of Social Progress (D. Vico, J. Kondors, J.-zh. Rousseau). Man in the historical process.
Didactic unit: The physical level of the model OSI				
24. Modern generallylanet civilization, its features and contradictions.		2	11	Selecting parameters of regulators for DC and AC electric drives

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Streaming input-output in C ++				

1. Worldview as a subject of philosophy.	0,5	0,5	13, 14	Working at the seminar lesson, student: - gets acquainted with the versions of the worldview and their grounds, getting the opportunity to assess their own; - compares philosophy with mythology, religion, art and science; - realizes the basis of the excellent scientific knowledge system from unscientific.
2. The subject of philosophy and specificity of philosophical knowledge.	0,5	0,5	14, 15, 2	Working at the seminar lesson, student: - It is understood in the specifics of the subject area of ??philosophy; - meets the structure of philosophical knowledge and its main aspects; - learns to apply the main methods of philosophy; - studies the functions of philosophy.
Didactic unit: Information aspects of systems study				
3. The birth of philosophical thought, its cultural and historical prerequisites.		0,5	1	Working at the seminar lesson, student: - studies the background of philosophical knowledge; - gets acquainted with axial time according to K. Yaspers; - Compare Eastern and Western styles of philosophizing.
4. Eastern philosophy.		0,5	3	Working at the seminar lesson, student: - meets the main schools and directions of Eastern Philosophy; - compares the ancient Indian and Oldequime philosophy.
5. Antique philosophy. Background of philosophical knowledge in ancient Greece. Miletsky school. Eleate school. Heraklit. EmPedocl. Anaxagor. Pytagoreism. Antique atomism. Softers. Socrates. Plato. Aristotle. Kinism. Hellenistic period of antique philosophy: epicureism, stoicism, skepticism, neoplatonism.		0,5	3	Working at the seminar lesson, student: - studies the background of philosophical knowledge in ancient Greece; - analyzes the submissions of the main schools of antique philosophy.

6. Medieval philosophy.		0,5	3	Working at the seminar lesson, student: - studies the prerequisites of the Christian worldview; - analyzes the main philosophical problems of medieval philosophy.
7. The philosophy of the Renaissance.		0,5	3	Working at the seminar lesson, student: - studies the foundations of humanism of the Renaissance; - analyzes the prerequisites for scientific knowledge; - Exploring the features of the philosophy of the Renaissance.
8. The philosophy of the new time.		0,5	3	Working at the seminar lesson, student: - explores the premises of the scientific revolution of the 19th century and its influence on philosophical thinking; - analyzes the philosophical aspects of the formation of the scientific picture of the world; - studies materialistic trends in the philosophy of the new time; - Compare rationalism and empirism.
9. Philosophy of the era of classicism.		0,5	3	Working at the seminar lesson, student: - studies the transcendental philosophy of I. Kant; - learn to use the dialectical method of Gegel; - meets the antisciented philosophy of A. Shopenhauer and F. Nietzsche; - analyzes the main provisions of the materialistic philosophy of L. Feyerbach; - Explores the basics of Marxism.
10. The main directions of modern philosophy.		0,5	3	working at the seminar lesson, student: - analyzes such directions of modern philosophy as positivism, existentialism, neopreidism, phenomenology, hermeneutics, postmodernism; - Based on their comparison, it is studyable for a critical method.

11. Russian Philosophy.		0,5	3	Working at the seminar lesson, student: - studies the sock ideas of Russian philosophy; - considers the criticism of rationalism, sensualism and empiricism by Russian philosophers; - Analyzes the fundamental prerequisites of the theory of unity.
Didactic unit: Functional schemes of automatic control systems.				
12. Teaching about being.	0,5	1	15, 4	Working at the seminar lesson, student: - gets an idea of ??the content of the concept of "being"; - compares the content of the concepts of "Genesis" and "matter"; - studies philosophical ideas about matter; - analyzes the main problems of the philosophy of space and time.
13. Decision on development.	0,5	1	15, 4	Working at the seminar lesson, student: - compares the metaphysical and dialectical vision of the surrounding world; - explores the concept of determinism and industrialism; - explores the concepts of locality and nonlocality; - analyzes the philosophical problems associated with self-organization of matter.
Didactic unit: Philosophy Cognition				
14. Theory of knowledge.	1	1	14, 5	working at the seminar lesson, student: - reveals the structures and forms of the cognitive process; - explores the epistemological models and theoretical and cognitive strategies; - learns to distinguish the truth objective and subjective; - learns to use truth criteria; - explains the need for absolute and relative truth; - shows the possibility of logical evidence of truth.

15. Scientific knowledge.	1	1	15, 5, 6	Working at the seminar lesson, student: - learns to distinguish scientific knowledge from unscientific; - explore the levels and forms of scientific knowledge; - meets the basic methods of empirical and theoretical research; - Analyzes the main concepts of scientific knowledge.
Didactic unit: Philms Consciousness				
16. Consciousness, its origin and essence.	0,5	0,5	7	Working at the seminar lesson, student: - trying to understand what consciousness is; - explores the main properties of consciousness; - Finds grounds for an answer to the question of the mental possibilities of the car.
17. Theory of consciousness.	0,5	0,5	7	Working at the seminar lesson, student: - analyzes the main paradoxes and problems of philosophy of consciousness; - compares the main philosophical theories of consciousness.
Didactic unit: human philosophy				
18. Philosophical concept of man.	1	1	8	Working at the seminar lesson, student: - learns a philosophical understanding of a person based on the identification of specific signs of existence; - compares various philosophical concepts of man; - compares various anthropogenesis theories.
19. The essence of human being.	1	1	8	Working at the seminar lesson, student: - compares the projections of the human essence on various planes of being and study their integration into a single ontological whole; - analyzes the specificity of human activity; - reflects on the spiritual essence of man; - conducts a demarcation line between individuals, individual, personality and personality; - Explore the mechanisms of socialization of the personality.

Didactic unit: Culture philosophy				
20. Socio-cultural genesis of a person.	1	1	9	Working at the seminar lesson, student: - characterizes cultural factors of social life and human existence; - gets an idea of ??the content of the concept of "social system"; - considers culture as the essence of society; - considers the nosphere as a way of life of society; - Considers civilization as a stage in the development of society.
21. Doctrine of values.	1	1	16, 9	Working at the seminar lesson, student: - considers values ??as elements of culture; - studies the types of values ??and the principles of their hierarchical classification; - finds and interprets the value content of human being; - reflects on the nature of good and evil.
Didactic unit: Social philosophy				
22. Definition and subject of social philosophy.	1	1	10	Working at the seminar lesson, student: - considers various types of society and its social structure; - analyzes and compares various levels of public life; - explores society as a self-developing system; - finds approaches to solving basic problems in the development of civilizations.
23. Public consciousness.	1	1	11, 12	Working at the seminar lesson, student: - formulates the main signs of the forms of public consciousness and justifies their need for public life; - explore the driving forces of public life and the goal of social development; - explores the main trends and forms of the principal process; - allocates the main signs of the progress of public life; - Analyzes the main problems of social progress.
Didactic unit: The physical level of the model OSI				

24. The philosophy of global problems of humanity.	1	1,5	11, 16	Working at the seminar lesson, student: - reveals the features and contradictions modern generallylanetary civilization; - classifies and analyzes global problems of humanities; - reflects on the possible scenarios of the future in the framework of the generallylanetary civilization; - predicts the development of human civilization on the basis of certain mechanisms of the historical process and the specified signs of the modern public being of a person.

Literary sources

Main literature

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Internet resources

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2. http://elibrary.nstu.ru/

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Methodical support and software

Methodological support

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2. Сандакова Л. Б. Философия науки [Электронный ресурс] : электронный учебно-методический комплекс / Л. Б. Сандакова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2021]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000243409. - Загл. с экрана.

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM

Course: 1, semester : 1

		Semester
№	Kind of activity	1
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	66
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	18
8	Consultations, hours	10
9	Independent work, hours	42

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
is able to perceive the intercultural diversity of society in socio-historical ohm, ethical and philosophical contexts; *regarding the following learning results*:
has practical experience in analyzing philosophical and historical facts, the experience of assessing cultural phenomena.
knows the main categories of philosophy, the laws of historical development, the basics of intercultural communication.

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. UK-1. 1 1. Search for the necessary information, its critical analysis and summarizes the results of the analysis to solve the task	Lections; Seminars; Independent work
knows the main categories of philosophy, the laws of historical development, the basics of intercultural communication.	

2. UK-5. 1 1. Know the main categories of philosophy, the laws of historical development, the basics of intercultural communication.	Lections; Seminars; Independent work
has practical experience in analyzing philosophical and historical facts, the experience of assessing cultural phenomena.	
3. UK-8. 3 3. Owns the victim first aid skills.	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: from primitiveness to new time				
1. Primitive society. Ancient world.		2	1, 2, 3	Lecture
2. Middle Ages: Features of European and Arab-Muslim civilizations		2	1, 2, 3	Lecture
Didactic unit: Differential calculus of the functions of a valid variable				
3. Eastern Slavs in antiquity. Old Russian state in the IX-XII centuries.		2	1, 2, 3	Lecture
4. Specific period (feudal fragmentation). Fighting Rus with foreign invaders at the beginning of the XIII century.		2	1, 3	Lecture
5. Education of a single Russian state in the XV-XVI centuries		2	1, 2, 3	Lecture
6. The troubled time of the beginning of the XVII century in Russia		2	1, 3	Lecture
Didactic unit: World and Russia in a new time				
7. The beginning of the new time. Russia in the XVII century.		2	1, 3	Lecture
8. Century XVIII: development trends in the world and Russia. The reforms of Peter I and Catherine II		2	1, 3	Lecture
9. Europe and Russia in the first half of the XIX.		2	1, 3	Lecture
10. Great reforms of 1860-1870s. Russia in the pureform period		2	1, 3	Lecture
Didactic unit: World in the twentieth century				
11. Russia and the world at the beginning of the twentieth century. From the revolution to the revolution. World War II		2	1, 3	Lecture
12. 1917. Soviet Russia. Civil War.		4	1, 3	Lecture

13. World in the interwar period: the main development tests. USSR on the way of building socialism		2	1, 3	Lecture
14. Second World War		2	1, 3	Lecture
15. Peace in the second half of the twentieth century. From late Stalinism to Perestroika		4	1, 3	Lecture
16. Perestroika. Russian Federation in the 1990s - early 2000s		2	1, 3	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: from primitiveness to new time				
1. The Ancient East and Antiquity	2	2	1, 2, 3	Practical (seminars) occupation
2. Middle Ages: from the barbaric world to early capitalism	2	2	1, 2, 3	Practice (seminar occupation)
Didactic unit: Differential calculus of the functions of a valid variable				
3. The formation of a single centralized state	2	2	1, 2, 3	Practical (seminars) occupation
5. The reform of Ivan the Terrible. Official	2	2	1, 2, 3	Practical (seminars) occupation
Didactic unit: World and Russia in a new time				
4. bourgeois revolutions in Europe in the XVII-XVIII centuries.	2	2	1, 2, 3	Practical (seminars) occupation
8. Russian Empire in the XVIII century. From Peter I to Catherine II	2	2	1, 2, 3	Practical (seminars) occupation
9. Russia in the XIX century.	2	2	1, 2, 3	Practical (seminars) occupation
Didactic unit: World in the twentieth century				
6. Revolutionary process in Russia and in the world at the beginning of the twentieth century: causes, features, results	2	2	1, 2, 3	Practical (seminars) occupation
7. Great Patriotic War	2	2	1, 2, 3	Practical (seminars) occupation

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: from primitiveness to new time				
1. Ancient Greece - The cradle of the European civilization		2	1, 2, 3	CRS
2. Ancient Rome: from the origin to bloom and decline		2	1, 2, 3	CRS

3. Barbaric world		2	1, 2, 3	CRS
Didactic unit: Differential calculus of the functions of a valid variable				
4. Early Middle Ages. Empire Karl Great		2	1, 2, 3	CRS
5. Byzantine civilization: Development Features		2	1, 2, 3	CRS
6. Classic European medieval		2	1, 2, 3	CRS
7. Education of the national states in Europe		2	1, 2	CRS
8. Revival and Reformation		2	1, 2, 3	CRS
10. Great geographical discoveries and also role in the genesis of capitalism in Europe		2	1, 2	CRS
Didactic unit: World and Russia in a new time				
10. Napoleonic Wars		2	1, 2	CRS
11. Eastern (Crimean) War		2	1, 2	CRS
Didactic unit: World in the twentieth century				
12. first World War		2	1, 2	CRS
13. Great depression and the beginning of fascism in Europe		2	1, 2	CRS
14. Two-polar system of international relations in the second half of the twentieth century.		2	1, 2	CRS

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Main literature

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2. Захарова, Л. Л. История мировых цивилизаций : учебное пособие / Л. Л. Захарова. — Томск : Томский государственный университет систем управления и радиоэлектроники, Эль Контент, 2012. — 146 c. — ISBN 978-5-4332-0038-8. — Текст : электронный // Электронно-библиотечная система IPR BOOKS : [сайт]. — URL: http://www.iprbookshop.ru/13884.html (дата обращения: 02.03.2021). — Режим доступа: для авторизир. пользователей

3. Всемирная история : учебник для студентов вузов / Г. Б. Поляк, А. Н. Маркова, И. А. Андреева [и др.] ; под редакцией Г. Б. Поляк, А. Н. Маркова. — 3-е изд. — Москва : ЮНИТИ-ДАНА, 2017. — 888 c. — ISBN 978-5-238-01493-7. — Текст : электронный // Электронно-библиотечная система IPR BOOKS : [сайт]. — URL: http://www.iprbookshop.ru/71211.html (дата обращения: 02.03.2021). — Режим доступа: для авторизир. пользователей

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Additional literature

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2. История мировых цивилизаций : методические указания к практическим занятиям и самостоятельной работе для студентов бакалавриата, обучающихся по направлению подготовки 38.03.04 Государственное и муниципальное управление / составители Т. Л. Пантелеева, Ю. В. Посвятенко. — Москва : Московский государственный строительный университет, Ай Пи Эр Медиа, ЭБС АСВ, 2016. — 28 с. — ISBN 978-5-7264-1417-1. — Текст : электронный // Электронно-библиотечная система IPR BOOKS : [сайт]. — URL: http://www.iprbookshop.ru/59023.html (дата обращения: 02.03.2021). — Режим доступа: для авторизир. пользователей

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3. История России, всемирная история [Электронный ресурс]. - 2005-2019. - Режим доступа: http://www.istorya.ru/. - Загл. с экрана.

4. https://e.lanbook.com/

5. http://www.iprbookshop.ru/

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Methodical support and software

Methodological support

1. Степаненко Л. В. История России в контексте общемировых исторических процессов [Электронный ресурс] : электронный учебно-методический комплекс / Л. В. Степаненко ; Новосиб. гос. техн. ун-т. - Новосибирск, [2020]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000242588. - Загл. с экрана.

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Specialized software

Использование специализированного программного обеспечения для изучения дисциплины не требуется

ANNOTATION OF THE PROGRAM
Distribution

Course: 1, semester : 2

		Semester
№	**Kind of activity**	**2**
1	Total credits	2
2	Total hours	72
3	Total classes in the contact form, hours	61
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	0
8	Consultations, hours	5
9	Independent work, hours	11

External requirements

is able to determine the range of tasks in the framework of the target and choose the best ways to solve them, based on existing legal norms, resources available and restrictions; *regarding the following learning results*:
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	
1. UK-2. 2 2. Selects the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 2				
Didactic unit: Basics of state theory				

1. Basics of state theory	2	2	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Basics of the theory of law				
2. Fundamentals of the theory of law		4	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Basic Requirements for Relay Protection Block and Features of Electrical Equipment and Block Systems Generator Transformer.				
3. Basics of constitutional law		4	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Basics of administrative law				
4. Basics of administrative law		4	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Fundamentals of criminal law				
5. Fundamentals of criminal law. Countering Corruption	1	4	1	An oral survey of students is carried out, solving situational problems on the topic, discussion of abstracts on the chosen topic, consideration of various points of view on problematic issues
Didactic unit: Civil Basics Rights				
6. Basics of civil law	1	6	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Basics of labor law				

7. Fundamentals of labor law		4	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Basics of family law				
8. Fundamentals of family law		4	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Basics of legal regulation of professional activities				
9. Basics of legal regulation of professional activities		2	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Basics of environmental law				
10. Basics of environmental law		2	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 2				
Didactic unit: Basics of state theory				
1. Basics of state theory		2	1	In a practical lesson, an oral survey of students is carried out, the solution of situational problems on the topic, the presentation of students on issues marked in the program of seminary classes, discussing abstracts on the topic.
Didactic unit: Basics of the theory of law				

2. Fundamentals of the theory of law	1	2	1	An oral survey of students is carried out, solving situational problems on the topic, speaking of students on issues marked in the program of seminary classes, discussing abstracts on the chosen topic, consideration of various points of view on problematic issues.
Didactic unit: Basic Requirements for Relay Protection Block and Features of Electrical Equipment and Block Systems Generator Transformer.				
3. Basics of constitutional law	1	2	1	An oral survey of students is carried out, the solution of situational problems on the topic, the presentation of students on issues marked in the program of practical exercises. Students are conducted by a discussion on the role and importance of the Constitution of the Russian Federation.
Didactic unit: Basics of administrative law				
4. Basics of administrative law	1	2	1	An oral survey of students is carried out, solving situational problems on the topic, discussion of abstracts on the chosen topic, consideration of various points of view on problematic issues.
Didactic unit: Fundamentals of criminal law				
5. Fundamentals of criminal law. Countering Corruption		1	1	measures the horizontal component of the magnetic field of the Earth . Experimentally examines the magnetic field of the circular current. The schedule builds, compares with theoretical dependence.
Didactic unit: Civil Basics Rights				
6. Basics of civil law	1	2	1	An oral survey of students is carried out, solving situational problems on the topic, discussion of abstracts on the chosen topic, consideration of various points of view on problematic issues.
Didactic unit: Basics of labor law				
7. Fundamentals of labor law	1	2	1	An oral survey of students is carried out, solving situational problems on the topic, discussion of abstracts on the chosen topic, consideration of various points of view on problematic issues.
Didactic unit: Basics of family law				

8. Fundamentals of family law	1	5	1	In a practical occupation, an oral survey of students is carried out, solving situational problems on the topic, discussion of essays on the chosen topic.

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10. http://znanium.com/

Methodical support and software

Methodological support

1. Поляков С. А. Правоведение [Электронный ресурс] : электронный учебно-методический комплекс / С. А. Поляков ; Новосиб. гос. техн. ун-т. - Новосибирск, [2020]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000242449. - Загл. с экрана.

2. Коровин Н. К. Правоведение [Электронный ресурс] : электронный учебно-методический комплекс / Н. К. Коровин ; Новосиб. гос. техн. ун-т. - Новосибирск, [2013]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000181677. - Загл. с экрана.

Specialized software

1 Reference Legal System LLC "Luxith" ATP "ConsultantPlus"

2 Reference Legal System OOO "Guarantor" ATP "Garant"

ANNOTATION OF THE PROGRAM
Highest mathematics

Course: 1 2, semester ы : 1 2 3

		Semester		
№	**Kind of activity**	**1**	**2**	**3**
1	Total credits	7	6	3
2	Total hours	252	216	108
3	Total classes in the contact form, hours	167	164	40
4	Lectures, hours	72	72	18
5	Practical lessons, hours	72	72	18
6	Laboratory studies, hours	0	0	0
7	of them in an active and interactive form, hours	18	0	0
8	Consultations, hours	21	18	2
9	Independent work, hours	85	52	68

External requirements

can apply the appropriate physico-mathematical apparatus, methods of analysis and modeling, Theoretical and experimental study in solving professional problems; *regarding the following learning results*:
applies a mathematical apparatus of research of functions, linear algebra, differential and integral calculation, rows, differential equations, the theory of complex variable functions, numerical methods
is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. about mathematics as a special way of knowledge of the world, the generality of its concepts and ideas;	Lections; Independent work
2. about mathematical analysis as the most important section of mathematics used in modern mathematical Modeling	Lections; Independent work
applies a mathematical apparatus of research of functions, linear algebra, differential and integral calculation, rows, differential equations, the theory of complex variable functions, numerical methods	

3. Basic concepts of higher mathematics: limit of sequence and function, derivative and private derivatives, differential, integral Riemann from the function of one variable, incomprehensible integrals and multiple integrals, ordinary differential equation, numerical row, power row, Fourier series, Fourier integral ;	Lections; Independent work
4. The formulation and methods of solving the main tasks associated with the concepts listed above	Lections; Independent work
5. UK-1. 2 2. To be able to: apply search techniques, collection and processing information; Creit analysis and synthesis of information obtained from different sources; Apply a system approach to solve the tasks.	Seminars; Independent work
6. differentiate the functions of one variable specified explicitly, parametrically and implicitly; carry out their full study using differential calculus methods; differentiate the functions of many variables;	Seminars; Independent work
7.	Seminars; Independent work
8. calculate double, triple and curvilinear integrals and use them when solving the tasks of geometry and physics;	Seminars; Independent work
9. Find general solutions and solutions to Cauchy problems for the basic classes of ordinary differential equations of the first and higher orders, solve the simplest systems of ordinary differential equations;	Seminars; Independent work
10. to determine the convergence of numerical and functional rows, represent Functions in the form of Taylor and Fourier series and in the form of the Fourier integral;	Seminars; Independent work
11. Translate information from the language of a specific task into the language of mathematical symbols and build mathematical models of simplest systems and processes in natural science and technique;	Lections; Seminars; Independent work
12. choose methods for solving problems based on the analysis of the constructed mathematical model.	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: Elements of modern physics				
1. 2. Elements and nodes with memory.		14	3, 4	Work with abstract
Didactic unit: Diagnostic Opportunities PC				
2. . The subsystem generated by the set, its structure. 2.2. Congrunce, factor algebra, theorem on homomorphism. Manifolds. Birkgood theorem. Grilles. Boolean algebras. Stone theorem. The principle of duality for Boolean algebras. Boolean ring. Ideals and filters of Boolean algebra. 2.3. Algebras of relationships. Relational algebras.		18	3, 4	Work with abstract
Didactic unit: Integral calculus of functions of one valid variable				

3. 3.1. The concept of a primitive function, its properties. Uncertain integral, its properties. The main table of uncertain integrals. The main integration methods (summarizing the differential sign, integrating in parts, replacement of the variable). 3.2. Theorem on the decomposition of rational fraction on the sum of the simplest. Integrating rational functions. 3.3. A certain integral as a limit of integrated amounts. The main properties of a specific integral. Middle theorem. 3.4. A certain integral with the variable upper limit and its properties. Formula Newton Labitsa. 3.5. Basic methods for calculating certain integrals. 3.6. Incomplete integrals with infinite limits. Invalous integrals from unlimited functions. 3.7. Appendix of a specific integral to the tasks of geometry: calculating the areas of flat figures, the length of the arc curve, the volume of bodies according to their cross section and the volume of the bodies of rotation.		24	2, 3, 4	Work with abstract
Didactic unit: Differential calculus of the functions of several valid variables				
4. 4.1. The concept of the function of many variables. Definition area, limit and continuity. 4.2. Private derivatives. Full differential and its connection with private derivatives. Tangent plane and normal surface. 4.3. Extremes function 2 variables. Required and sufficient conditions. The greatest and smallest values ??of the function on a closed area. 4.4. Vector Analysis Elements: The derivative of the scalar field in the direction. Gradient.		16	3, 4	Work with abstract
Semester: 2				
Didactic unit: integral calculus of functions of several valid variables				

5. 5.1. Definitions of double and triple integrals, their main properties. 5.2. Configuration of the re-integral. Calculating double and triple integrals in Cartesian coordinates. 5.3. The concept of the curvilinear coordinate system. Polar, cylindrical and spherical coordinate systems. Replacing variables in multiple integrals. 5.4. The curvilinear integrals of the first and second kind, their main properties, calculation. Physical applications. 5.5. Green formula. The conditions for the independence of the curvilinear integral of the second kind from the path of integration.		20	1, 11, 12, 2, 3, 4	Work with abstract
Didactic unit: Differential equations				
6. 6.1. Physical objectives leading to differential equations. Differential equations of first order, basic concepts. Common decision. Cauchy task. The theorem of the existence and uniqueness of the solution of the Cauchy problem. The main classes of equations integrated in quadratures (with separating variables, homogeneous, linear, Bernoulli, in full differentials). 6.2. Differential equations of higher orders. Cauchy task. Equations that reduce the order. 6.3. Linear differential equations, homogeneous and inhomogeneous. The structure of the overall solution. Linear differential equations with constant coefficients. 6.4. Method of variation of arbitrary constants. Equations with the right side of a special type. 6.5. The concept of a system of ordinary differential equations. Normal form. The structure of the overall solution. 6.6. Normal system of linear differential equations with constant coefficients. The solution in the case of simple valid roots of the characteristic equation.		26	1, 2, 3, 4	Work with abstract
Didactic unit: Rows and elements of harmonic analysis				

7. 7.1. Numeric rows. Convergence and sum of the row. Required convergence condition. Actions with rows. Sufficient signs of convergence of aligning rows. 7.2. Signaged rows. Absolute and conditional convergence. Aligning rows. Sign of Leibnia. 7.3. Functional series, region of convergence of the functional series. The concept of uniform convergence. 7.4. Power rows. Abel theorem. Radius of convergence. Properties of power rows. A number of Taylor. Decomposition of the function in power rows. 7.5. Fourier rows. Trigonometric Fourier row. Integral Fourier. 7.6. Orthogonal systems of functions. Fourier row. Fourier coefficients. 7.7. Decomposition in trigonometric Fourier series of functions specified on the interval. Formulation of the conditions for decomposability of functions in a row of Fourier. Decomposition in a Fourier series of even and odd functions. Decomposition in a row of Fourier functions on cosine or sinus. 7.8. Fourier series in comprehensive form. 7.9. Fourier integral in real and comprehensive form.		26	1, 2, 3, 4	Work with abstract
Semester: 3				
Didactic unit: Equations of mathematical physics				
8. Classification of equations in private derivatives. Physical problems leading to equations of mathematical physics		4	1, 3	Work with abstract
9. Setting the simplest boundary value problems for equations of mathematical physics. The method of separation of variables and the method of eigenfunctions and their use to solve the boundary value problems of mathematical physics in a limited area.		6	1, 3	Work with abstract
10. Staging and methods for solving problems of mathematical physics in an unlimited area. Method of similarity and dimensions. 8		8		Work with abstract

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: Elements of modern physics				
1. 1.1. Elementary functions, properties, graphics. 1.2. Graphs of functions specified parametrically and in the polar coordinate system. 1.3. Sequence limit. 1.4. Limit function at point and infinity. Algebraic limit properties. 1.5. The first and second wonderful limits. 1.6. Continuity function. Grocery points and their classification.	4	16	5	Allocate the main elementary functions whose graphs are used for transformations; Build lines given by parametric method and in the polar coordinate system; find out the nature of uncertainty when calculating the limit; Choose a way to disclose uncertainty; investigate continuity functions; Classify the gaps.
Didactic unit: Diagnostic Opportunities PC				
2. 2.1. Derivative function at point. Geometric meaning. 2.2. Derivative complex function. Derived reverse function. The derivative of the function specified parametrically implicitly. 2.3. Lopital rule. 2.4. Monotonicity of the function, extremum function. Required and sufficient conditions of monotony and extremum function. The greatest and smallest values ??of the function on the segment. 2.5. Conversion and concavity function graphics. Points of inflection. Required and sufficient inflection conditions. Asymptotes of curves. 2.6. General Research Scheme Function and Graphic Construction.	4	20	5, 6	Select differentiation techniques depending on the method of setting the function; Improve the technique of differentiation of complex functions; Apply the concept of the derivative in solving problems with geometric content; Analyze the possibility of applying the Lopital rule when calculating the limits; investigate the functions of differential calculus methods; Check the awareness of the research results and their graphical representation.
Didactic unit: Integral calculus of functions of one valid variable				

3. 3.1. Perfect. Uncertain integral and its properties. 3.2. Table of basic integration formulas. Integrating a summing up of differential, in parts and replacement of the variable. 3.3. Integrating rational functions. 3.4. Integrating trigonometric functions and some irrationalities. 3.5. Certain integral and its calculation. 3.6. Applications of a specific integral to calculate the areas of flat figures, arc lengths, bodies of rotation. 3.7. Invalid integrals. 3.8. Geometric applications of a specific integral.	6	20	11, 5, 7	Molds the simplest integration techniques; checks the result of integration by differentiation; chooses and justifies methods for integrating functions of various types; Selects the coordinate system and the necessary formula when calculating the areas of figures, arc lengths, the volume of rotation bodies. applies a specific integral when solving tasks with geometric content; classifies immunity integrals; Investigate incompatible integrals for convergence.
Didactic unit: Differential calculus of the functions of several valid variables				
4. 4.1. The field of determining the function of many variables; 4.2. Private derivatives and differential functions of many variables; 4.3. Tangent plane and normal surface. 4.4. Extremes function of two variables. Study of the function to the largest and smallest values ??in a closed area. 4.5. The derivative of the scalar field in the direction. Gradient.	4	16	5, 6	Compare the concepts of the definition area and derivative for functions of one and two variables; Collect the technique of differentiation of functions of many variables; investigate the functions of two variables to the extremum, the greatest and smallest values ??in the closed area; Calculate the rate of change of the scalar field in a specified direction, determine the direction of the greatest change.
Semester: 2				
Didactic unit: integral calculus of functions of several valid variables				
5. four. Axial stretching compression.		24	8	Select the coordinate system for the rational calculation of the integrals; Multiple integrals use when solving tasks with geometric content. compare the curvilinear integrals of the first and second kind and apply the necessary integral when solving a specific task; Use curvilinear integrals when solving some physical problems.
Didactic unit: Differential equations				

6. 6.1. Differential equations of the first order. Common decision. Cauchy task. 6.2. Differential equations of higher orders. Common decision. Cauchy task. Equations that reduce the order. 6.3. Linear differential equations with constant coefficients. 6.4. Linear inhomogeneous differential equations. Method of variation of permanent. 6.5. Linear inhomogeneous differential equations with the right side of a special type. 6.6. Systems of differential equations. Exception method. 6.7. Systems of linear differential equations with constant coefficients. The solution in the case of simple roots of the characteristic equation.		28	11, 12, 9	determine the type of differential equations; Select the appropriate decision methods; constitute an algorithm for solving linear inhomogeneous equations with the right-hand side of a special type; Differential equations are used in solving problems with physical and geometric content.
Didactic unit: Rows and elements of harmonic analysis				
7. 7.1. Numeric rows. Required convergence condition. Sufficient signs of convergence of aligning rows. 7.2. Signaged rows. Absolute and conditional convergence. Aligning rows. Sign of Leibnia. 7.3. The region of the convergence of the functional series. 7.4. Power rows. Radius of convergence. A number of Taylor. Decomposition of the function in power rows. 7.5. Fourier series on trigonometric function system. Dirichlet condition. Fourier series for even and odd functions. 7.6. Fourier series in comprehensive form. 7.7. Integral Fourier.		20	10	select a sign for a rational study of numerical rows into convergence; find the region of convergence of functional series; represent functions in the form of power series, perform approximate calculations, evaluate the error; Represent functions in the form of a row of Fourier in a valid and complex form, as well as in the form of the Fourier integral.
Semester: 3				
Didactic unit: Equations of mathematical physics				
1. Corrosion of metals and ways to protect against corrosion. Colloid Sistems.		4		Osill the rates of solving boundary value problems for ordinary differential equations; Defines its own numbers and own functions

2. The method of separating variables and the method of eigenfunctions.		6		uses physical concepts and laws boundary objectives of mathematical physics; classifies the edges of the dachas; masters the reception of the separation of pebbles; converts inhomogeneous grams in homogeneous; uses the method of decomposition according to its own functions when solving inhomogeneous equations
3. The method of propagating waves and heat distribution in unlimited areas. Solving problems in semi-reduced blasts. Method of similarity and dimensions.		8	1	Collects graphic techniques for solving wave problems; represents the results of the solution of the task of heat propagation through the error function; analyzes the dimension in the problems of thermal conductivity and hydrodynamics; Uses the rainar algebra when compiling dimensionless parameters.

Literary sources

Main literature

1. Воронин Д. В. Математический анализ. Ч. 1 : курс лекций / Д. В. Воронин, Г. В. Недогибченко ; Новосиб. гос. техн. ун-т. - Новосибирск, 2007. - 192 с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000066342

2. Воронин Д. В. Математический анализ. Ч. 2 : курс лекций / Д. В. Воронин, Г. В. Недогибченко ; Новосиб. гос. техн. ун-т. - Новосибирск, 2010. - 205 с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000127023

3. Максименко В. Н. Курс математического анализа. Ч. 1 : учебное пособие [для 1 курса технических специальнотей и всех форм обучения] / В. Н. Максименко, А. Г. Меграбов, Л. В. Павшок ; Новосиб. гос. техн. ун-т. - Новосибирск, 2009. - 355 с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000125883

4. Икрянников В. И. Уравнения математической физики : учебное пособие / В. И. Икрянников ; Новосиб. гос. техн. ун-т. - Новосибирск, 2005 [2006]. - 103, [1] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000052556

Additional literature

1. Максименко В. Н. Курс математического анализа. Ч. 2 : учебное пособие [для 1 курса технических специальностей всех форм обучения] / В. Н. Максименко, А. Г. Меграбов, Л. В. Павшок ; Новосиб. гос. техн. ун-т. - Новосибирск, 2011. - 410 с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000159783

Internet resources

1. Российское Образование [Электронный ресурс] : федерал. портал .- Режим доступа: http://www.edu.ru/. - Загл. с экрана.

2. http://elibrary.nstu.ru/

3. Новосибирская открытая образовательная сеть[Электронный ресурс]] : сайт. – Режим доступа: http://www.edu54.ru/. – Загл. с экрана.

4. https://e.lanbook.com/

5. eLIBRARY.RU (Научная электронная библиотека РФФИ) [Электронный ресурс]. – [Россия], 1998. – Режим доступа: http://(www.elibrary.ru). – Загл. с экрана.

6. Мартинсон Л. К. Дифференциальные уравнения математической физики / Л. К. Мартинсон, Ю. И. Малов. – М. : Изд-во МГТУ им. Н. Э. Баумана, 2010. – 367 с. – (Математика в техническом университете. Вып. 12).

7. http://www.iprbookshop.ru/

8. http://znanium.com/

Methodical support and software

Methodological support

1. Шеремет О. В. Математический анализ [Электронный ресурс] : электронный учебно-методический комплекс / О. В. Шеремет, Е. А. Лебедева ; Новосиб. гос. техн. ун-т. - Новосибирск, [2015]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000215386. - Загл. с экрана.

2. Бутырин В. И. Уравнения математической физики [Электронный ресурс] : электронный учебно-методический комплекс / В. И. Бутырин, А. В. Гобыш, Г. А. Кузин ; Новосиб. гос. техн. ун-т. - Новосибирск, [2017]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000234963. - Загл. с экрана.

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Linear Algebra

Course: 1, semester : 1

		Semester
№	**Kind of activity**	**1**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	86
4	Lectures, hours	36
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	18
8	Consultations, hours	12
9	Independent work, hours	58

External requirements

can apply the appropriate physico-mathematical apparatus, methods of analysis and modeling, Theoretical and experimental study in solving professional problems; *regarding the following learning results*:
applies a mathematical apparatus of research of functions, linear algebra, differential and integral calculation, rows, differential equations, the theory of complex variable functions, numerical methods

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
applies a mathematical apparatus of research of functions, linear algebra, differential and integral calculation, rows, differential equations, the theory of complex variable functions, numerical methods	
1.The main concepts of the highest mathematics course: coordinate systems, defo-dividers, vector algebra, equations of linear geometric objects, curves and surfaces of the second order;	Lections; Seminars; Independent work
2. Calculate scalar, vector and mixed works for finding angles between vectors, squares, volumes, work and my cops	Lections; Seminars; Independent work
3. Explore and solve systems of linear algebraic control equations Iramara , inverse matrix and Gauss;	Lections; Seminars; Independent work
4. Make equations of geometric objects;	Lections; Seminars; Independent work
5. to give curves and surfaces of the second order to the canonical Wi-DO;	Lections; Seminars; Independent work

6. Staging and methods for solving the main tasks related to the above concepts.	Lections; Seminars; Independent work
7. Drawing up the linear operator matrices in this basis ;	Lections; Seminars; Independent work
8. find their own vectors of the linear operator;	Lections; Seminars
9. Translate information from a specific task to the language of mathematical symbols and build Mathematical models of simplest systems and processes in natural science and technique;	Lections; Seminars
10. choose methods for solving problems based on the analysis of the constructed mathematical model.	Lections; Seminars

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: Higher algebra				
1. 1.1. Matrix. Operations on matrices. The determinant of the matrix and its properties. Inverse matrix. Building the reverse matrix. 1.2. Linear independence of rows and columns of the matrix. Rank matrix. The invariance of rank for elementary transformations of the matrix. Ring stepped matrix. Calculation of the grade of the matrix using the Gauss algorithm. Theorem on the basic minor. 1.3. Systems of linear equations. Basic concepts and definitions. Matrix solution solution. Cramer formulas. Gauss method. The uniform of the system of linear algebraic equations (the Cappeli theorem).	2	12	1, 3, 6	a) studies the matrices and the sismam of linear equations

2. 2.1. Vectors. Linear operations over vectors and their properties. The concept of linear space. Linear dependence and linear independence of vectors. Base and dimension of linear space. Coordinate systems. Vector coordinates. Linear operations over vectors in coordinate form. 2.2. Scalar product of vectors. Properties of a scalar product. The expression of the scalar product through the coordinates of the vectors in the orthonormal base. Vector length. The angle between vectors. The condition of the orthogonality of vectors. Vector cosine guides. Projection of the vector, properties of projections. 2.3. Vector art and its properties. The expression of the vector product through the coordinates of the vectors in the orthonormal base. Square parallel gram and triangle. The condition of the collinearity of the eyelids.	2	8	2, 7	A) Reads vectors, vectors
Didactic unit: Analytical Geometry				
3. 3.1. The concept of equations of lines and surfaces. Algeb raic lines and surfaces. Plane in pro-space. Vector, general, normal plane equation. Mutual location of the planes. 3.2. Direct in plane and in space. Vector equation, parametric and canonical equations of direct. Mutual location of direct, straight and planes. Distance from point to direct on the plane and to the plane in space. 3.3. Second order curves. Canonical equations and basic properties. Equations of 2nd order curves in polar coordinates. 3.4. Second-order surfaces. Canonical equations and basic properties. Section method. Rotation surfaces. Cylindrical surface. Cone.	2	8	4, 5	a) bumps equations of lines and surfaces b) studies direct in the plane and in space
Didactic unit: Elenament of computers.				

4. 4.1. Linear operator. Linear conversion matrix. Change linear conversion matrix when replacing the basis. Own numbers and own linear transformation vectors. Linear conversion matrix in the base from its own vectors. Operator of a simple structure. The conditions of the simple structure of the operator. 4.2 Linear operator in Euclidean space. Self-adjoint operator. Properties of own numbers and own vectors of a self-adjoint operator. Raving the matrix of the self-adjoint operator to the diagonal form. 4.3 Quadratic forms. Matrix record. Change the quadratic form matrix when replacing the basis. Classification of quadratic forms. Bringing a quadratic form to canonical form. Criteria Sylvester. Law of inertia. Decarta rule. 4.4 Bringing equations of curves and second-order surfaces to canonical form based on the theory of quadratic forms.	2	8	10, 8, 9	a) studies linear operators

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: Higher algebra				
1. 1.1. Matrixes and determinants. 1.2. Linear equal systems.	4	10	1, 3, 6	a) studies the methods of solid to perform the first part of the standard calculation (tasks 5, 6, 7); b) getting acquainted with the methods of research and the re-suction of systems of line equations; c) learns to find the decomposition of the basis of the basis of the Basis.
2. 2.1. Linear operations over vectors and their properties. 2.2. Scalar, vector and mixed vectors. 2.3. Baseline decomposition.	2	10	2, 7	a) is studying the mutual arrangement of vectors: collinearity, ortility, companar; b) Applies the methods of vector algebra to the re-suction of geometric tasks.
Didactic unit: Analytical Geometry				

3. 3.1. The concept of equations of lines and surfaces. Algeb raic lines and surfaces. Plane in pro-space. Vector, general, normal plane equation. Mutual location of the planes. 3.2. Direct in plane and in space. Vector equation, parametric and canonical equations of direct. Mutual location of direct, straight and planes. Distance from point to direct on the plane and to the plane in space. 3.3. Second order curves. Canonical equations and basic properties. Equations of 2nd order curves in polar coordinates.	2	8	4, 5	a) studies methods for filling the second part of the standard calculation (task 10,11,12) b) meets the mutual arrangement of the straight and plane in space.
Didactic unit: Elenament of computers.				
4. 4.1. Linear operator. Linear conversion matrix. Change linear conversion matrix when replacing the basis. Own numbers and own linear transformation vectors. Linear conversion matrix in the base from its own vectors. Operator of a simple structure. The conditions of the simple structure of the operator. 4.2 Linear operator in Euclidean space. Self-adjoint operator. Properties of own numbers and own vectors of a self-adjoint operator. Raving the matrix of the self-adjoint operator to the diagonal form. 4.3 Quadratic forms. Matrix record. Change the quadratic form matrix when replacing the basis. Classification of quadratic forms. Bringing a quadratic form to canonical form. Criteria Sylvester. Law of inertia. Decarta rule. 4.4 Bringing equations of curves and second-order surfaces to canonical form based on the theory of quadratic forms.	2	8	10, 8, 9	a) meets linear operators and linear forms b) studies the equations of second-order curves

Literary sources

Main literature

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3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

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Methodical support and software

Methodological support

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2. Тимошенко Е. И. Линейная алгебра и аналитическея геометрия (Тимошенко Е.И.) [Электронный ресурс] : электронный учебно-методический комплекс / Е. И. Тимошенко ; Новосиб. гос. техн. ун-т. - Новосибирск, [2011]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000157387. - Загл. с экрана.

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Chemistry

Course: 1, semester : 1

		Semester
№	**Kind of activity**	**1**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	66
4	Lectures, hours	18
5	Practical lessons, hours	18
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	0
8	Consultations, hours	10
9	Independent work, hours	42

External requirements

can apply the appropriate physico-mathematical apparatus, methods of analysis and modeling, Theoretical and experimental study in solving professional problems; *regarding the following learning results*:
demonstrates the understanding of chemical processes and applies the main laws of chemistry
can demonstrate the use of the main methods of obtaining, transformation, transport and the use of heat in Heat engineering and systems; *regarding the following learning results*:
Demonstrates the understanding of the basic laws of thermodynamics and thermodynamic ratios

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
Demonstrates the understanding of the basic laws of thermodynamics and thermodynamic ratios	
1. On the connection of the course with other disciplines of the direction and on its role in the preparation of students	Lections; Seminars; Independent work
2. On the basic concepts and laws of the chemicals and; On the acid-base and redox properties of compounds	Lections; Seminars; Laboratory works; Independent work
demonstrates the understanding of chemical processes and applies the main laws of chemistry	
3.	Lections; Seminars; Laboratory works; Independent work
Demonstrates the understanding of the basic laws of thermodynamics and thermodynamic ratios	

4. On classification, appointment and basic requirements for power, information and general use Electric machines of automation systems	Lections; Seminars; Laboratory works; Independent work
5. on the general properties of homo- and heterogeneous systems	Lections; Seminars; Laboratory works; Independent work
6. On the reliability of electrical machinery automation systems	Lections; Laboratory works; Independent work
demonstrates the understanding of chemical processes and applies the main laws of chemistry	
7. about mathematical modeling	Seminars; Independent work
8. quantum-mechanical model of the structure of the atom and the frequency of properties of chemical elements and their connections	Lections; Independent work
Demonstrates the understanding of the basic laws of thermodynamics and thermodynamic ratios	
9. Basic concepts and laws of chemical thermodynamics and kinetics	Lections; Seminars; Laboratory works; Independent work
demonstrates the understanding of chemical processes and applies the main laws of chemistry	
10. the main concepts of the theory of electrolyte and non-electrolyte solutions; Features of complex and colloidal solutions	Lections; Seminars; Laboratory works; Independent work
Demonstrates the understanding of the basic laws of thermodynamics and thermodynamic ratios	
11. Basic concepts and the laws of electrochemistry	Lections; Seminars; Laboratory works; Independent work
12. Classification of corrosion processes, methods of protection of metals and alloys of metals from corrosion	Lections; Seminars; Laboratory works; Independent work
demonstrates the understanding of chemical processes and applies the main laws of chemistry	
13. OPK-8. 1 1. Know: Methods and software development tools, software development projects management methods, project data organization methods, regulatory documents (standards and regulations) for software development and projects	Seminars; Laboratory works; Independent work
14. Record the equations of reactions, basic mathematical and kinetic expressions, describing the chemical processes of various types	Lections; Seminars; Laboratory works; Independent work
15. calculate the amount, mass and concentration of the substance in homo- and heterogeneous systems	Lections; Seminars; Laboratory works; Independent work
Demonstrates the understanding of the basic laws of thermodynamics and thermodynamic ratios	
16. Calculate the main thermodynamic physical, kinetic, electrochemical values, their change depending on the conditions of flowing in homo- and heterogeneous systems; Calculate the constants of chemical and phase equilibria	Lections; Seminars; Laboratory works; Independent work
demonstrates the understanding of chemical processes and applies the main laws of chemistry	
17. U1. To be able to determine the quality of energy conversion in various production and technological processes	Seminars; Laboratory works; Independent work
18. record schemes and models of homo- and heterogeneous processes, describing their properties	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: General and inorganic chemistry				

1. Subject of chemistry, goals and objectives of studying discipline. The main quantitative laws of chemistry. The concept of chemical equivalent. Electronic structure of an atom. Quantum-mechanical model atom. The principle of Pauli and the rule of Hund. The structure of multi-electronic atoms. The principle of the lowest energy, the rule of Clekkovsky.		2	1, 2, 8	Lecture
2. Periodic system D.I. Imeteleev and changing the properties of elements and their compounds. Redox reactions (OSR). The degree of oxidation. Compilation of OSR equations.		1	14, 3, 4, 8	Lecture
3. Chemical Communication. The main types and characteristics of the covalent bond. The method of valence ties. Hybridization. Comprehensive compounds.		2	10, 14, 15, 3, 4	Lecture
4. Solutions. Methods for expressing the concentration of solutions. The main provisions of the theory of electrolytic dissociation. Dissociation constant; The law of dilution of ostelald. Step dissociation of weak electrolytes. Constants of acidity and basicity. Electrolytic water dissociation. Hydrogen indicator. Ionic reactions in solutions, hydrolysis of salts.		2	10, 15, 2, 3, 5	Lecture
Didactic unit: Functions of the complex variable				
5. Chemical thermodynamics. The main thermodynamic functions of the state of the system. Entalpy, Entropy and Gibbs Energy and their changes in chemical processes. The basics of thermochemistry. The law of hess and its consequence. Criteria of spontaneous flow of chemical reactions.		2	16, 3, 9	Lecture

6. Chemical kinetics. The rate of homo- and heterogeneous chemical reactions. The law of the active masses, the reaction rate constant. Factors affecting the rate of chemical reaction. The concept of activation energy. The concept of homogeneous and heterogeneous catalysis. Chemical equilibrium. Conditions of chemical equilibrium. Constant equilibrium and its connection with thermodynamic functions. Principle Le Chateel.		2	14, 16, 2, 3, 9	Lecture
7. Basics of electrochemistry. Definition and classification of electrochemical processes. The concept of electrode potentials. Standard hydrogen electrode and hydrogen potentials. Galvanic elements, EMF and its measurement. Thermodynamics of electrode pro-processors. Nernsta equation. Potentials of metal, gas and redox electrodes. Electrochemical and concentration polarization.		2	1, 11, 14, 16, 2, 3	Lecture
8. corrosion and protection of metals from corrosion. Main types of corrosion. Chemical and electrochemical corrosion. Corrosion under the action of wandering currents. Corrosion protection methods: doping, electrochemical protection, protective coatings; Changes in the properties of the corrosion environment.		1	12, 18, 3, 6	Lecture
9. Coding of information		1	10, 16, 18, 2, 5	Lecture
10. Electrolysis. Sequence of electrode processes. Faraday laws. Electrolysis with insoluble and soluble anodes.		1	11, 16, 18, 2, 3, 6	Lecture
11. Colloid systems. Dispersion and dispersed systems. Classification of colloid systems. Solo and gels. Micelles and their structure. Stability of colloidal systems, optical and electrical properties. Methods for obtaining and destruction of colloidal systems.		2	10, 15, 18, 3, 5	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities

Semester: 1				
Didactic unit: General and inorganic chemistry				
1. Redox reactions		2	10, 15, 3, 5	Laboratory work: 1. Performs experiments 2. Fixes observations, 3. Makes conclusions and discusses the results of working with the teacher.
2. Solutions. Methods of preparation of solutions		2	10, 15, 2, 3, 5	Laboratory work: 1. Performs experiments on the preparation of solutions of a given concentration; 2. Measures the density of the solution; 3. Calculates and establishes the concentration of solutions obtained; 4. Declares the experiment in the symbol language; 5. Represents the results of the experiment in a convenient form and discusses with the teacher.
3. Dissociation of weak and strong electrolytes. Hydrolysis of salts. Determination of pH of aqueous solutions. The formation of insoluble compounds.		2	10, 15, 16, 18, 2, 3, 5	Laboratory work: 1. Performs experiments on the measurement and determination of pH solutions; 2. Conducts hydrolysis of salts of various types and determines the pH of the solution using indicators; 3. conducts experiments on obtaining precipitation of insoluble compounds; 4. Declares the experiment in the symbol language; 5. Represents the results of the experiment in a convenient form and discusses with the teacher
4. complex compounds. Qualitative reactions to iron, copper (II) cations.		2	10, 15, 4	Laboratory work: 1. Performs experiments on obtaining and properties of complex compounds; 2. Declares the experiment in the language of characters; 3. Represents the results of the experiment in a convenient form and discusses with the teacher.

5. Definition Metal Metal Mass Equivalents		2	13, 14, 15, 2, 3, 4	Laboratory work: 1. Collects the installation - the eudiometer; 2. Determines the amount of gas distinguished; 3. Calculates the molar mass of metal equivalents; 4. Declares the experiment in the symbol language; 5. Represents the results of the experiment in a convenient form and discusses with the teacher.
Didactic unit: Functions of the complex variable				
6. General patterns of chemical processes. Determination of the thermal neutralization effect.		2	16, 2, 3, 9	Laboratory work: 1. Perform calorimetric measurements for rigid instructions; 2. Processes measurement results; 3. Represents the result in the language of characters, graphs, drawings in a convenient form; 4. Makes conclusions and discusses the results of working with the teacher.
7. Kinetics of chemical reactions. Factors affecting the reaction rate. Chemical equilibrium.		2	14, 16, 17, 2, 3, 9	Laboratory work: 1. Performs measurements of the reaction rate and analyzes the effect of factors on the speed of processes; 2. Perform qualitative experiments on equilibrium displacement in the reaction; 3. Consider qualitative changes in the symbol language; 4. Declares the results in a convenient form and discusses with the teacher.
8. electrochemical processes. Galvanic element and electrolysis of aqueous solutions of salts.		2	11, 15, 16, 2, 3, 5, 6	Laboratory work: 1. Collects a galvanic element and electrolyzer; 2. Regulates in the language of characters and drawings of the device, the operation of the galvanic element and the electrolyzer; 3. Conducts measuring the voltage of the electroplating element and the electrolyte decomposition potential by hard instructions; 4. Represents the measurement results in a convenient form and discusses with the teacher.

9. Corrosion of metals and protection of metals from corrosion.		2	12, 18, 2, 3, 6	Laboratory work: 1. Collects devices for protection of metals from corrosion; 2. draws up in the language of characters and drawings of the device; 3. monitors qualitative changes in various types of corrosion; 4. Forms answers to homework questions and solves the task; 5. Represents the measurement results in a convenient form and discusses with the teacher.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: General and inorganic chemistry				
1. The law of equivalents. Redox reactions		2	1, 13, 14, 15, 2, 4, 7	Practical lesson: 1. Determines the degree of oxidation, 2. Records semoretors of oxidation and recovery, 3. Makes up an electronic balance 4. Determines the oxidizing agent and reducing agent, calculates their molar masses of equivalents.
2. solutions. Methods for expressing the concentration of solutions.		2	1, 15, 5	Practical lesson: 1. Calculates the concentration of solutions; 2. Resolves the task of quantitative calculations of the composition of the solution.
3. Dissociation of weak and strong electrolytes. Hydrolysis of salts. Determination of pH of aqueous solutions. Working solubility.		4	1, 10, 14, 15, 18, 5	Practical lesson: 1. Records the dissociation equations of strong and weak electrolytes; 2. Calculates the pH of solutions of strong and weak electrolytes; 3. Records the hydrolysis equations in molecular and ion-molecular forms; 4. Calculates pH solutions of salts; 5. Records the schemes of heterogeneous equilibrium in the solution of non-disabilities; 6. Calculates the solubility of small and hard-soluble connections.

4. chemical bond. Comprehensive connections.		2	1, 10, 14, 15, 3	Practical lesson: 1. is formulas for complex compounds, writes dissociation equations; 2. Calculates concentrations in solutions of complex compounds.
Didactic unit: Functions of the complex variable				
5. Chemical thermodynamics.		2	1, 16, 3, 9	Practical lesson: 1. Calculates the thermodynamic functions of the system status; 2. Conducts thermochemical calculation; 3. Determines the direction of process flow.
6. Kinetics of chemical reactions. Chemical equilibrium.		2	1, 14, 15, 16, 17, 2, 3, 9	Practical lesson: 1. Records the kinetic expressions of the rates of homo- and heterogeneous chemical reactions; 2. Calculates the rate of chemical reaction; 3. Records the kinetic expression of a chemical equilibrium constant and calculates its value; 4. Determines the direction of the reaction when changing external conditions on the principle of Le Chateel.
7. Electrochemical processes and systems.		2	1, 11, 14, 16, 18, 2, 3	Practical lesson: 1. Records the equations of electrode reactions occurring in a galvanic element and electrolyzer; 2 calculates the electrode voltage, equilibrium voltage of the galvanic element; 3. Calculates the amount of substances formed on the electrodes at electrolysis.
8. Corrosion of metals and methods for protecting metals from corrosion.		2	1, 12, 14, 16, 18, 2, 3	Practical lesson: 1. Records the equations of corrosion processes; 2. is the schemes of the corrosion galvanic element; 3. Selects methods for protecting metals from corrosion depending on the nature of the corrosion environment.

Literary sources

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1. Основы химии: Учебник / В.Г. Иванов, О.Н. Гева. - М.: КУРС: НИЦ ИНФРА-М, 2014. - 560 с.: 60x90 1/16. (обложка) ISBN 978-5-905554-40-7, 400 экз. - Режим доступа: http://znanium.com/catalog.php?bookinfo=421658 - Загл. с экрана.

Additional literature

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1. ХиМиК : [сайт]. – 2008–2020. – URL: https://xumuk.ru/ (дата обращения: 20.02.2021). – Текст : электронный.

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Methodical support and software

Methodological support

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2. Апарнев А. И. Общая химия. Сборник заданий с примерами решений : учебное пособие / А. И. Апарнев, Л. И. Афонина ; Новосиб. гос. техн. ун-т. - Новосибирск, 2013. - 118 с. : табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000181263

3. Химия. Сборник лабораторных работ : методическое пособие по техническим направлениям и специальностям всех форм обучения / Новосиб. гос. техн. ун-т ; [сост.: А. И. Апарнев, Р. Е. Синчурина]. - Новосибирск, 2014. - 78 с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000209514

Specialized software

1 Microsoft Office Application Pack

2 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

3 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Physics

Course: 1 2, semester ы : 1 2 3

		Semester		
№	**Kind of activity**	**1**	**2**	**3**
1	Total credits	2	5	8
2	Total hours	72	180	288
3	Total classes in the contact form, hours	45	135	136
4	Lectures, hours	0	54	54
5	Practical lessons, hours	36	36	36
6	Laboratory studies, hours	0	36	36
7	of them in an active and interactive form, hours	18	0	0
8	Consultations, hours	7	7	8
9	Independent work, hours	27	45	152

External requirements

can apply the appropriate physico-mathematical apparatus, methods of analysis and modeling, Theoretical and experimental study in solving professional problems; *regarding the following learning results*:
demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics
is able to measure electrical and non-electrical values ??at heat efficiency and heat Technique; *regarding the following learning results*:
selects measurement tools, performs measurements of electrical and non-electrical values, processes measurement results and evaluates their error

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics	
1. OPK-2. 2 2. Demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics	Lections; Seminars; Independent work
selects measurement tools, performs measurements of electrical and non-electrical values, processes measurement results and evaluates their error	
2. OPK-5. 1 1. Selects the measurement tools, performs measurements of electrical and non-electrical values, processes the measurement results and evaluates their error	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results
Semester: 2			
Didactic unit: Physical bases of classical mechanics			
1. vector and coordinate methods of describing motion. Kinematics of the material point, medium and instantaneous speed. Acceleration. Dynamics of material point. The principle of non-carriage of Galileo. Pulse. The law of preservation of the impulse.		2	1, 2
2. Mass center of the hour-Titz system. Inerization center system. Work and power. Kinetic energy and potential energy. The law of preserving the complete mechanical energy of the SIS-topic. Absolutely elastic and absolutely inelastic strikes.		2	1, 2
3. Kinematics of the rotational movement. Angular velocity and acceleration vectors. The energy of the rotational motion. The moment of the inertia of the solid body. Steiner Theorem.		2	2
4. Moment of forces, equation of dynamics of rotational motion. The moment of the impulse particles and the hour-tice system. The law of preserving my cop of the pulse.		2	2
5. The Law of the World Hard. Heavenly mechanics. Lecture demonstrations at the rate of classical mea-chenic.		2	1, 2
Didactic unit: oscillations and waves			
6. oscillatory processes. Harmonic OS-Cyllator. Characteristics of oscillations. Differential equalization of oscillations and its solution in a complex and trigo-nomethrical form. Spring, mathematical and physical bench. Addition of oscillations of one direction. Method of vector diagrams, aided amplitude and on-point phase of the resulting oscillation. Bie. Modulation. Spectrum		2	2
7. Addition of mutually perpendicular oscillations. Figures Lissuzh. Diffe-renocial equation of fucked oscillations and its solution. Quality. You needed oscillations. The insistency of the oscil frequency from the frequency of forcing strength. Resonance.		2	2
8. one-dimensional wave equation and its solution. Waves in elastic media. Phase and group Soon. Wave interference. Standing waves. Doppler Effect.		2	2
Didactic unit: Physical bases of relativistic mechanics			
9. Basics of relativistic mechanics. Postules Ein Stein. Properties of pro-space and time in Einstein. The conversion of Lorentz and the consequences of them (simultaneity of co-existence, reduction of length and slowing down time). In-graves between events. RELATIVISTIC Act of the Speed ??Learning.		2	2
10. Relativistic dynamics. Relativistic impulse. The kinetic energy of a relay-tyivist particle. The law of the relationship of mass and energy. The energy of rest. Disintegration of particles.		2	1, 2
Didactic unit: Molecular-kinetic theory			

11. The kinetic theory of idea gases. Pressure and temperature. Experienced in-horses of perfect gas. Os-new equation of molecularly-kinetic theory of gases.		2	1, 2
12. barometric formula. Boltzmann distribution. Distribution of Maxwell. Radial, medium-mean-square, media molecules.		2	1, 2
13. The number of degrees of freedom of molecule. The distribution of energy in the degrees of freedom. Internal gas energy of polyhydric Men.		2	2
14. p Elan gases. Van der Waals equation.		2	2
15. Kinetic phenomena. Power transfer. Diffusion, thermal conductivity, elm bone.		2	2
16. properties of fluids. Smashing. Capillary phenomena. Crystals. Heat-capacity of solid tel.		2	2
Didactic unit: Basics of thermodynamics			
17. The first top of the thermodynama-Miki. The operation of gas with due to its volume. Heat capacity.		2	2
18. Isoprocesses in the frame of the per-beginning of thermodynamines. Adiabatic Pro-Cess. Equation Adiabat.		2	2
19. Reversible and irreversible processes. Cycles. The concept of entropy. The law of the age of entropy. The second initial thermodynamics. The third principle of thermodynamics.		2	2
20. Heat engines and well-free machines. Carno cycle.		2	2
21. Stand-time stream. Gaussian theorem. You are the numbers of the field strength using the Gauss theorem (plane, thread, sphere, ball).		2	1, 2
Didactic unit: Electrostatics			
22. Electrostatics. The law of Ku-Vonda. Electric tension. Field of a check-in charge. Power lines. The principle of superfront fields. Work on the panel of charge in the field. The theorem on the circulation of the age-torus of tension. The potential of the electric field, the potential difference, equipotential upwards. The potential of the check-in charge. Communication of on-scales and potential.		2	2
23. Dipole. The behavior of the dipole in the external electric field. Dielectrics in an electronic field. Polarization of dielectrics. Electric shift. Teo-rema Gauss for the vector of electrical displacement. The behavior of vectors of strain and electrical displacement at the border of the time of the two dielectrics. Electric, piezoelectrics, ferroelectrics.		2	2
24. Conductors in the electric field. Electrical field of charged wire. Electrical EM-bone of a secluded wire-nickname. Capacitors. Capacitor EM-bone. Energy system of fixed point charges. Energy of a charged secluded conductor, the energy of the con-expensor. Energy of the electro-carstatic field.		2	2
25. Laminar current		2	1, 2
Didactic unit: Permanent current			
26. Permanent electric current. Power and current density. Ohm's law for a homogeneous section of the chain. Work and current power. Joe-Ulya law - Lenza. Ohma law for an inhomogeneous site of Tse-Pi. Kirchhoff laws.		2	1, 2

27. The laws of Oma and Joule - Lenza in differential form. Classical electrical conductivity theory. The dependence of resistance from temperature. Superconductivity. Thermoelectric phenomena. Contact Difference of Potentials.		2	1, 2
Semester: 3			
Didactic unit: Energy saving in thermal energy transport and distribution systems,			
28. Magnetic field. The magnetic moment of the circuit with the T-com. The torque acting on the contour with the current in a homogeneous magnetic field. Vector magnetic induction. Bio-Savara law - Laplas. Calculation of fields created by conductor with current. Magnetic field of moving-state charge.		2	2
29. AMPER Act. Insurance parallel pro-videos with current. Power of Lo Renza. Movement of charged particles in a magnetic field. Hall effect.		2	2
30. The theorem on the circulation of the age-torus of magnetic induction. Calculation of solenoid fields, toroid. The distribution of the magnetic field in the cross section of the round wire with a current. Magnetic stream. Work on moving wire-nicks with a current in a magnetic field. Gauss theorem for a magnetic field.		2	1, 2
31. The phenomenon of electromagnetic induction is a vortex electro-tricary field. The law of electro-toughening induction of Faraday. Lenza rule. Generator, electricity tel. Toki Foucault.		2	1, 2
32. inductance contour. Mutual induction. Transformer. The phenomenon of self-induction. Transient processes in the moments of including the electronic circuit. Time of re-laxation. Energy of the magnetic field. Oscillatory contour. Alternating current.		2	2
33. Magnetic DC circuits		2	1, 2
34. Relativistic character of magnetic interaction-via. The concept of a single electromagnetic field. Lorentz transforms for electric and magnetic field. Invariants of mechanics and electrodine-Miki.		2	1, 2
35. The system of the Mac-Svetle equations for the electromagnet field in the integral and differential form. The concept of a shift current.		2	1, 2
36. Electromagnetic waves. Properties, radiation and raz-space. Vector oo-va-puncthing. Electromechanical transients in electric drive with DPT with DPT power from a thyristor converter (TP-DPT system)		2	1, 2
37. Lecture Demonstrations		2	1, 2
Didactic unit: Wave optics			
38. Geometric optics. Wave interference. In-Terference in thin plans. Interferometers.		2	1, 2
39. Diffraction. Principle of Guy-Gens Fresnel. Fresnel zone method. Diffraction on a circular hole and disk. Diffraction on the gaps. Diffraction grating.		2	2
40. Polarization of electromagnetic waves. Classical dispersion theory. Split-wandering electromagnetic waves in dispersing media.		2	2
Didactic unit: Basics of quantum mechanics			

41. thermal radiation and its characteristics. Kirchhoff laws, Stefan-Boltzmann, wines. Planck hypothesis about radiation energy quantization. Form-Moul Planck.		2	2
42. Photons. Photoeffect, in-horses of Tabletova, Einstein Equation for Photo Effect Ta. Compton effect. Low pressure. Fire-Wave Dualism.		2	2
43. Runtime spectra of atoms. Experiences of re-Zhortord. Bohr postulates and boron model for hydrogen atom. Energy spectrum.		2	2
44. Waves de Broglie. Experts of Davisson and Jermer. Co-ratio of the uncertainty steits of Heisenberg. Operator of physical quantities. Schrodinger equation. Wave function and its meaning. Quantum Conditions.		2	2
45. Schrodinger equation for stationary states. Particle in a potential pit. Quantum harmonic oscillator. Tunnel effect.		2	2
46. Quantum-mechanical model of hydrogen atom. Quantum numbers. Spin.		2	2
47. Atomic systems with many electrons. Procyp Nontentences of the Tended particles. Fermian and bosons. Bar Pauli. Periodic system of chiemented elements.		2	2
48. hydrogen molecule. Chest links. Spectra of the Men. Raman light scattering. X-ray radiation Optical quantum generators.		2	2
Didactic unit: Basics of solid physics			
49. Zonor theory of crystals. Metals, dielectrics, lumps. Quantum statistics. The distribution of Bose Einstein. The distribution of Fermi Dirac.		2	1, 2
50. degenerate Fermi gas. Phase space of an electric throne. Quantum theory of electrical conductivity of metal zommerfeld.		2	1, 2
51. Own and impurity semiconductors. Media statistics in semiconductors. Criterion for the leveling of semiconductors, photoconductivity, r-p per speaker.		2	1, 2
52. The heat capacity of solids. Debai laws, Dulga and PH. Quantum theory of thermostility of Einstein. Quantum theory of heat-bone debt. Normal lattice oscillations, spectrum of normal oscillations. Phonons. Thermal expansion and thermal conductivity of solid tel.		2	1, 2
Didactic unit: core and elementary particles			
53. Atomic core. Nuclear re-promotions. Radioactivity. Elementary particles.		2	1, 2
54. Uniform picture of physical phenomena: mechanics ; Molecular physics and thermodynamics; Electricity and magnetism; oscillations, waves and optics; Quantum physics		2	1, 2

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 2				
Didactic unit: Physical bases of classical mechanics				

1. Introductory in-catch. Processing the results of direct multiple measurements.		4	2	Declares the laboratory work protocol. Examines various types of errors. Calculates the standard deviation of the measured value and determines the random error of measurement, taking into account the coefficients of Student. Builds a histogram of the measured value.
2. Measuring the time of the collision of elastic bodies		4	2	considers the collision of balls in SCI. Applies a rough physical model - considers the collision of cubic form. Selects variables (abscissa and ordinate) for the correct graphical representation of the results obtained, namely: the schedule in the selected axes is straight.
3. Measuring the initial speed of the bullet using a ball-leaf pendulum.		4	2	Uses the laws of energy and impulse to explain the results obtained. It receives an estimate of the error of the measured value and uses it when constructing the schedule.
4. Studying the skimming movement of mat-nick wubbek.		4	2	Uses the representation of the axial vector of explaining the studied phenomenon. Conducts an assessment of the standard deviation of the angular acceleration.
Didactic unit: oscillations and waves				
5. free fluctuations in physical ma-nodeship.		4	2	explores the dependence of the fluctuations of the physical pendulum. From the position of the suspension point.
6. Waves on the string.		4	2	Measures the dependence of its own oscillations of the string from the strength of the tension and the number of harmonics. Calculates the speed of propagation of elastic waves in the medium. Compare results with theoretical.
Didactic unit: Basics of thermodynamics				
7. Determination of heat capacity relations using the terminal and desor.		4	2	explains from a physical point of view the difference between CP and CV. Calculates the adiabatic indicator. Builds a duty cycle in the axes T - S, P - V, P -T.
Didactic unit: Electrostatics				

8. .		4	2	According to the results of the experiment, it builds a picture of power lines and equipotentials. Explains the behavior of the field lines E on the interface between the media with different dielectric constant.
Didactic unit: Permanent current				
9. Studying the operation of the power supply.		4	2	Explores the dependence of the useful power and power loss of loss resistance and internal resistance of the source.
Semester: 3				
Didactic unit: Energy saving in thermal energy transport and distribution systems,				
10. Definition of a specific charge of electro-on.		4	2	Measures the dependence of the anode current of the magnetron from the solenoid current. Graphically determines the cut-off current of the solenoid and calculates the specific electron charge along the working formula. Compares the result with theoretical.
11. Measurement of the horizontal component of the magnetic field of the Earth and the study of the magnetic field of the circular current.		4	2	Measures the period and amplitude of oscillations on the oscilloscope screen. The graph of the dependence of the oscillation period in the circuit on the tank, the end of the load from the load resistance, finds a critical resistance.
12. Free electro-magnetic co-lebia in a coolant con-tour.		4	2	Measures the period and amplitude of oscillations on the screen oscilloscope. Build a graph of the dependence of the oscillation period in the circuit on the tank, the logarithmic decrement on the load resistance is critical resistance.
13. Forced oscillations in the oscillatory circuit.		4	2	measures the dependence of the voltage on the condenser from the generator frequency. Builds a resonant curve.
Didactic unit: Wave optics				
14. Light interference. Fresnel biprism.		4	2	receives an interference picture from Fresnel's bipris. According to the measured parameters, the biprizm is calculated. Conducts comparison with the results of determining the corner of the biprisms on the deviation of the laser beam.

15. Laser light diffraction. Fraunhing diffraction.		4	2	explores the diffraction of laser radiation on the holographic diffraction grid and the grid (two-dimensional diffraction grating). Calculates according to the parameters of the diffraction pattern, the characteristics of the lattices.
16. Study of polarized light. Law of Malyus. Brewer angle.		4	2	Measures light intensity who passed through two polarizers. Compare the result with the law of Malyus. Experimentally determines the corner of the Brewster.
Didactic unit: Basics of quantum mechanics				
17. Definition of constant Stephen Boltzmann.		4	2	Experimentally examines the law of thermal radiation of Stephen-Boltzmann.
Didactic unit: Basics of solid physics				
18. Determination of the width of the forbidden semiconductor zone.		4	2	Builds the temperature dependence of the semiconductor electrical conductivity. Calculates the width of the forbidden zone.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: Mechanics of translational motion				
1. Place of physics in natural science. The role of exploy. Units. System C. Introduced Units of Measurements.		2	1, 2	discusses the place of physics in natural science and role of exploration.
2. Decartova coordinate system. Polar coordinate system. Spherical coordinate system. The concept of derivative and inte-rig.	1	2	2	Learns about the various coordinate system, the concept of derivative and interest.
3. Scalar and Vector. Addition of vectors. Pra-vehicle triangle, parallelogram-ma rule. Subtract vectors. Single and well-left vector. Multiplication of vector by number. Scalar product of vectors. Vector artwork. The rule of the right screw.	1	2	2	Gets working skills with scalar and vector values ??..
4. Kinematics. Material point. Coordinating Method of Motion Descriptions. Radius vector. Vector method of describing motion. Natural way to describe the motion. The trajectory.	1	2	2	solves the task of the kinematics of the material point. Uses various ways to describe the movement.

5. The average speed of the path, the middle vector of the speed. Move. Instant speed, instant acceleration.	1	2	1, 2	disassembled with the concepts: the average speed of the path, the average velocity vector, movement, instantaneous speed, instantaneous acceleration.
6. curvilinear movement. Radius of curvature. Normal and tangential acceleration. Uniform rectilinear movement. Uniform movement around the circumference.	1	2	2	Examines the phenomenon of electromagnetic induction. Sprinkles Faraday Zon and Lenza rule. Calculates the energy of the simplest current systems.
7. Equipment straight movement.	1	2	2	Solves the task for an equal-name straight movement.
8. Movement in the field of gravity. Ballistic task.	1	2	1, 2	Examines movement in the field of gravity.
9. inertial reference systems. The first law of Newton (the law of inertia). Force. Mass inert, gravitational mass. The second law of Newton. Pulse (number of movement). The third law of Newton.	1	2	2	Disasses and comprehensies the concepts of mass, strength, impulse. Analyzes the laws of the dynamics of the material point
10. Transformation of Galilee. The law of addition speeds. The principle of the relativity of Gali-leu.	1	2	2	comprehends the relativity of motion.
11. The principle of independence of the forces. Types of forces: Gravity strength, strength of elasticity, peace friction force, sliding friction force, rolling force, resistance strength.	1	2	2	Learning types of forces.
12. The law of preserving the impulse. Mass center particle system. The system of the center of inertia.	1	2	2	comprehends the law of preserving the pulse.
13. Work of force. Power. Kinetic energy.	1	2	1, 2	Meets with the concepts: work strength, power, kinetic energy.
14. Power fields. Conservative and dissipative forces. Potential fields, potential energy.	1	2	1, 2	Dating the audience with the classification of the main types of autonomous power supply systems, the advantages and disadvantages of these systems, as well as the prospects for their further development
15. Punch. Absolutely elastic strike and absolutely inelastic strike. The law of conservation of the number of movement and complete mechanical energy in the collisions of particles.	1	2	1, 2	Solves the challenge of the collision of particles. The concepts of absolutely elastic and absolutely inelastic strike are used.
16. Preparation for test work.	2	2	1, 2	Preparation for testing.
17. Test.		2	1, 2	Examination.

18. Final lesson.	2	2	1, 2	Final lesson His
Semester: 2				
Didactic unit: Physical bases of classical mechanics				
19. Kinematics and the dynamics of the progressive movement of the material point. Curvilinear movements. Construction of the equations of motion in various systems:		2	1, 2	Explore the characteristics of the pressure sensor
20. The law of preserving momentum and energy. Elastic and inelastic blow.		2	2	Solves the task in the laboratory reference system (LSO) and in the system of the inertia center (SCI). Analyzes the capabilities of these approaches, compares them.
21. Kinematics of the rotational motion		2	1, 2	uses axial vectors. Calculates moments of inertia of the simplest solids. Uses the moments equation. Applies the law of preservation of the moment of momentum.
22. the dynamics of the rotational motion. The dynamics of complex systems of the joint rotational and progressive movement.		2	2	Dynamics of rotational motion. The dynamics of complex systems of the joint rotational and translational motion.
Didactic unit: oscillations and waves				
23. Decision of a differential equation of free and decaying oscillations.		2	1, 2	Applies a single energy approach to the description of the oscillations of ideal systems of various physical nature. Makes the differential oscillation equation. Calculates the parameters of oscillations and attenuation of real oscillating systems
Didactic unit: Physical bases of relativistic mechanics				
24. Relativistic kinemati. Transformation Lo Renza. Relativistic di Namika. The decontaminations and chapels of the parties of high energies.		2	2	comprehensies the presentation of the Lorentz length reduction and deceleration. time, about relativistic impulse and relativistic energy. It uses the concept of interval when solving problems, applies the relativistic rate of addition of speeds.
Didactic unit: Molecular-kinetic theory				
25. Equation of the state of idea gas. Analysis of the processes.		2	2	Builds the graphs of isoproces in various axes. It applies the equations of the state of the ideal gas to calculate the functions of the state of the ideal gas
26. Maxwell distribution, Boltzmann.		2	1, 2	Calculates the most likely, rms and medium-wide speed, applies distribution functions.

Didactic unit: Basics of thermodynamics				
27. Internal gas energy of polyhydric molecules. Heat capacity.		2	2	Applies the law of uniform distribution of energy in the degrees of freedom. Calculates various types of heat-capacity
28. Calculation of isoprocesses within the first start of thermodynamics.		2	1, 2	Calculates the change in thermodynamic parameters in isothermal, isoobaric, isochoric and adiabatic processes.
29. Calculation of the efficiency of thermal ma-tires based on ideal cycles.		2	1, 2	Applies thermodynamic and statistical determination of entropy. Calculates the efficiency of the simplest cycles. Uses graphics of cycles of the ideal heat machine and refrigerators in the T-S axes.
Didactic unit: Electrostatics				
30. Cut law. The use of the principle of superposition to calculate the electric static fields of point and continuously distributed charges.		2	2	Mastering the main representations of electrostatics, calculates the field strengths, applies the principle of superposition.
31. Application of the Ga Uss theorem for calculating electric static fields.		2	2	Applies Gauss theorem for calculating the vector of electric field strength.
32. Calculation of electricity potentials.		2	2	Calculates the potentials of electric fields, uses the relationship between the tension and the potential of the electrostatic field.
33. Movement of charged particles in electrostatic fields.		2	1, 2	Applies the main law of the dynamics to describe the movement of the charged particle in the electric field.
34. Explorer in the electric field. Method of electronic images.		2	1, 2	Explorer in the electric field. Method of electronic images.
35. Calculation of the parameters of con-depersators. The energy of the electro-deformed field.		2	2	Calculation of the parameters of con-depersators. The energy of the electro-carstatic field.
Didactic unit: Permanent current				
36. Calculation of DC circuits.		2	1, 2	Calculation of DC circuits.
Semester: 3				
Didactic unit: Energy saving in thermal energy transport and distribution systems,				
37. Application of the Bio-Savara-Laplace Law for Ra Cole Magnetic Fields.		2	1, 2	highlights simple (direct and circular elements in a complex configuration conductor . It applies the formula of bio-savarazaplas and the principle of superposition to calculate magnetic fields.

38. The interaction of wire-nicks with current. Movement of the conductor with a current in a magnetic field. Movement of charged particles in a magnetic field.		2	1, 2	Calculates the strength and moments of forces acting on conductors with current. Applies the main law of the dynamics to describe the movement of the charged particle in the electric and magnetic field under the action of the force of Lorentz. Meetments with examples of practical application phenomenon
39. Calculation of magnetic fields by magnetic vector circulation theorem Induction.		2	1, 2	Compares methods for calculating magnetostatic fields. Selects the calculation method in a specific task. For symmetric current distributions, applies the magnetic induction vector circulation theorem.
40. Electromagnetic induction. Faraday law and Lenza law. Inductivity of conductors. Calculation of the energy of the simplest current systems.		2	1, 2	Learn the HTTP protocol and implements the Web server program
41. Calculation of transitional transitions in electrical circuits.		2	1, 2	calculates the inductance of the conductors. Receives the law of changing the strength of the current in the moments of turning on and off the electrical circuit. Calculates the energy of the simplest current systems.
42. Magnetics. Boundary conditions on the border of the Magnet-Cove section.		2	1, 2	Explore the magnetic properties of the atom and its behavior in the external magnetic field calculates the field in the magnets and on the interface border Two Magnets.
43. Wave processes. Electromagnetic waves.		2	1, 2	Calculates the parameters of the wave processes. Explores the main properties of electromagnetic waves.
Didactic unit: Wave optics				
44. Interference in thin films.		2	1, 2	Calculates the interference picture. Finds the position of the maxima and minima.
45. Diffraction on a circular hole, disk and slit. Diffraction lattice.		2	1, 2	Applies method of Fresnel zones to calculate the diffraction on the gap, a round hole and disk.
46. Dispersion and polarization.		2	1, 2	To prepare for classes, it is necessary to independently examine theoretical material, material from the main (optional) and methodical literature
Didactic unit: Basics of quantum mechanics				

47. The laws of heat radiation. Plank Theory.		2	2	calculates the emission of absolutely black bodies and bodies with a real radiative ability . Displays the laws of heat radiation from the plank formula
48. Energy and photo-new impetus. Photo effect. Common effect.		2	2	Energy and pulse photo-new. Photo effect. Compton effect.
49. Waves de Broglie, the extinguishing of uncertainty.		2	2	Aware of the physical essence of the de Brogly waves and uses the ratio of uncertainties to assess the parameters of real physical processes.
50. Solution of the Srera-Dinger equation for various quantum systems.		2	1, 2	Calculates the form of a wave function for particles occupying various energy levels in an infinitely deep potential pit. The concept of probability density function
51. Removal of invisible lines by the method of Roberts		2	1, 2	Getting acquainted with the concept of tunneling, reflection and passing through a potential barrier.
52. Electronic states in the atom. Quantum numbers.		2	1, 2	fixes the physical meaning of quantum numbers. Calculates the possible values ??of the momentum of the pulse, the magnetic moment and their electron projections in the atom. Applies the selection rule and the principle of Pauli to the analysis of the filling of electronic shells in atom and possible electronic transitions.
Didactic unit: Basics of solid physics				
53. Electrical conductivity of metals and semiconductors.		2	1, 2	Calculates the electrical conductivity of metals according to the classic model of the friend and the Zommerfeld model. Calculates the electrical conductivity of semiconductors.
Didactic unit: core and elementary particles				
54. Nuclear reactions. Radioactivity.		2	1, 2	Calculates the energy yield of nuclear reactions, studies the laws of radioactive decay.

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Main literature

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Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Computer science

Course: 1, semester ы : 1 2

		Semester	
№	**Kind of activity**	**1**	**2**
1	Total credits	4	4
2	Total hours	144	144
3	Total classes in the contact form, hours	87	60
4	Lectures, hours	18	18
5	Practical lessons, hours	0	0
6	Laboratory studies, hours	54	36
7	of them in an active and interactive form, hours	18	0
8	Consultations, hours	13	4
9	Independent work, hours	57	84

External requirements

is able to search, processing and analyzing information from various sources and submit it in the required format using information, computer and network technologies; *regarding the following learning results*:
Algorithmizes the solution of tasks and implements algorithms with The use of software
applies the means of information IT technologies for searching, storage, processing, analysis and reporting
is able to carry out business communication in oral and written forms in the state language of the Russian Federation and foreign language (AH); *regarding the following learning results*:
uses modern information and communicative means for communication

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
Algorithmizes the solution of tasks and implements algorithms with The use of software	
1. OPK-1. 1 1. Algorithms the solution of tasks and implements algorithms using software tools	Lections; Laboratory works; Independent work
applies the means of information IT technologies for searching, storage, processing, analysis and reporting	
2. OPK-1. 2 2. Applies information technology tools for searching, storing, processing, analyzing and presenting information	Lections; Laboratory works; Independent work
uses modern information and communicative means for communication	
3. UK-4. 3 3. Uses modern information and communication tools for communication	Lections; Laboratory works; Independent work

applies the means of information IT technologies for searching, storage, processing, analysis and reporting	
6. Apply the main methods, methods and means of obtaining, storing and processing information using computers and computer tools	Lections; Laboratory works; Independent work
uses modern information and communicative means for communication	
7. barriers to communication and ways to overcome them	Lections; Laboratory works; Independent work
applies the means of information IT technologies for searching, storage, processing, analysis and reporting	
8. to search for information in the local and global Networks	Lections; Laboratory works; Independent work
Algorithmizes the solution of tasks and implements algorithms with The use of software	
10. Appointment and function of a text editor, the main techniques of work with the text editor	Laboratory works; Independent work
uses modern information and communicative means for communication	
11. Purpose and functions of a table processor, techniques for working with a table processor	Lections; Laboratory works; Independent work
Algorithmizes the solution of tasks and implements algorithms with The use of software	
12. Acceptance of work with a graphic editor	Lections; Independent work
13. Mathcad techniques for solving specific tasks	Lections; Laboratory works; Independent work
14. Creating algorithms and their implementation in the form of a software product	Lections; Laboratory works; Independent work
15. Programming	Lections; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results
Semester: 1			
Didactic unit: Basic concepts and methods of information and coding theory.			
1. Introduction. The concept of information and computer science. History of development of informatics. The overall characteristics of the processes of collection, transmission, processing and accumulation of information. Coding information. Number system. Binary arithmetic. Translation of information from one number system to another. Units of information.		2	1, 2
Didactic unit: Technical means of implementing information processes			
2. PC architecture. The main elements of the PC. RAM. Types of external memory. The structure of magnetic disks. Principles for recording and reading information on magnetic and laser disks. Comparative characteristics of external storage devices. Logic device names. Basics of logic.		4	3, 7
Didactic unit: software implementation of information processes			

3. Operating Systems. Main menu Windows, desktop, taskbar, window structure. The shell of the operating system WIN COMMANDER. File storage system. The concept of the file and its storage on the disks. File name when working in Windows. File types, extension assignment. Optimization of information storage. Folders, their purpose and name. The concept of the root catalog. Full file path. Basket.		2	1, 6, 7
Didactic unit: Models of solving functional and computing			
4. Models of solving functional and computing tasks. Algorithmization and programming.		4	11, 12, 13
5. Local networks and their use in solving data processing applications. Global networks. Protection of information.		2	8
6. High-level programming languages. The main functions of the programming environment.		4	14, 15
Semester: 2			
Didactic unit: Basics of algorithm and programming			
7. Introduction to the project		6	1, 2, 3
8. The concept of algorithm		6	1, 2, 3
9. Numerical methods		6	1, 2, 3, 6

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: software implementation of information processes				
1. Text editor MS Word. Appointment, opportunities, basic settings.	8	8	1, 10, 2, 3	Laboratory work in the terminal class
2. MS Excel table processor. Appointment, opportunities, basic settings. The concept of an active cell. Work with columns and rows. Data Types, Entering them, the organization of automatic calculations with the help of formulas, the most commonly used features, their structure and record in the spreadsheet. Basic techniques for work with formulas (copy, transfer, cleaning, deletion). Relative and absolute addressing	8	12	1, 11, 6	Laboratory work in the terminal class
3. Basics of logic	2	8	7	The study of the logical elements of the computer
Didactic unit: Models of solving functional and computing				
3. Databases. Purpose, scope		8		Composition and circuit solutions of power circuits and PS control circuits.

4. Creating a Web page.		8	8	Creating simple web pages.
5. Mathcad. Purpose, basic principles of constructing algorithms for mathematical tasks. Work with built-in features, eyelids, arrays.		10	13, 14, 15	Works in the mathematical package Mathcad.
Semester: 2				
Didactic unit: Basics of algorithm and programming				
6. Introduction to Matlab		9	1, 2, 3	
7. Drawing up an algorithm		9	1, 2, 3, 6	
8. Numerical methods		9	1, 2, 3	
9. Modern technologies in programming		9	1, 2, 3	

Literary sources

Main literature

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Methodical support and software

Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Introduction to the direction

Course: 1, semester : 1

		Semester
№	**Kind of activity**	**1**
1	Total credits	2
2	Total hours	72
3	Total classes in the contact form, hours	45
4	Lectures, hours	18
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	8
8	Consultations, hours	7
9	Independent work, hours	27

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
uses a systematic approach to solve problems
is able to manage their time, build and implement a self-development trajectory based on the principles of education throughout life; *regarding the following learning results*:
effectively plans to own a whole time

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. UK-1. 1 1. Search for the necessary information, its critical analysis and summarizes the results of the analysis to solve the task	Lections; Seminars; Independent work
uses a systematic approach to solve problems	
2. MC-1. 2 2. Uses the system approach to solve the tasks of	Lections; Seminars; Independent work
effectively plans to own a whole time	
3. UK-6. 1 1. Effectively plans his own time	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 1				
Didactic unit: General familiarization with the process of learning in the university.				
1. The process of learning in the NSTU: Bachelor, magistracy, graduate school. Rights and obligations of students in the process of studying at the university.		4	1, 3	The total characteristic of the educational process established by applicable federal high education standards at the chosen direction of learning.
Didactic unit: Acquaintance with applicable educational standards.				
2. Federal State Educational Standard of Higher Education (GEF) in the direction of preparation 13.03.01 Thermal power engineering and heat engineering (undergraduate level)		2	1, 3	Familiarization with the requirements of the standard, finding out the conditions for the implementation of the educational trajectory of the university.
7. Features of the types of professional activities of graduates.		6	1, 2, 3	Features of the types of professional activities of graduates who have mastered the program of the undergraduate: Estimated project and design and design; Research; organizational and managerial; production and technological; installation and commissioning; Service and operational. The distribution of graduates to the enterprises and organization of the region.
Didactic unit: Information support of the learning process.				
8. DC electronic devices		2	3	The overall characteristics of the NSTU library resources, GPTB SB RAS, Institutions of the SB RAS for specialized preparations. Rules and conditions for access to printed and electronic library resources.
9. Conduct practice.		4	3	Terms and venues of stationary and exit practices: to receive primary professional skills and skills, including primary skills and skills. research activities; To receive professional skills and experience of professional activities (technological practice, research work; prediplomal.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities

Semester: 1				
Didactic unit: Introductionful practice of first-year students				
1. Formation of an electronic student portfolio.	2	2	1, 3	familiarization with the procedure for the formation and content of the student's electronic portfolio
2. TRANSION ON LABORATES OF THE TEPTER EXTRACTING STATIONS NGTU .	2	4	3	familiarization with the material and technical process of learning in the university
3. Excursion for electrical laboratories of electrical departments of the energy faculty of the NSTU.	2	6	3	Acquaintance with the material and technical basis of training on related specialties of the energy orientation
4. Exit practical activity On the basis of regional offices in Novosibirsk, the leading foreign company Viessmann for the production of boiler and energy equipment.	2	4	2, 3	Acquaintance with advanced foreign innovative technologies for the production of thermal and electrical energy. Exit lesson on the basis of a regional office in Novosibirsk, the leading foreign company VIESSMANN for the production of boiler and energy equipment. Determination of the modern world-class technology in the direction of training.
5. Acquaintance with the NSTU library.		2	3	Acquaintance with technology storage technologies in high school. Conditions and rules for working with library funds.

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Methodical support and software

Methodological support

1. Расчет тепловых схем паротурбинных ТЭС : методические указания к курсовому и дипломному проектированию для 4 и 5 курсов ФЭН всех форм обучения (специальности 140100, 140101, 140104, 220301, 140204) / Новосиб. гос. техн. ун-т ; [сост.: О. К. Григорьева, О. В. Боруш]. - Новосибирск, 2010. - 57, [1] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000148924

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Safety of vital activity

Course: 2, semester : 4

		Semester
№	**Kind of activity**	**4**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	66
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	0
8	Consultations, hours	10
9	Independent work, hours	42

External requirements

is able to create and maintain safe life conditions, including in emergency situations; *regarding the following learning results*:
Conditions to apply in professional and daily activities. Methods of protection against hazards, including in the threat and emergence of emergency situations and military conflicts, and ways to ensure safe livelihoods.
Know the basics of life safety, has an idea of ??how to create safe conditions that ensure sustainable development of society in professional and daily activities and the preservation of the environment.
owns the victim first aid skills.

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
Know the basics of life safety, has an idea of ??how to create safe conditions that ensure sustainable development of society in professional and daily activities and the preservation of the environment.	
1. UK-8. 1 1. Know the basics of life safety, has an idea of ??how to create safe conditions that ensure sustainable development of society in professional and daily activities and the preservation of the environment.	Lections; Seminars; Independent work

Conditions to apply in professional and daily activities. Methods of protection against hazards, including in the threat and emergence of emergency situations and military conflicts, and ways to ensure safe livelihoods.	
2. UK-8. 2 2. Conditions to apply in professional and daily activities. Methods of protection against dangers, including in the threat and emergence of emergency situations and military conflicts, and ways to ensure safe livelihoods.	Lections; Seminars; Independent work
owns the victim first aid skills.	
3. can work with systemic natural science patterns of professional activity objects	Seminars

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Protection in emergency situations				
1. Classification of maniogenous and natural origin. Basic principles, events and ways to protect the population in emergency. Dangerous NSO objects.		4	1, 2	Drawing up the abstract of the lecture material
2. Fire safety and lightning protection.		4	1, 2	Drawing up the abstract of the lecture material
Didactic unit: Software Experiment Management and Data Processing				
3. Basic concepts of BC. Legislative and regulatory documents in the field of BC. Instructions in the workplace. Injury.		2	1, 2	Drawing up the abstract of the lecture material
4. Investigation and accounting of occupational diseases. Insurance against industrial accidents and occupational diseases.		2	1	Drawing up the abstract of the lecture material
Didactic unit: Sanitation sanitation Labor hygiene				
5. The effect of production factors on personnel and ways to protect against them in emergency situations.		6	2	Drawing up the abstract of the lecture material
6. Special assessment of working conditions.		2	1, 2	Drawing up the abstract of the lecture material
Didactic unit: Energy turbines and power plant boilers.				
7. Analyzing the danger of human damage to electric shock.		4	1, 2	Drawing up the abstract of the lecture material
8. Protection measures from human damage by electric shock.		2	1, 2	Drawing up the abstract of the lecture material
Didactic unit: Ecology				
11. Global environmental problems of modernity.		2	1, 2	Drawing up the abstract of the lecture material

12. Environmental pollution. Waste production and consumption.		6	1	Drawing up the abstract of the lecture material
13. Pollution of the city of Novosibirsk.		2	1, 2	Drawing up the abstract of the lecture material

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Protection in emergency situations				
1. Studying fire safety systems in NSTU.		2	2	Excursion to the university with a democracy of means of warning and rescue
2. Visit to the fire and technical exhibition.		2	1, 2	Studying the fire development NSO services. Organization of fire safety in TsUM, theaters and on large industrial facilities, the use of fire extinguishers (video)
Didactic unit: Software Experiment Management and Data Processing				
3. Investigation and accounting of accidents at work.		4	1, 2	With the help of cases, study and analyze various types of accidents. The second stage is a role-playing game: students form a commission to investigate accidents and draw out an act of investigating an accident on the basis of real materials.
Didactic unit: Sanitation sanitation Labor hygiene				
4. Creating comfortable working conditions in the workplace.		4	1, 2	Analysis of the state of production factors present at any workplace (microclimatic parameters and luminous environments) .
Didactic unit: Energy turbines and power plant boilers.				
5. Working with the simulator cardiovascular resuscitation "Maxim III".		2	2	Working with simulator cardiovascular resuscitation "Maxim III "
6. Consideration and analysis of various emergency situations in office and residential premises.		2	2, 3	Consideration of various ways to hit the electrical current, analysis of the degree of lesion.
7. Studying methods for reducing the risk of human damage from an electric current.		2	1, 2	Studying the ideology of constructing systems of subordinate regulation

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Electrical Equipment

Course: 2, semester : 3

		Semester
№	**Kind of activity**	**3**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	83
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	0
8	Consultations, hours	9
9	Independent work, hours	61

External requirements

can apply the appropriate physico-mathematical apparatus, methods of analysis and modeling, Theoretical and experimental study in solving professional problems; *regarding the following learning results*:
demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics	
1. OPK-2. 2 2. Demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 3				
Didactic unit: Main onyatia system analysis				

1. Basic concepts, elements and characteristics of electrical circuits. Basic laws of electrical chains. Schemes of substitution		2	1	Studies of theoretical material. Answers to questions
Didactic unit: Theory and methods for analyzing linear electrical circuits of DC				
3. Compilation of equations for calculating currents in the schemes with the help of laws Kirchhoff. Transferring the source of the EMF and the current source through the electrical circuit assembly. Replacing the branch with an equivalent branch with a source of EDC		4	1	Studies of theoretical material. Answers to questions
4. The method of contour currents. Principle and overlay method. Method of nodal potentials and two nodes. Method of equivalent generator (active two-pole). Balance of capacity		4	1	Studies of theoretical material. Answers to questions
Didactic unit: Telephony and multimedia computer networks.				
5. Ways to represent sinusoidal electrical values. Elements of the electrical circuit of the sinusoidal current.		2	1	Studies of theoretical material. Answers to questions
6. Ohm and Kirchhoff laws for sinusoidal current chains. Symbolic method of calculating sinusoidal circuits		2	1	Studies of theoretical material. Answers to questions
7. Resonant phenomena in linear electrical circuits of sinusoidal current		2	1	Studies of theoretical material. Answers to questions
8. Chains with mutual inductance		2	1	Studies of theoretical material. Answers to questions
Didactic unit: Technological schemes of heat units.				
9. Three-phase electrical circuits. Basic concepts. Vector diagrams		2	1	Operation of theoretical material. Answers to questions
10. Calculation Symmetric modes of three-phase circuits		2	1	Studies of theoretical material. Answers to questions
11. Calculation of asymmetric modes of three-phase chains		2	1	Studies of theoretical material. Answers to questions
12. The method of symmetric components. Calculation of complex electrical circuits under static load		4	1	Studies of theoretical material. Answers to questions
13. Power determination in three-phase circuits		2	1	Studies of theoretical material. Answers to questions
Didactic unit: Transient processes in linear electrical circuits and their methods calculation				

14. Basic concepts and laws used in calculating transient processes in linear electrical circuits. Classic method of calculating transients. Calculation of transient processes in chains of the first and second order.		3	1	Studies of theoretical material. Answers to questions
15. Operator method for calculating transients		3	1	Studies of theoretical material. Answers to questions

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Theory and methods for analyzing linear electrical circuits of DC				
1. Study of linear electrical circuits of DC		4	1	Pre-calculation of parameters, Required to perform laboratory studies. Assembling scheme. Research
Didactic unit: Telephony and multimedia computer networks.				
2. Study of linear chains of sinusoidal current		4	1	Preliminary calculation of parameters is necessary for the implementation of laboratory studies. Assembling the scheme. Research
3. The study of the AC circuits with mutual inductance		4	1	Preliminary calculation of parameters is necessary for the implementation of laboratory studies. Assembling the scheme. Research
Didactic unit: Technological schemes of heat units.				
4. Study of the modes of three-phase chains		6	1	Pre-calculation of parameters, Required to perform laboratory studies. Assembling scheme. Research

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Theory and methods for analyzing linear electrical circuits of DC				
1. Equivalent transformations of DC linear electrical circuits. Determination of input resistance		1	1	Mastering the receptions of the equivalent transformation of electrical circuits. Solving tasks to determine the input resistance of a passive two-pole
2. Calculation of linear electrical circuits of DC using the ruler of the currents of currents (lever rules)		1	1	The development of the methods of compiling equivalent schemes in solving problems

3. Calculation of linear circuits of direct current by applying the laws of Kirchoff and the contour current methods		2	1	solving problems ,, allow you to master the calculation of electrical circuits using the Circhhoot's laws and the contour currents
5. Calculation of linear DC linear circuits using the method of nodal potentials and the applix method		2	1	Solving tasks that allow you to master the method of nodal potentials and the application method
7. Calculation of DC circuits using the equivalent generator method		1	1	solving problems that allow you to master the equivalent generator method
Didactic unit: Telephony and multimedia computer networks.				
8. Calculation of linear chains of sinusoidal current with vector diagrams		1	1	Solving problems that allow you to master a vector presentation of the parameters of the sinusoidal current chains and the association between them
9. Calculation of sinusoidal circuits using a symbolic method		1	1	Solution of tasks, allowing to learn how to determine the parameters of the linear chains of the sinusoidal current
10. Calculation of alternating current circuits with mutual inductance		1	1	Calculation of linear electrical circuits containing magnets-knitted elements
11. Calculation of alternating current circuits in resonance mode		1	1	Mastering the calculation of the sinusoidal circuits in the resonance mode
Didactic unit: Technological schemes of heat units.				
12. Calculation Symmetric modes of three-phase circuits		2	1	mastering methods for calculating three-phase chains in symmetric modes
13. Calculation of asymmetric modes of three-phase chains		1	1	Solving problems for calculating asymmetric three-phase circuit modes with active load
Didactic unit: Transient processes in linear electrical circuits and their methods calculation				
14. Calculation of transient processes in first-order circuits by the classical method		1	1	Mastering the classical method of calculating transient processes using task solutions
15. Calculation of transient processes in second-order circuits by the classical method		1	1	Mastering the classical method of calculating transient processes using task solutions
16. Calculation of transients in first-order chains by the operator method		1	1	Mastering the operator method of calculating transient processes by solving problems
17. Calculation of transient processes in second-order circuits by the operator method		1	1	Mastering the classical method of calculating transient processes using task solutions

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Methodological support

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Specialized software

1 Software modeling program ELCUT

2 PTC Mathcad

3 Editor diagrams and block diagrams for Windows Microsoft Visio

4 Design Science Mathtype

5 Microsoft Office Application Pack

6 Microsoft Office Application Pack

7 Performing a graphic part of the RHZ at the professional level Autodesk Autodesc AutoCAD

ANNOTATION OF THE PROGRAM

Special chapters of higher mathematics

Course: 2, semester : 4

		Semester
№	Kind of activity	4
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	79
4	Lectures, hours	36
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	18
8	Consultations, hours	5
9	Independent work, hours	65

External requirements

can apply the appropriate physico-mathematical apparatus, methods of analysis and modeling, Theoretical and experimental study in solving professional problems; *regarding the following learning results*:
applies a mathematical apparatus of research of functions, linear algebra, differential and integral calculation, rows, differential equations, the theory of complex variable functions, numerical methods

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
applies a mathematical apparatus of research of functions, linear algebra, differential and integral calculation, rows, differential equations, the theory of complex variable functions, numerical methods	
1. The concept of random events, the main theorems Probability theories	Lections; Seminars; Independent work
2. The concept of random variance and their probabilistic characteristics	Lections; Seminars; Independent work
3. about random processes and their main characteristics	Lections; Independent work
4. UK-1. 2 2. Able to solve practical tasks associated with professional activities	Lections; Seminars; Independent work
5. Determine the likelihood of complex events	Lections; Seminars; Independent work
6. Determine the numerical characteristics of random variables based on the laws of probability distribution	Lections; Seminars; Independent work

7. Define the law of distribution of random variables The well-known laws of the distribution of these random variables	Seminars; Independent work
8. Methods for processing the original statistical material	Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Probability theory				
1. Random events. Classification. Probability. Theory Theory Theory Theory Theory Probability Probability.	8	8	1, 5	Work with abstract
2. Sequence of independent tests. Bernoulli scheme. Integral and limit theorem. Asymptotic formula Poisson. The general theorem on the repetition of experiments.	2	2	1, 5	Work with abstract
3. random processes. Basic concepts.	4	4	2, 6	Work with abstract
4. Laws of the distribution of probability of random variables. The laws of distribution of discrete ST: Binomial Law, Poisson Law (rare phenomena). The laws of the distribution of continuous SV: exponential law, the law of uniform density, the normal law of distribution, truncated normal law.	4	4	2, 6	Work by Skographic
5. Systems of continuous random variables The function of the distribution of the system of continuous SV and its properties. The density of the distribution of probabilities of the system of two sv and its properties. Conditional distribution laws. Numeric characteristics of the SV system The initial and central moments of the SV system Correlation moment and correlation coefficient. Regression lines. Correlation relations. The laws of distribution of functions of SV. Numeric characteristics of SV functions The law of distribution of the function of one random argument. Determination of the law of distribution of the function of two random arguments.	4	4	2, 6	Work with abstract

6. Random processes and models of dynamic systems. The basic concepts of the linear algebra and the theory of probability. Multidimensional random vectors. Properties of conditional characteristics of normally distributed random vectors. Random process and its numeric characteristics. Differential models of continuous dynamic systems. Difference models of discrete dynamic systems.	4	4	3	Work with abstract
Didactic unit: Elements of mathematical statistics				
7. Statistical estimates of the numerical characteristics of St. Point estimates and requirements for their definition (consistency, loosening and efficiency). Interval estimates. Trust probability and confidence interval.	6	6	4	Work with abstract
8. Checking the likelihood of hypotheses and levels of significance. Criticiceries of the significance of the hypothesis. Criterion belongs to two statistical samples of a single general population. Checking the hypothesis on the form of the law of distribution of CV.	4	4	4	Work with abstract

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Probability theory				
1. Random events. Basic concepts. The amount and work of events. The record of complex events through the components of its simple events. Classical definition of the probability of an event for the scheme of cases. The main theorems of probability theory (multiplication and addition theorems). Formula full probability and hypotheses theorem. Sequence of independent tests. Private and general theorems on repetition of experiments. The integral limit theorem asymptotic formula of Poisson.	6	6	1, 2, 5	kinematic circuit of the steering mechanism.

2. Random variables. Numerical characteristics of CF.Function and the density of the probability distribution of random variable. Numerical characteristics of a random variable.	8	8	1, 2, 6	Calculate the main numerical characteristics of discrete and continuous random variables. Build and analyze graphs of distribution functions
3. Some laws of the distribution of probability random variance (Poisson's law, the law of uniform density, normal law). Random variables. Dependent and independent St. Numeric characteristics of a system of discrete and continuous SV. Functions of random variables. Numeric characteristics of SV functions	8	8	2, 6, 7	build and analyze graphs of various distribution laws Calculate the main characteristics of the SV system Determine the numeric characteristics of the functions of
Didactic unit: Elements of mathematical statistics				
4. Statistical estimates of the numerical characteristics of sv. Equipment assessments and requirements for their definition (consistency, failure and efficiency). Interval estimates . Trust probability and confidence interval	6	6	1, 2, 4, 8	Build histograms and polygons of frequencies. Calculate point and interval estimates of distribution parameters
5. Checking the likelihood of hypotheses and levels of significance.	8	8	1, 2, 4, 8	Choose evaluation criteria Determine the levels of significance

Literary sources

Main literature

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Internet resources

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2. http://elibrary.nstu.ru/

3. https://e.lanbook.com/

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5. http://znanium.com/

Methodical support and software

Methodological support

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2. Теория вероятностей и математическая статистика [Электронный ресурс] : электронный учебно-методический комплекс / В. И. Бутырин, С. Н. Веричев, А. В. Гобыш, Э. Б. Шварц ; Новосиб. гос. техн. ун-т. - Новосибирск, [2013]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000182153. - Загл. с экрана.

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Technical thermodynamics

Course: 2, semester ы : 3 4

		Semester	
№	**Kind of activity**	**3**	**4**
1	Total credits	3	5
2	Total hours	108	180
3	Total classes in the contact form, hours	63	84
4	Lectures, hours	36	36
5	Practical lessons, hours	18	18
6	Laboratory studies, hours	0	18
7	of them in an active and interactive form, hours	18	14
8	Consultations, hours	7	10
9	Independent work, hours	45	96

External requirements

can apply the appropriate physico-mathematical apparatus, methods of analysis and modeling, Theoretical and experimental study in solving professional problems; *regarding the following learning results*:
demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics
can demonstrate the use of the main methods of obtaining, transformation, transport and the use of heat in Heat engineering and systems; *regarding the following learning results*:
applies knowledge of the foundations of thermodynamics for calculating thermodynamic processes, cycles and their indicators
Demonstrates the understanding of the basic laws of thermodynamics and thermodynamic ratios

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics	
1. OPK-2. 2 2. Demonstrates an understanding of physical phenomena and applies the laws of mechanics, thermodynamics, electricity and magnetism, optics	Lections; Seminars; Independent work
Demonstrates the understanding of the basic laws of thermodynamics and thermodynamic ratios	
2. OPK-3. 4 4. Demonstrates an understanding of the basic laws of thermodynamics and thermodynamic ratios	Lections; Seminars; Laboratory works; Independent work
applies knowledge of the foundations of thermodynamics for calculating thermodynamic processes, cycles and their indicators	

3. OPK-3. 5 5. Applies knowledge of the foundations of thermodynamics to calculate thermodynamic processes, cycles and their indicators	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results
Semester: 3			
Didactic unit: Basics of thermodynamics			
1. Basic concepts and definitions		2	1
2. Status equations		2	1
3. The heat capacity of the heat and mass transfer during the condensation of vapors		2	1
4. Zero and the first law of thermodynamics		2	3
5. The first law of thermodynamics		4	2
6. First Thermodynamic Law for Gas Flow		2	1
7. The second law of thermodynamics		4	2
8. Entropic diagrams of thermodynamic cycles		2	2
9. Differential equations of thermodynamics		4	2
10. Thermodynamic equilibrium		2	1
11. Thermodynamics of phase transitions		4	1
12. Wet air		2	2
13. Ocean energy resources		4	1
Semester: 4			
Didactic unit: Thermodynamics of technical systems			
14. Throtting		4	3
15. Thermodynamics of the flow		4	1
16.		4	2
17. Thermodynamic cycles of thermal machines		12	3
18. Refrigerated installations		6	3
19. New ways of energy conversion		6	3

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Thermodynamics of technical systems				
1. Measurement of fluid heat capacity		4	2	Measurement and processing of experimental data
2. Measurement of wet air parameters	2	4	2	Measurement and processing of experimental data
3. Research of free convection		5	2	Measurement and processing of experimental data
4. Study of forced convection		5	2	Measurement and processing of experimental data

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Basics of thermodynamics				
20. Thermal state parameters	2	2	2	Steering trapezes.
21. The equation of the state of the ideal gas	2	2	1	Steering trapezes.
22. The first law of thermodynamics	2	2	2	Steering trapezes.
23. Gas ??cycles	4	4	3	Steering trapezes.
24. Wet Air. Processes in wet air.	2	2	2	Steering trapezes.
25. Economic Balances. Losses of the exxigaty	2	2	2	Steering trapezes.
26. Gas ??throttling and vapor	2	2	2	Steering trapezes.
27. Thermodynamic processes	2	2	2	Steering trapezes.
Semester: 4				
Didactic unit: Thermodynamics of technical systems				
28. H-S Diagram	2	2	2	Steering trapezes.
29. Cycles of steam-turbine installations	2	6	3	Steering trapezes.
30. Gas ??settings	4	6	3	Steering trapezes.
31. Cycles of refrigeration units.	4	4	3	Steering trapezes.

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Main literature

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6. Электронно-библиотечная система НГТУ [Электронный ресурс] : электронно-библиотечная система. – [Россия], 2011. – Режим доступа: http://elibrary.nstu.ru/. – Загл. с экрана.

Methodical support and software

Methodological support

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2. Горбачев М. В. Термодинамика и теплопередача [Электронный ресурс] : электронный учебно-методический комплекс / М. В. Горбачев, М. С. Макаров, В. С. Наумкин ; Новосиб. гос. техн. ун-т. - Новосибирск, [2020]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000242711. - Загл. с экрана.

Specialized software

1 Creating reports for laboratory work. Microsoft Microsoft Office

2 PTC Mathcad

ANNOTATION OF THE PROGRAM
Technical Mechanics

Course: 2, semester : 3

		Semester
№	**Kind of activity**	**3**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	63
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	16
8	Consultations, hours	7
9	Independent work, hours	45

External requirements

can take into account the properties of structural materials in thermal calculations, taking into account dynamic and thermal Loads; *regarding the following learning results*:
demonstrates knowledge of the basic laws of mechanics of structural materials used in thermal power and heat engineering
Performs calculations for the strength of the elements of heat engineering and systems, taking into account the conditions of their work

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
demonstrates knowledge of the basic laws of mechanics of structural materials used in thermal power and heat engineering	
1. The main types of mechanisms, methods of research and calculation, their kinetic and dynamic characteristics.	Lections; Seminars; Independent work
2. Principles of creation and order of engine design, appointment and classification of typical design elements th (mechanical gear, shafts, supports, connections, couplings, springs, etc.), accuracy of the manufacture of size and roughness of surfaces	Lections; Seminars; Independent work
3. Design and rely on the strength of shafts, welded, rivet, press, threaded, key connections details. Check the rolling bearings for durability.	Lections; Seminars
4. Working with systemic natural science models of professional activity objects	Lections; Seminars; Independent work

5. Apply the main methods of physical research of phenomena and properties of the material world objects.	Lections; Seminars; Independent work
6.The procedure for the development and design of sketches of machines, images of assembly units, assembly drawing of the product, to draw up the specification, using machine graphics methods.	Lections; Seminars; Independent work
7. Self select a reference literator ATURA, GOST, as well as the prototypes of the design.	Lections; Seminars; Independent work
8. The procedure for developing and designing technical machines and structures.	Lections; Seminars; Independent work
9. Choose the simplest models of physical objects and Processes	Lections; Seminars; Independent work
11. Axioms of mechanics, ways to transform the strength systems to the simplest form, the equilibrium conditions of the system of forces and bodies, the conditions of the static determination of the system.	Lections; Seminars; Independent work
12. How to model real objects and compile their calculated schemes in the tasks of theoretical and applied mechanics.	Lections; Seminars; Independent work
13. Essence of the intense body of the body When applying external strengths and methods of its research, the hypothesis of strength and methods for determining the mechanical characteristics of materials, the simplest types of deformation and the procedure for calculating the strength and rigidity.	Lections; Seminars; Independent work
Performs calculations for the strength of the elements of heat engineering and systems, taking into account the conditions of their work	
14. to carry out project and verification calculations of gearboxes on contact and bending stresses, belt gears for traction, chain gears for specific pressure in the hinge. Determine the forces in engagement.	Lections; Seminars; Independent work
15. to carry out project and verification calculations of gearboxes on contact and bending stresses, belt gears for traction, chain gears for specific pressure in the hinge. Determine the forces in engagement.	Lections; Seminars
16. Methodical bases for calculating the deformation and strength properties of parts of machines and structural elements, the main criteria for their health.	Lections; Seminars
17. High-voltage electrical equipment of electrical technological installations	Lections; Seminars

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Basics of statics.				
1. Introduction to theoretical mechanics. Status of mechanical systems. Asioms of statics. The moment of strength and pairs of forces. Parallel transfer of forces. The equilibrium conditions of the power system. Center of gravity.		2	13, 2, 4, 5, 6, 7, 8, 9	Study of the basic concepts of statics.
Didactic unit: Kinematics point and body.				
2. Ways to set a point movement. Progressive and rotational motion of a solid body. Flat-headed body movement. Body movement around a fixed point.		1	1, 4, 6, 7, 8, 9	Study of the basic concepts of kinematics.
3. Complex movement point. Coriolis theorem. Complex body movement.		1		Determination of speeds and accelerations of the point in a complex movement.

Didactic unit: Dynamics of the material point and system.				
5. Introduction to the dynamics. Tasks and axioms of speakers. Differential point equations. Free oscillations of the material point. The number of motion of the material point and system. The moment of the co-course of movement. The principle of Dalamber for non-free material point.		1	6	Basic concepts of dynamics of points and systems.
5. The principle of possible movements. General equation of speakers. The kinetic energy of the material point and system. Potential power field.		1	6	The main theorems of the speakers.
Didactic unit: The main concepts of resistance of materials.				
6. Introduction. Stress-strain body state. Section method. The law of a bitch. Mechanical characteristics of structural materials. Theory of strength. Geometric characteristics of sections.		6	11, 12, 13, 14, 16, 17, 7, 9	The main positions of resistance of materials.
Didactic unit: Industrial controllers as part of automated technological control systems				
7. The simplest types of deformations: Spraying compression, twist, bending, stability. Calculations for strength and rigidity in hazardous sections. Building an Eppure of internal power factors.		8	14, 16, 17, 2	Calculations for strength and rigidity.
Didactic unit: Basic concepts of design Machines.				
8. Machines and mechanisms. Structural and kinematic analysis of mechanisms. Definition of speeds and accelerations of links.		2	14, 15, 16, 17, 2, 3	Study of the structure and kinematics of the mechanism links.
Didactic unit: Mechanical transmissions.				
9. Gear classification. Calculations and design of individual types.		6	14, 15, 16, 17, 2, 3	Studying structures and procedure for calculating various types of mechanical gear.
Didactic unit: Shafts and their supports.				
11. Shafts and axles. Calculation and design of shafts. Support shafts. Slip bearings. Classification of rolling bearings. Selection and calculation of rolling bearings. Shaft seals.		4	14, 15, 16, 17, 2, 3	Project and test calculations of shafts and their supports.
Didactic unit: Connections of machine parts.				
12. Types of machine parts: Welded; rivet; presses; threaded; Sponewings. Classification of couplings. Elastic elements.		4	14, 15, 16, 17, 2, 3	Classification of parts compounds and their calculations.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Basics of statics.				
1. Equilibrium system of forces. Ferm calculation	2	2	15	Study of the equilibrium of the systems of forces and bodies
Didactic unit: Kinematics point and body.				
2. Point Kinematics Research	4	2	1, 11, 12, 7	The study of the kinematic parameters of the movement of the point.
Didactic unit: Dynamics of the material point and system.				
3. System dynamics.	2	2	1, 12, 13, 14, 2, 4, 5, 7	The study of the dynamic characteristics of the system movement of the tel.
Didactic unit: Industrial controllers as part of automated technological control systems				
4. Spraying compression, twisting, bending and stability.	4	7	14, 15, 16, 4, 5, 6, 7, 8	Studies of the strength and rigidity of various mechanical systems in the occurrence of simple types of deformed state.
Didactic unit: Mechanical transmissions.				
5. Kinematic and power calculations of gearboxes.	2	1	15, 16, 4, 5, 6, 8	Kinematic and power calculations of mechanical drives.
Didactic unit: Shafts and their supports.				
6. Calculations of the shafts and the selection of bearings.	2	2	15, 16, 17, 3, 6, 7, 9	refined calculation of shafts and checking bearings for durability.
Didactic unit: Connections of machine parts.				
7. Calculations of various types of compounds of parts for strength and carrying capacity.		2	14, 15, 2, 3	Performing standard calculations of parts connections.

Literary sources

Main literature

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3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

5. http://znanium.com/

Methodical support and software

Methodological support

1. Механика : [методические указания и контрольные задания для ФЭН дневной и заочной форм обучения] / Новосиб. гос. техн. ун-т ; [сост. Ю. С. Поляков]. - Новосибирск, 2009. - 58, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000089963

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5. Детали машин и основы конструирования : учебно-методическое пособие по дисциплинам "Прикладная механика" и "Механика" / [В. П. Гилета и др.] ; Новосиб. гос. техн. ун-т. - Новосибирск, 2017. - 107, [3] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000234353

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Specialized software

1 PTC Mathcad

ANNOTATION OF THE PROGRAM
Hydrogazodynamics

Course: 2, semester : 3

		Semester
№	**Kind of activity**	**3**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	81
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	0
8	Consultations, hours	7
9	Independent work, hours	63

External requirements

can demonstrate the use of the main methods of obtaining, transformation, transport and the use of heat in Heat engineering and systems; *regarding the following learning results*:
Applies knowledge of the basics of hydrogazodynamics for calculating thermal installations and systems
demonstrates the understanding of the basic laws of fluid and gas movement

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
demonstrates the understanding of the basic laws of fluid and gas movement	
1. Learn to use professional literature, reference data and technical documentation.	Lections; Seminars; Independent work
2. to explore the basic laws of hydrogazodynamics, thermodynamics and heat exchange	Lections; Seminars; Laboratory works; Independent work
3. To study theoretical methods for calculating the movement of fluid and gas	Lections; Seminars; Laboratory works; Independent work
Applies knowledge of the basics of hydrogazodynamics for calculating thermal installations and systems	
4. Own the methods of calculating and analyzing hydropneumo systems.	Lections; Seminars; Laboratory works; Independent work
5. Learn to conduct Hydraulic calculations of apparatus and processes	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results
Semester: 3			
Didactic unit: Physical properties of liquids and gases			
1. Physical properties of liquids and gases. Physical models of liquids and gases. Thermodynamic processes in solid media.		1	2
Didactic unit: Hydrostatics			
2. Basic hydrostatic equation. Paradoxes of hydrostatics: Paradox Pascal, N.E. Zhukovsky. Differential hydrostatic equations.		2	2
3. Differential equation of the surface surface. Relative equilibrium of solid media. Rotation of a vessel with liquid.		2	2, 3
Didactic unit: Equations of motion and their integration			
4. Bernoulli equation for incompressible and compressible liquids, gases.		8	3
Didactic unit: Dynamics of compressible liquids, gases			
5. Isoentropic ratios for perfect compressible gas. Presentation of flow parameters through critical. Elements of the theory of the nozzle of Laval. Other methods for accelerating gas flows. The law of treatment of influence.		2	1, 3
6. Elements of the theory of the nozzle of the footage. Other methods for accelerating gas flows. The law of appeal impact. Racing seals, discharge. Conducting a supersonic flow of convex and concave plane angles. Relatives for a straight jump. Relations for oblique jumps. Impact adiabat.		1	3, 4
7. Conducting the angular configurations with a supersonic stream.		2	1, 3
8. Gugonio equation. Notos of Laval.		2	3
Didactic unit: Non-stationary hydrodynamics			
9. Hydraulic blow.		2	2, 4
10. nonstationary hydraulic losses.		2	2, 4
Didactic unit: Potential flows			
11. concepts of speed potential and current function. The simplest potential streams.		3	3
12. The history of the development and the basic concepts of the theory of optimization		3	3
Didactic unit: EXISTING OF LIQUES , gases			
13. Investigation of the electrical properties of conductive materials		4	2
14. Embossing through a siphon and from a centrifugal nozzle.		2	5

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Laws of conservation in mechanics				
1. Aerodynamic tube and instruments for measuring flow rate.		4	2, 4	Conduct experiments in the aerodynamic pipe and learning how to measure the flow rate.
Didactic unit: Equations of motion and their integration				
2. Determination of flow modes in a round tube.		4	2, 4	The laws of resistance for different flow rates in the cylindrical tube are experimentally determined.
Didactic unit: Dynamics of viscous liquids and gases				
3. Specific energy distribution along the length of the variable section pipe. Local hydraulic resistances.		6	4, 5	Experimentally investigated the distribution of the specific energy of the flow of the variable section channel.
Didactic unit: EXISTING OF LIQUES , gases				
4. the expiration of the liquid from the holes and nozzles with constant pressure.		4	3, 4, 5	Determination by experimental coefficients characterizing the expiration of fluid through holes in a thin wall and through nozzles with constant pressure.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Physical properties of liquids and gases				
1. Analysis of the influence of the viscosity of gases on the flow regimes.		2	1, 2	Solving tasks to determine the physical properties of gases.
Didactic unit: Laws of conservation in mechanics				
2. Law of energy conservation.		4	3, 5	Solving tasks to determine the laws of resistance
3. Solving tasks, analysis of typical RGS.		6	1, 3, 4, 5	The analysis of the tasks of the objectives of artistic texts submitted on the RGZ
Didactic unit: Dynamics of viscous liquids and gases				
4. Determination of flow modes in permanent cross-section pipes.		1	4	Solution of the tasks.
5. Determination of flow modes in variable section pipes.		1	2	Solution of the tasks.
Didactic unit: EXISTING OF LIQUES , gases				
6. study of energy characteristics, distribution of magnetic, electric and tempera Instrument fields in metal products at a constant current in the inductor		2	1, 3	Solution of the tasks.

7. Embossing from holes and nasad Cove. Local hydraulic resistances.		2	2, 5	Solution of the tasks.

Table 3.4

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Dynamics of compressible liquids, gases				
1. Ejectors.		4	2, 5	Examine the basic laws put in the output of the main ejector equation.

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Methodical support and software

Methodological support

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4. Определение погрешностей измерений в аэрофизическом эксперименте : методические указания к лабораторным работам по курсу "Методы и техника аэродинамического эксперимента" для 4 курса факультета летательных аппаратов дневного отделения / Новосиб. гос. техн. ун-т ; [сост.: М. Д. Бродецкий, В. Н. Зиновьев, И. И. Мажуль]. - Новосибирск, 2005. - 30 с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000044740

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM

Course: 1, semester : 2

		Semester
№	Kind of activity	2
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	61
4	Lectures, hours	18
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	0
8	Consultations, hours	5
9	Independent work, hours	47

External requirements

can take into account the properties of structural materials in thermal calculations, taking into account dynamic and thermal Loads; *regarding the following learning results*:
demonstrates knowledge of the basic rules for building and designing sketches, drawings and schemes in accordance with the requirements of standards
Performs sketches, drawings and schemes in accordance with the requirements of standards using the design automation tools

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
demonstrates knowledge of the basic rules for building and designing sketches, drawings and schemes in accordance with the requirements of standards	
1. in the field of structural and electrical materials used in the electrical machines of automation systems and Their impact on the main indicators: accuracy and reliability	Lections; Seminars; Independent work
2. to know the requirements of the unified system of design documentation	Lections; Seminars; Independent work
Performs sketches, drawings and schemes in accordance with the requirements of standards using the design automation tools	
3. be able to read and develop design documents	Lections; Seminars; Independent work
4. Be able to save the file in the AutoCAD graphics editor	Seminars; Independent work
5. Use the AutoCAD graphics editor to create a detail drawing.	Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 2				
Didactic unit: graphics as a means of presenting information				
1. Ways to display and perceive information. Projection methods. Projecting objects.		4	1	Aspectation of the lecture.
2. Images - types, cuts, section		4	1, 2	Aspectation of the lecture.
Didactic unit: Protection of electrical equipment.				
3. Products production.		2	2, 3	Aspectation of the lecture.
4. Drawing up a thermal system. Examples of thermal schemes of modern power units TPP and nuclear power plants. Methods for calculating the principal thermal schemes of condensation TPPs and nuclear power plants. Features of calculating thermal CHP circuits. Features of calculating the vapor power units. Features of calculating thermal NPP schemes.		6	2, 3	Aspectation of the lecture.
5. Types and types of schemes. Setting the electrical principal and list of items.		2	2, 3	Aspectation of the lecture.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 2				
Didactic unit: Basics of computer graphics				
1. Familiarity with the interface of the AutoCAD graphic editor. Creating, editing geometric objects.		8	4	Mastering the AUTOCAD graphic editor commands.
Didactic unit: graphics as a means of presenting information				
2. Projecting objects to 3 projection planes.		10	1	Solution of tasks: Proceeding objects.
Didactic unit: Protection of electrical equipment.				
3. Creating and forming the drawing Details, assembly drawing.		14	2, 3, 5	Performing tasks included in the RGZ
4. Registration of the electrical principle and list of elements.		4	2, 3, 5	The implementation of the E3 and PE3 scheme.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities

Semester: 2				
Didactic unit: Basics of computer graphics				
1. Creating editing geometric objects in AutoCAD.		8	4, 5	Exercise exercises.
Didactic unit: graphics as a means of presenting information				
10. Images: types, cuts, sections.		2	1, 2	Execution of calculations. Registration of the explanatory note. Preparing for protection
11. Projecting methods.		2	1	Solution of tasks: Proceeding objects.
Didactic unit: Protection of electrical equipment.				
4. Welded connection.		2	2, 3, 5	design the drawing of the Sat and Specifications.
5. Drawing details.		2	2, 3, 5	on Sat drawing to perform the drawing of the details.
6. Sketch details.		2	2, 3	Execution of the sketch.

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Methodical support and software

Methodological support

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5. Милютина Д. Г. Инженерная графика [Электронный ресурс] : электронный учебно-методический комплекс / Д. Г. Милютина ; Новосиб. гос. техн. ун-т. - Новосибирск, [2017]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000235000. - Загл. с экрана.

Specialized software

1 Web Google Chrome Browser

2 Performing a graphic part of the RHZ at the professional level Autodesk Autodesc AutoCAD

3 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Metrology

Course: 3, semester : 5

		Semester
№	**Kind of activity**	**5**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	41
4	Lectures, hours	18
5	Practical lessons, hours	0
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	0
8	Consultations, hours	3
9	Independent work, hours	67

External requirements

is able to measure electrical and non-electrical values ??at heat efficiency and heat Technique; *regarding the following learning results*:
selects measurement tools, performs measurements of electrical and non-electrical values, processes measurement results and evaluates their error

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
selects measurement tools, performs measurements of electrical and non-electrical values, processes measurement results and evaluates their error	
1. to know ways of assessing the error of indirect measurements	Lections; Laboratory works; Independent work
2. Know the basic concepts of metrology	Lections; Laboratory works; Independent work
3. Know the varieties of signals	Lections; Laboratory works; Independent work
4. To be able to measure using analog and digital measuring instruments	Lections; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Basic concepts of metrology.				
1. Metrology. Theoretical foundations of metrology. Quantitative and qualitative properties of objects. Basic concepts and definitions. International System Units SI.		3	1, 3	Lecture.
Didactic unit: Structural schemes of traction gears and power plants.				
2. Measurement tools. Measurement result. Multiple measurements. Measurement errors, sources of errors. Processing measurement results.		3	1, 2	Lecture.
Didactic unit: Scientific and legislative metrology				
3. Scientific and legislative metrology. Legal fundamentals of the Law of the Russian Federation "On Ensuring Unity of Measurements". The structure of the metrological service in the country, in the enterprise, in organizations that are legal entities, its functions.		3	2	Lecture.
4. Metrological support, standards, exemplary and working measures, testing schemes, state metrological laboratories, measuring equipment and other measuring instruments.		3	2	Lecture.
5. Metrological characteristics of measuring instruments, their rationing.		2	2, 4	Lecture.
Didactic unit: Measuring Information Signals				
6. signals of measuring information - voltage, currents - their varieties. Pulses. Interference.		4	2, 3	Lecture.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Structural schemes of traction gears and power plants.				
1. Evaluation of methodological and additional instrumental errors in measurements.		9	1, 2, 3, 4	Laboratory work.
Didactic unit: Scientific and legislative metrology				

2. Statistical processing of measurement results. Verification of measuring instruments.		9	1, 2, 3, 4	Laboratory work.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Structural schemes of traction gears and power plants.				
1. Factors affecting measurement results.		5	1, 2	Independent work.
Didactic unit: Scientific and legislative metrology				
2. Legal basis for ensuring unity of measurement. Federal laws and organizational materials. State Metrological Service and other public services for ensuring the unity of measurement.		10	2	Independent work.

Literary sources

Main literature

1. Метрология, стандартизация и сертификация: Учебное пособие / В.Е. Эрастов. - М.: Форум, 2008. - 208 с.: 60x90 1/16. - (Высшее образование). (переплет) ISBN 978-5-91134-193-0 - Режим доступа: http://znanium.com/catalog.php?bookinfo=138307 - Загл. с экрана.

2. Метрология, стандартизация, сертификация: Учебное пособие / А.И. Аристов, В.М. Приходько, И.Д. Сергеев, Д.С. Фатюхин. - М.: ИНФРА-М, 2012. - 256 с.: 60x90 1/16 + CD-ROM. - (Высшее образование). (переплет, cd rom) ISBN 978-5-16-004750-8 - Режим доступа: http://znanium.com/catalog.php?bookinfo=239847 - Загл. с экрана.

Additional literature

1. Гущин, С. Н. Технические измерения : учебно-методическое пособие / С. Н. Гущин. — 3-е. — Киров : Вятская ГСХА, 2017. — 102 с. — Текст : электронный // Лань : электронно-библиотечная система. — URL: https://e.lanbook.com/book/129608 (дата обращения: 15.03.2021). — Режим доступа: для авториз. пользователей.

Internet resources

1. http://elibrary.nstu.ru/

2. https://e.lanbook.com/

3. http://www.iprbookshop.ru/

4. Мультиметры цифровые универсальные [Электронный ресурс] // АКТАКОМ-Сибирь. - 2011. - Режим доступа: http://aktakom-siberia.ru/catalog/kontrolno_izmeritelnyie_priboryi_i_aksessuaryi/multimetryi_i_voltmetryi_nastolnyie/multimetryi_universalnyie. - Загл. с экрана.

5. http://znanium.com/

Methodical support and software

Methodological support

1. Метрология и измерительная техника : методическое руководство к выполнению лабораторного практикума для 1 курса АВТФ (направлений 12.03.01, 12.03.04, 09.03.02), 3 курса технических специальностей других факультетов / Новосиб. гос. техн. ун-т ; [сост.: В. К. Береснев, Г. Г. Матушкин, А. Э. Каспер]. - Новосибирск, 2017. - 56, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000235091

2. Основы метрологии : программа, методические указания, вопросы для самопроверки и контрольные задания для 2 и 3 курсов технических факультетов заочной формы обучения / Новосиб. гос. техн. ун-т ; [сост. Г. Г. Матушкин]. - Новосибирск, 2008. - 62, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000088374

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Materials & Science

Course: 2, semester : 4

		Semester
№	**Kind of activity**	**4**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	61
4	Lectures, hours	36
5	Practical lessons, hours	0
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	16
8	Consultations, hours	5
9	Independent work, hours	47

External requirements

can take into account the properties of structural materials in thermal calculations, taking into account dynamic and thermal Loads; *regarding the following learning results*:
demonstrates knowledge of applications, properties, characteristics and methods of studying structural materials, chooses structural materials in accordance with the required characteristics for use in the field of professional activities

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
demonstrates knowledge of applications, properties, characteristics and methods of studying structural materials, chooses structural materials in accordance with the required characteristics for use in the field of professional activities	
1.Properties of various materials, the relationship between the structure, properties and application of materials in various industries. Basic analysis methods allowing to predict behavior of materials and products from them in real operating conditions	Lections; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 4				
Didactic unit: Fundamentals of the structure and properties of materials. Phase transformations				

1. 1. Nomenclature of technical materials in thermal power. 2. The crystal structure of metals. 3. The main provisions of the theory of crystallization. 4. The theory of alloys.		8	1	Discussion of the topic is discussed.
Didactic unit: Fundamentals of thermal processing and surface hardening				
2. 5. Methods of research materials. 6. Theory of thermal processing.		6	1	Discussion of the topic is discussed.
Didactic unit: Structural metals and alloys				
3. 7. Alloyed steel and alloys. 8. Aluminum and its alloys. Copper and her alloys.		8	1	Discussion of the topic is discussed.
Didactic unit: Non-metal and composite materials				
4. nine. The main technologies for the manufacture of parts from non-metallic materials. 10. Ceramic materials. 11. Composite materials.		8	1	Discussion of the topic is discussed.
Didactic unit: Fundamentals of structural materials				
5. 12. Material processing technology.		6	1	Discussion of the topic is discussed.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Fundamentals of the structure and properties of materials. Phase transformations				
1. 1. Study of the state of alloys of the Iron-cementite system.	4	4	1	Laboratory work. Analysis of the chart of the state of iron cementite. Studying the structure and properties of iron-carbon alloys.
Didactic unit: Fundamentals of thermal processing and surface hardening				
2. Laboratory work. The study of thermal processing methods. Evaluation of the properties of materials after heat treatment. Choosing an optimal method of thermal processing.	4	4	1	Laboratory work. The study of thermal processing methods. Evaluation of the properties of materials after heat treatment. Select the optimal method of heat treatment.
Didactic unit: Structural metals and alloys				
3. 3. Study of the structure and properties of aluminum alloys.	4	4	1	Laboratory work. Studying the peculiarities of heat treatment of deformable aluminum alloys. Evaluation of the structure and properties.
Didactic unit: Fundamentals of structural materials				

4. . 4. Recrystallization Annealing.	4	6	1	Laboratory work. Investigation of the effect of the degree of cold plastic deformation and temperature of recrystallization annealing on the structure and mechanical properties of metal materials.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Fundamentals of the structure and properties of materials. Phase transformations				
1. 1. Diagrams of the state of alloys of various purposes		4	1	Preparation of RGZ.
Didactic unit: Structural metals and alloys				
2. 2. Choosing materials for the manufacture of products for various purposes.		4	1	Preparation of RGZ
Didactic unit: Non-metal and composite materials				
3. 3. Study of polymer, ceramic and composite materials.		4	1	Preparation of RGZ
Didactic unit: Fundamentals of structural materials				
4. 4. Selection of product manufacturing technology for various purposes.		5	1	Preparation of RGZ

Literary sources

Main literature

1. Плохов А. В. Физические и механические свойства материалов : [учебник] / А. В. Плохов, А. И. Попелюх, Н. В. Плотникова. - Новосибирск, 2018. - 340, [1] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000238175

Internet resources

1. Электронно-библиотечная система НГТУ [Электронный ресурс]. - Новосибирск : Новосибирский государственный технический университет, 2011-2017. - Режим доступа: http://elibrary.nstu.ru/. - Загл. с экрана.

2. http://elibrary.nstu.ru/

3. Голобоков А. С., Сергеева В. И., Пономарева П. А. Проблемы энергетического сотрудничества на Корейском полуострове в условиях угроз региональной безопасности. территория новых возможностей / А. С. Голобоков, В. И. Сергеева, П. А. Пономарева. - Текст : электронный // Вестник Владивостокского гос. университета экономики и сервиса. - 2017. - № 3 .- ЭБС Издательство «Лань» [Электронный ресурс] : электронно-библиотечная система. - [Россия], 1993. - URL: https://e.lanbook.com/reader/journalArticle/374365/#1 (дата обращения 23.03.2021). - Режим доступа:для авториз. пользователей.

4. https://e.lanbook.com/

5. http://www.iprbookshop.ru/

6. http://znanium.com/

Methodical support and software

Methodological support

1. Изучение диаграммы состояния сплавов системы "железо-цементит" : методические указания к лабораторной работе № 2 по курсу "Материаловедение" для механико-технологического факультета, факультета летательных аппаратов, факультета энергетики / Новосиб. гос. техн. ун-т ; [сост.: Н. В. Плотникова и др.]. - Новосибирск, 2017. - 19, [3] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000235250

2. Исследование способов термической обработки для повышения конструктивной прочности детали : методические указания к лабораторной работе № 3 по курсу "Материаловедение" для механико-технологического факультета, факультета летательных аппаратов, факультета энергетики дневного обучения / Новосиб. гос. техн. ун-т ; [сост.: А. И. Смирнов, Е. А. Дробяз, А. А Никулина]. - Новосибирск, 2017. - 25, [1] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000235241

3. Цветные металлы и сплавы. Рекристаллизационный отжиг : методические указания к выполнению лабораторных работ № 5 и 6 по дисциплине "Материаловедение" для механико-технологического факультета, факультета летательных аппаратов, факультета энергетики / Новосиб. гос. техн. ун-т ; [сост.: Е. А. Дробяз, А. А. Никулина, Н. С. Стукачева]. - Новосибирск, 2017. - 22, [2] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000235238

4. Исследование структуры и свойств алюминиевых сплавов : методические указания к выполнению лабораторной работы № 4 по материаловедению для 1-3 курсов МТФ (направления и специальности 220700 [и др.], ФЛА (направления и специальности 160100 [и др.]), ФЭН (направление 140101) всех форм обучения / Новосиб. гос. техн. ун-т ; [сост.: Е. Е. Корниенко и др.]. - Новосибирск, 2014. - 17, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000199747

5. Организация самостоятельной работы студентов Новосибирского государственного технического университета : методическое руководство / Новосиб. гос. техн. ун-т ; [сост.: Ю. В. Никитин, Т. Ю. Сурнина]. - Новосибирск, 2016. - 19, [1] с. : табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000234042

Specialized software

1 Creating reports for laboratory work. Microsoft Microsoft Office

ANNOTATION OF THE PROGRAM

Basics of personal and communicative culture

в составе дисциплин: Культура научной и деловой речи

Культура и личность

Course: 1, semester : 2

		Semester
№	**Kind of activity**	**2**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	66
4	Lectures, hours	18
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	16
8	Consultations, hours	10
9	Independent work, hours	42

Literary sources

Internet resources

1. http://elibrary.nstu.ru/

2. https://e.lanbook.com/

3. http://www.iprbookshop.ru/

4. http://znanium.com/

ANNOTATION OF THE PROGRAM
Scientific and business speech culture

Course: 1, semester : 2

		Semester
№	**Kind of activity**	**2**
1	Total credits	1,5
2	Total hours	54
3	Total classes in the contact form, hours	31
4	Lectures, hours	8
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	8
8	Consultations, hours	5
9	Independent work, hours	23

External requirements

is able to carry out business communication in oral and written forms in the state language of the Russian Federation and foreign language (AH); *regarding the following learning results*:
demonstrates the ability to exchange business information in oral and writing In the state language
uses modern information and communicative means for communication

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
demonstrates the ability to exchange business information in oral and writing In the state language	
1. UK-4. 1 1. Demonstrates the ability to exchange business information in oral and written forms in the state language	Lections; Seminars; Independent work
uses modern information and communicative means for communication	
2. UK-4. 3 3. Uses modern information and communication tools for communication	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**

Semester: 2				
Didactic unit: Culture of speech				
1. Russian in the cultural and historical space of the XX-XXI centuries. The state of speech culture of society at the present stage.		2	1, 2	Lecture. Suiting the abstract lecture. Participation in the discussion part of the lecture. Performing creative tasks.
2. The normative aspect of the speech culture of a specialist.		2	1, 2	Lecture. Suiting the abstract lecture. Participation in the discussion part of the lecture. Performing creative tasks.
Didactic unit: Stylistics				
4. Scientific speech as a component of the training and professional activities of students.		1	1, 2	Lecture. Suiting the abstract lecture.
5. Business speech as a component of the professional activity of a specialist. Etiquette of a business letter.		1	1, 2	Lecture. Suiting the abstract lecture.
Didactic unit: Rhetoric				
7. Basics of public speech. Speech academic etiquette. Features of the culture of scientific communication.		1	1, 2	Lecture. Suiting the abstract lecture.
8. etiquette of business conversations. Features of the device to work.		1	1, 2	Lecture. Suiting the abstract lecture. Participation in the discussion part of the lecture. Performing creative tasks.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 2				
Didactic unit: Culture of speech				
1. Language and speech. National language: non-vertical forms and functional styles.	2	2	1, 2	Practical lesson. Deal in the texts of non-Lectureny forms of the National Language: Purchase, Argo, Slang, Dialect.
2. Theory of norms. Orphoepic, lexical, grammatical, stylistic rules of Shrill.		4	1, 2	Practical lesson. Estimates with messages about one of the types of national language (message scheme: definition, properties, examples, use sphere). Analysis of examples (words, phrases) with orthoepic difficulties. Performing tasks for orthoepic and grammatical standards. Working with a table of thermal elements.
Didactic unit: Stylistics				

5. Normal system of differential equations. Theorem of existence and uniqueness. Normal linear system of differential equations. General solution of a linear homogeneous system. Linear inhomogeneous system. Linear equation of N-th order. Reducing the order of a linear homogeneous system of differential equations	4	4	1, 2	Practical activity. Text-making, drawing up question and popular plans. Identify errors in science-style texts. Performances with reports on the topic of the found scientific article.
6. Genres of written business communication. Statement. Explanatory note. Summary upon admission to work.		4	1, 2	Practical lesson. Business securities. Writing Summary.
Didactic unit: Rhetoric				
7. Oral scientific and educational conference. Refstract message accompanied by electronic presentation.	2	2	1, 2	Practical occupation. Suggestions with reports accompanied by electronic presentation.
10. Genres of oral business communication. Interview with the device to work.		2	1, 2	Practical occupation. Intelligence in business negotiations. Performances with reports on "Intercultural Communication in Business Sphere".

Literary sources

Main literature

1. Мистюк Т. Л. Стилистика русского языка и культура речи. Теория : [учебное пособие] / Т. Л. Мистюк ; Новосиб. гос. техн. ун-т. - Новосибирск, 2017. - 81, [2] с.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000234615

2. Мистюк Т. Л. Стилистика русского языка и культура речи. Практикум : [учебное пособие] / Т. Л. Мистюк ; Новосиб. гос. техн. ун-т. - Новосибирск, 2018. - 50, [2] с.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000237782

3. Культура научной и деловой речи. Нормативный аспект : [учебное пособие / Н. Я. Зинковская и др.] ; Новосиб. гос. техн. ун-т. - Новосибирск, 2019. - 73, [2] с. : табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000241171

4. Мистюк Т. Л. Русский язык и культура речи. Нормы. Стилистика : учебное пособие / Т. Л. Мистюк ; Новосиб. гос. техн. ун-т. - Новосибирск, 2015. - 83, [1] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000220164

5. Леонова А. В. Русский язык и культура речи : [учебное пособие] / А. В. Леонова ; Новосиб. гос. техн. ун-т. - Новосибирск, 2012. - 106, [1] с. : табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000174005

6. Русский язык и культура речи / Штрекер Н.Ю. - М.:ЮНИТИ-ДАНА, 2015. - 383 с.: ISBN 978-5-238-00604-8 - Режим доступа: http://znanium.com/catalog.php?bookinfo=882544 - Загл. с экрана.

Additional literature

1. Маркелова Е. В. Деловой русский язык [Электронный ресурс] : электронный учебно-методический комплекс / Е. В. Маркелова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2011]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000163897. - Загл. с экрана.

Internet resources

1. Земская Е. А. Активные процессы в русском языке последнего десятилетия XX века [Электронный ресурс] / Е. А. Земская. – Ч. 2, 1. – Режим доступа: http://www.gramota.ru/biblio/magazines/gramota/russianworld/28_49. – Загл. с экрана.

2. http://elibrary.nstu.ru/

3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

5. http://znanium.com/

Methodical support and software

Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Culture and personality

Course: 1, semester : 2

		Semester
№	**Kind of activity**	**2**
1	Total credits	1,5
2	Total hours	54
3	Total classes in the contact form, hours	31
4	Lectures, hours	8
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	8
8	Consultations, hours	5
9	Independent work, hours	23

External requirements

is able to carry out social interaction and implement its role in the command; *regarding the following learning results*:
determines the cooperation strategy to achieve the goal
is able to perceive the intercultural diversity of society in socio-historical ohm, ethical and philosophical contexts; *regarding the following learning results*:
has practical experience in analyzing philosophical and historical facts, the experience of assessing cultural phenomena.
knows how to communicate with representatives of other nationalities and denominations in compliance with ethical and intercultural norms.
knows the main categories of philosophy, the laws of historical development, the basics of intercultural communication.
is able to manage their time, build and implement a self-development trajectory based on the principles of education throughout life; *regarding the following learning results*:
plans its trajectory Professional development and takes steps on its implementation

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
determines the cooperation strategy to achieve the goal	

1. UK-3. 1 1. Determines the collaboration strategy to achieve the goal	Lections; Seminars; Independent work
knows the main categories of philosophy, the laws of historical development, the basics of intercultural communication.	
2. UK-5. 1 1. Know the main categories of philosophy, the laws of historical development, the basics of intercultural communication.	Lections; Seminars
knows how to communicate with representatives of other nationalities and denominations in compliance with ethical and intercultural norms.	
3. UK-5. 2 2. Conditions to communicate with representatives of other nationalities and denominations in compliance with ethical and intercultural norms.	Lections; Seminars; Independent work
has practical experience in analyzing philosophical and historical facts, the experience of assessing cultural phenomena.	
4. UK-8. 3 3. Owns the victim first aid skills.	Lections; Seminars
plans its trajectory Professional development and takes steps on its implementation	
5. UK-6. 2 2. Plans to be the trajectory of its professional development and takes steps on its implementation	Lections; Seminars
12.Have the experience of a public speech and the oral presentation of the results of their study activities	Seminars
knows how to communicate with representatives of other nationalities and denominations in compliance with ethical and intercultural norms.	
13. Know the basic rhetorical techniques necessary for the organization of a public speech	Seminars
determines the cooperation strategy to achieve the goal	
14. To be able to evaluate the level of preparedness and emotional state of the audience	Seminars
has practical experience in analyzing philosophical and historical facts, the experience of assessing cultural phenomena.	
15.To have an idea of ??the formal logical basics of thinking	Lections; Seminars; Independent work
plans its trajectory Professional development and takes steps on its implementation	
16. U1. To be able to independently draw up functional and concept schemes of coordinate converters	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 2				
Didactic unit: Communicative and sociocultural aspects of personality formation in the professional and business sector				
1. Personality and Basics of intercultural communication		2	1, 3	Lecture with elements of "brainstorming". Analysis of the concepts of "culture" and "personality".

2. Humanistic ideals and values ??in personality formation		2	2, 3, 4, 5	Lecture with elements of the discussion. Students are offered a number of problem situations. Lisviar versions of students. Their theoretical interpretus is given by the teacher.
3. Intellectual human development in culture		2	15, 16	Lecture with elements of "brainstorming". The issues of interaction of intellectual and business activity in the professional sphere are discussed. The question of the need for fundamental theoretical preparation within the framework of profile specialization is discussed.
4. Personal self-determination in modern culture		2	2, 4, 5	Lecture with a demonstration of video phrases. Joint discussion and interpretation of visual content, reflecting the nature and problems of modern cultural development.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 2				
Didactic unit: Communicative and sociocultural aspects of personality formation in the professional and business sector				
1. Personality and Society: Socialization Problems		2	12, 5	Seminar conversation, including the self-testing of students and teachers (acquaintance), analyzing self-testing from the point of view of the demonstration of psychological, behavioral, social features. Practical study of the methods of conducting such an analysis by students themselves.
2. Personality and modern mass communications. .	1	2	1, 14	A problem seminar with a discussion of film films, excerpts from artistic and scientific works characterizing the state of personality in the context of modern communications.
3. Features of ritual-mythological communication.	1	2	12, 3	analysis of the fragments of artistic texts, video materials (commercials, etc.) using various ritual and mythological elements

4. Value aspects of personality development: confessional and moral aspects of behavior in the business and professional sphere	1	2	2, 3, 4, 5	Problem seminar on the material of the history of ethical thought. Discussing the specifics of the formation and development of humanistic ideals in various sides of cultural life. Threads for work in mini-groups: "Craftsman and engineer: Humanistic and antigumanist trends in traditional and industrial production."
5. Culture and rationality. Analytical and reflexive personality formation skills.	1	2	1, 15, 16	Problem seminar with elements of the role-playing historical game "Court of Socrates", in the process of which the differences between traditional and rational thinking are found, the methods of argumentation and counterpressure are established in a public dispute .
6. Labor ethics. The problem of motivating work in the professional field	1	2	2, 5	The problem seminar that detects spiritual and moral aspects of the capitalist society (modern). Discussion and interpretation of scientific and artistic texts.
7. Professional engineer culture.	1	2	2, 5	Discussing various technical achievements in the history of culture. Motivate students to actively master the history of technology. Audience is offered a number of discussion issues on the topic: "Problems and Prospects for Technical Progress."
8. Scientific and technical creativity in the history of culture.	1	2	2, 5	Discussing various technical achievements in the history of culture. Motivate students to actively master the history of technology. Audience is offered a number of discussion issues on the topic: "Problems and Prospects for Technical Progress."
9. Problems of human development and future technology.	1	2	12, 13, 2, 5	Discussing various technical achievements in the history of culture. Motivate students to actively master the history of technology. Audience is offered a number of discussion issues on the topic: "Problems and Prospects for Technical Progress."

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Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Conflictology

в составе дисциплин: Социальные технологии

Организационная психология

Course: 2, semester : 3

		Semester
№	**Kind of activity**	**3**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	66
4	Lectures, hours	18
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	40
8	Consultations, hours	10
9	Independent work, hours	42

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Conflict management technologies				
1. Conflict: Concept, types, conflict dynamics		2	3	Students listen to the lecture and make up the cospure of the following sections: the concept of conflict, conflict typology, causes of conflict, conflict dynamics
2. Conflict resolution		1	3	
3. Negotiations as a way to resolve the conflict		2	3, 4	Students listen to the lecture and make up the cospure of the following sections: the concept of negotiations, types and features of the negotiations, the stages of the negotiation process
Didactic unit: Socio-project technologies				

4. Written genres of scientific and educational speech. Abstract, abstract, course and bachelor work.	1	1	1, 2	Students listen to the lecture and make up the cospate in the following sections: the concept of a social project, the project cycle, Designing in the resolution of social problems, stages of project activities
5. Fundraising as a stage of project activities	1	1	1, 2	Students listen to the lecture and make up the cospite in the following sections: the concept of fundraising, motivation of activity
6. Presentation of performance results	1	1	1, 2	Students listen to a lecture and make up the cosptext to the following sections: a presentation of the unitual and group activities

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Conflict management technologies				
1. conflict function	1	1	3, 4	Students work in subgroups, identify the positive and negative conflict functions, participate in group discussion
2. Strategies of behavior in conflict	1	1	3, 4	Students study strategies for behavior in conflict on the example of Thomas Killman's mesh -Killman to determine his own dominant strategy
3. Conflict analysis	2	2	4	Students lead a summary, propose methods of braking electric drive
4. Features of the group conflict	3	3	3, 4	Game "shipwreck", group discussion on the results of the game
5. Negotiations	5	5	3, 4	game "Dert and Balda", testing the technician of the negotiation process
Didactic unit: Socio-project technologies				
6. Social project	1	1	1, 2	Discussion of social problems of society and group, allocation of problems for writing a social project
7. Group and individual activity planning	1	1	1, 2, 4	Students develop a section of the social project "Stages and events"
8. Fundraising	1	1	1, 2	Group discussion "Search and attracting resources"
9. Presentation of activities	1	1	1, 2, 4	Game "Interview", game "Presentation of us"

10. Protecting the project	1	2	1, 2	Students will present and protect social projects

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Internet resources

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ANNOTATION OF THE PROGRAM
Social technologies

Course: 2, semester : 3

		Semester
№	**Kind of activity**	**3**
1	Total credits	1,5
2	Total hours	54
3	Total classes in the contact form, hours	31
4	Lectures, hours	8
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	20
8	Consultations, hours	5
9	Independent work, hours	23

External requirements

is able to determine the range of tasks in the framework of the target and choose the best ways to solve them, based on existing legal norms, resources available and restrictions; *regarding the following learning results*:
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions
formulates in the framework of the draft project a set of tasks providing its achievement
is able to carry out social interaction and implement its role in the command; *regarding the following learning results*:
determines the cooperation strategy to achieve the goal
interacts with other team members to achieve the task

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
formulates in the framework of the draft project a set of tasks providing its achievement	
1.	Lections; Seminars; Independent work
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	
2. UK-2. 2 2. Selects the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	Lections; Seminars; Independent work
determines the cooperation strategy to achieve the goal	

3. UK-3. 1 1. Determines the collaboration strategy to achieve the goal	Lections; Seminars; Independent work
interacts with other team members to achieve the task	
4. UK-3. 2 2. Interact with other team members to achieve the task	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Conflict management technologies				
1. Conflict: Concept, types, conflict dynamics		2	3	Students listen to the lecture and make up the cospure of the following sections: the concept of conflict, conflict typology, causes of conflict, conflict dynamics
2. Conflict resolution		1	3	
3. Negotiations as a way to resolve the conflict		2	3, 4	Students listen to the lecture and make up the cospure of the following sections: the concept of negotiations, types and features of the negotiations, the stages of the negotiation process
Didactic unit: Socio-project technologies				
4. Written genres of scientific and educational speech. Abstract, abstract, course and bachelor work.	1	1	1, 2	Students listen to the lecture and make up the cospate in the following sections: the concept of a social project, the project cycle, Designing in the resolution of social problems, stages of project activities
5. Fundraising as a stage of project activities	1	1	1, 2	Students listen to the lecture and make up the cospite in the following sections: the concept of fundraising, motivation of activity
6. Presentation of performance results	1	1	1, 2	Students listen to a lecture and make up the cosptext to the following sections: a presentation of the unitual and group activities

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Conflict management technologies				

1. conflict function	1	1	3, 4	Students work in subgroups, identify the positive and negative conflict functions, participate in group discussion
2. Strategies of behavior in conflict	1	1	3, 4	Students study strategies for behavior in conflict on the example of Thomas Killman's mesh -Killman to determine his own dominant strategy
3. Conflict analysis	2	2	4	Students lead a summary, propose methods of braking electric drive
4. Features of the group conflict	3	3	3, 4	Game "shipwreck", group discussion on the results of the game
5. Negotiations	5	5	3, 4	game "Dert and Balda", testing the technician of the negotiation process
Didactic unit: Socio-project technologies				
6. Social project	1	1	1, 2	Discussion of social problems of society and group, allocation of problems for writing a social project
7. Group and individual activity planning	1	1	1, 2, 4	Students develop a section of the social project "Stages and events"
8. Fundraising	1	1	1, 2	Group discussion "Search and attracting resources"
9. Presentation of activities	1	1	1, 2, 4	Game "Interview", game "Presentation of us"
10. Protecting the project	1	2	1, 2	Students will present and protect social projects

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1. Социальное проектирование: от идеи до президентского гранта : видеокурс. – Текст : электронный // Фонд президентских грантов : [сайт]. – [Москва]. – URL: https://xn--80asdbjdcwjs4g.xn--80afcdbalict6afooklqi5o.xn--p1ai/ (дата обращения: 26.02.2021). – Режим доступа: для зарегистрир. пользователей.

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Methodical support and software

Methodological support

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Specialized software

1 Microsoft Windows operating system

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Pedagogy of higher school

Course: 2, semester : 3

		Semester
№	**Kind of activity**	**3**
1	Total credits	1,5
2	Total hours	54
3	Total classes in the contact form, hours	31
4	Lectures, hours	8
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	20
8	Consultations, hours	5
9	Independent work, hours	23

External requirements

is able to determine the range of tasks in the framework of the target and choose the best ways to solve them, based on existing legal norms, resources available and restrictions; *regarding the following learning results*:
formulates in the framework of the draft project a set of tasks providing its achievement
is able to carry out social interaction and implement its role in the command; *regarding the following learning results*:
interacts with other team members to achieve the task
is able to manage their time, build and implement a self-development trajectory based on the principles of education throughout life; *regarding the following learning results*:
effectively plans to own a whole time
plans its trajectory Professional development and takes steps on its implementation

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
formulates in the framework of the draft project a set of tasks providing its achievement	
1. Basics of telecommospal	Lections; Seminars; Independent work
2. Basics management teams	Lections; Seminars; Independent work
interacts with other team members to achieve the task	
3. Establish recommendations for increasing group cohesion. and efficient operation of the group	Lections; Seminars; Independent work

formulates in the framework of the draft project a set of tasks providing its achievement	
4. Command concept, command forming steps	Lections; Seminars; Independent work
interacts with other team members to achieve the task	
5. knows the genres of business speech, their features in comparison with traditional business communication	Seminars; Independent work
6. Formulate technical Requirements based on existing standards and specifications	Lections; Seminars; Independent work
7. Command Roles and Command Behavior	Seminars; Independent work
8.Diagnose problems at different stages of the development team	Lections; Seminars
9. offer solutions to reduce negative effects in teamwork	Lections; Seminars; Independent work
formulates in the framework of the draft project a set of tasks providing its achievement	
10. Basics of verbal and non-verbal communication	Lections; Seminars; Independent work
11. Types of risks, risk classification	Seminars; Independent work
interacts with other team members to achieve the task	
12. Calculate the necessary technical and economic indicators of the operation of heat exchange equipment at a given heat loads, as well as technical, layout and strength characteristics. and heat exchangers.	Seminars; Independent work
formulates in the framework of the draft project a set of tasks providing its achievement	
13. Methods of strategic analysis, principles for determining the needs of the enterprise in financial, material, labor and intellectual resources, sources of their production	Lections; Independent work
14. Effective communication techniques	Lections; Seminars; Independent work
15. Build graphs of functions in the Cartesian and polar coordinate systems, calculate the limits of sequences and functions;	Lections; Seminars; Independent work
interacts with other team members to achieve the task	
16. to resist the effects of interpersonal effects	Lections; Seminars; Independent work
plans its trajectory Professional development and takes steps on its implementation	
17. receptions of presentations and arguments	Lections; Seminars; Independent work
formulates in the framework of the draft project a set of tasks providing its achievement	
18. Features of behavior in a team of people with various individual-typological characteristics	Seminars; Independent work
interacts with other team members to achieve the task	
19. Select partners for efficient operation of the command	Seminars; Independent work
20. Techniques for establishing contact	Seminars; Independent work
effectively plans to own a whole time	
21.Basics of time management	Seminars; Independent work
plans its trajectory Professional development and takes steps on its implementation	
22. perform analysis and calculate the modes of work of static electric energy converters	Lections; Seminars; Independent work
23. on the individual style of activity	Lections; Seminars; Independent work
24. detect operation planning errors	Lections; Seminars; Independent work
25. Methods for diagnosing identity features	Seminars; Independent work
interacts with other team members to achieve the task	

26. computing indefinite and certain integrals (including incompatible) with the help of basic integration methods, use integral calculus when solving geometry and physics tasks	Lections; Seminars; Independent work
plans its trajectory Professional development and takes steps on its implementation	
27. Manifestation and influence of individual characteristics in communication	Seminars; Independent work
28. Basics of self-testing	Seminars; Independent work
29. Apply personal diagnostic techniques	Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Sent and interaction				
1. Concept of communication; Functions, parties, communication styles	0	2	10, 15, 17	Students make a summary of the lecture material and receive answers to the questions asked by the teacher on the topic of lectures
2. Features of the perception of another person in the process of communication	2	2	13, 14, 16, 17, 26, 9	Students make an abstract on lecture material, answer the teacher's questions during the lecture, provide examples
Didactic unit: Teamwork				
3. The concept of the team, characteristic of the work team	0	2	1, 2, 3, 4, 6, 8, 9	Students make a summary of the lecture material and receive answers to the questions asked by the teacher on the topic of lectures
Didactic unit: Self-knowledge and self-development				
4. Self-organization and self-motive	1	2	22, 23, 24	Students make an abstract on lecture material, answer the teacher's questions during the lecture, provide examples

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 3				
Didactic unit: Sent and interaction				

1. The concept of verbal and non-verbal communication	2	2	10, 11, 12, 14, 27	Students perform exercises to transfer verbal and non-verbal information. The following questions are discussed in the dialogue mode: non-verbal communication systems; cultural features of manifestation of non-verbal communication; the causes of the difficulties of understanding of non-verbal communication and the ways to overcome them; Distortion of information in the process of communication.
2. Barriers of communication and methods for overcoming	2	2	11, 12, 14, 15	The following questions are discussed in the dialogue mode: the concept of communication barriers; Types of barriers and ways to overcome them. Students lead examples of communicative barriers.
Didactic unit: Teamwork				
3. Roles in the team	2	2	1, 18, 19, 2, 26, 3, 4, 6, 7, 9	Diagnosis of command roles according to the method of R.M. Belbina. Studying role characteristics. Discussion of the dependence of the team's efficiency from its composition.
4. Group phenomena and effects	2	2	1, 18, 2, 3, 5, 6, 7, 8, 9	In the dialogue mode, the following questions are discussed: phenomena arising in teamwork; Factors leading to group phenomena; Ways to reduce the negative impact of group phenomena on the activities of the team.
5. Interaction in the team	1	1	1, 11, 12, 14, 18, 19, 2, 3, 5, 6, 7, 8, 9	Students perform a command job, and then analyzed: - its behavior in the group; - What group phenomena and effects manifested themselves in teamwork; - how representatives of different command roles showed themselves.
Didactic unit: Self-knowledge and self-development				

6. Time management	2	2	21, 23, 24	In the dialogue mode, the following questions are studied: The basic concepts of time management; techniques and taking time management; The concept of individual style of activity. Students analyze personal temporary losses, determine the methods of increasing their effectiveness.
7. Basics of self-sustaining	2	2	10, 14, 16, 17, 20, 28	The types and objectives of the self-testing are discussed. It is studied by a summary as a form of self-testing: rules and typical errors when it is compiled. The specificity of self-testing in employment is discussed.
8. Diagnosis of individual characteristics	4	5	15, 18, 22, 23, 25, 26, 27, 29	in the dialogue mode, the following questions are studied: concept of character and temperament; typology of character and temperament; Temperament as the basis of an individual activity style. The diagnosis of character and temperament is carried out (according to one of the techniques: D.Kayirsi, K.leongard-N.Shimisek, Aisenka).

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Methodical support and software

Methodological support

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Specialized software

1 Microsoft Windows operating system

ANNOTATION OF THE PROGRAM
Physics burning

Course: 2, semester : 4

		Semester
№	**Kind of activity**	**4**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	71
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	0
8	Consultations, hours	15
9	Independent work, hours	73

External requirements

Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
can collect and analyze the source data for the design of professional activity objects
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
can collect and analyze the source data for the design of professional activity objects	
1. PC-8.V / PC. 1 1. Can collect and analyze the source data for the design of objects of professional activity	Lections; Seminars; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
2. PC-8.V / PC. 2 2. Conduct a preliminary feasibility study of the design development of objects of professional activity	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**

Semester: 4				
Didactic unit: Basic concepts and determination of the theory of fuel combustion.				
1. The subject of organic fuel combustion physics. Fuel combustion, burning reaction, ratio between reaction components, reaction rate, affecting factors, kinetic and diffuse burning, burning stage		2	1	Lecture
Didactic unit: Energy organic fuel.				
2. Energy fuels, their characteristics, fitness to burning in various types of furnaces.		4	1	Lecture
Didactic unit: Theoretical bases of electrical safety				
3. stoichiometric combustion reactions, calculation, is in air, fuel coefficient, methods for determining the excess air when burning.		4	1	Lecture
Didactic unit: Basic laws and reactions of combustion fuel.				
4. The laws of fuel combustion: the law of the active masses, the effect of temperature and pressure. The Act of Arrhenius, the rate of combustion reaction. Heterogeneous burning. Kinetic and diffusion burning.		4	1	Lecture
Didactic unit: Fuel combustion stages, Derivatography.				
5. Stages of burning fuel, drying, exit volatile, gasification , ignition, coke burning, burnout time. Combustion products, composition of gaseous products of burning.		5	1, 2	Lecture
Didactic unit: Fuel combustion in chamber and layer furnaces.				
6. combustion of fuel in chamber and layer furnaces. The temperature mode of the furnace, the characteristics of the flue process.		4	1, 2	Lecture
Didactic unit: Characteristics of the flue process.				
7. Characteristics of the flue process. Adiabatic combustion temperature		4	1	Lecture
Didactic unit: Structure of the power system				
8. Drying of fuel, sorption and desorption of material. Heat and mass transfer, Drying kinetics in the H-D diagram.		4	1	Lecture
Didactic unit: Fuel combustion in a boiling layer.				
9. Fuel combustion in a boiling layer, layer characteristics, movement of material in a layer, heat transfer to elements immersed in a layer.		4	1	Lecture

Didactic unit: Permanent and AC hybrid devices				
10. combustion of water-coal fuel, characteristics of the VUT, mathematical model of burning droplets VUT, the results of the work of boilers on water-coal fuel.		1	1	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Energy organic fuel.				
1. Recalculation of solid fuel.		2	1, 2	Practical lesson
Didactic unit: Theoretical bases of electrical safety				
2. Methods of stoichiometric calculation of fuel combustion		2	1, 2	Practical occupation
Didactic unit: Basic laws and reactions of combustion fuel.				
3. Optimization of an excess air coefficient when burning fuel in a steam boiler.		4	1, 2	Practical lesson
Didactic unit: Fuel combustion stages, Derivatography.				
4. Method Coordination of balances. Refinement of the results of boiler houses of balance tests.		2	1	Practical lesson
5. Derivatographic study of the fuel burnout process.		2	1	Prostychki occupation
Didactic unit: Fuel combustion in chamber and layer furnaces.				
6. Calculation of the development of a jet.		2	1, 2	Practical lesson
7. Thread interaction with stream.		4	1, 2	Practical lesson

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2. Щинников П. А. Перспективные ТЭС. Особенности и результаты исследования : [монография] / П. А. Щинников. - Новосибирск, 2007. - 282 с. : ил., табл., схемы. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000074129. - Парал. тит. л. англ. ; Огл. также на англ. яз..

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Methodical support and software

Methodological support

1. Щинников П. А. Физика горения [Электронный ресурс] : электронный учебно-методический комплекс / П. А. Щинников, Ю. В. Овчинников ; Новосиб. гос. техн. ун-т. - Новосибирск, [2012]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000174518. - Загл. с экрана.

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Specialized software

1 PTC Mathcad

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
non-traditional and in Optional Energy Sources

Course: 4, semester : 7

		Semester
№	**Kind of activity**	**7**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	84
4	Lectures, hours	36
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	16
8	Consultations, hours	10
9	Independent work, hours	96

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
is able to develop and ensure energy and resource saving measures at the objects of professional activity; *regarding the following learning results*:
Able to develop events on energy and resource saving on The teks of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. On the prospects for using NVIE in the world and Russia, the dynamics of energy consumption	Lections; Independent work
2. to be able to use professional literature, reference data, technical documentation, including use (with a dictionary) foreign technical literature	Lections; Seminars; Independent work
3. To be able to calculate, analyze processes, determine the expedient modes of operation in the installations that use non-traditional and renewable energy sources	Lections; Seminars; Independent work
Able to develop events on energy and resource saving on The teks of professional activity	
4. Methods and methods of using NVIE for generating electrical and heat	Lections; Seminars; Independent work

5. Designs and operating modes Installations	Lections; Seminars; Independent work
6. Technical, socio-economic and environmental problems of using NVIE	Lections; Independent work
7. on structural and electrical materials used When creating electrical machines of the ITransFormators	Lections; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Traditional and non-traditional energy sources; Energy sources and resources.				
1. Tunnel effect.		2	1, 2, 6, 7	Lecture
2. Dynamics of energy consumption and the development of energy economy, environmental problems of energy. Stock sources and resources		2	1, 2, 6, 7	Lecture
Didactic unit: Hydropower				
3. Small hydroelectric power plants.		1	3, 4, 5, 6	Lecture
4. Hydropower potential of the Russian Federation.		1	1, 2, 3, 6, 7	Lecture
5. Basic principles of water energy use.		1	4, 6	Lecture
6. Perfect and real hydroturbine power. Active and reactive turbines.		1	3, 4, 5	Lecture
7. Equipment HPP and GESS.		1	3, 4, 5	Lecture
Didactic unit: Use of ocean energy				
8. Energy balance of electric stroke of resistance		1	1, 2, 6	Lecture
9. Energy installations for the use of ocean energy (using the difference in water temperature, waves, tides, flows)	2	2	3, 4, 5	Discussion of new equipment development and schemes
Didactic unit: Wind power				
10. Wind energy reserves and its use. Wind Cadastre of Russia		1	1, 2, 6, 7	Lecture
11. Types of wind power plants		1	3, 4, 5	Lecture
12. Calculation of the perfect and real windmill.		1	3, 5	Lecture

13. wind power plant	2	2	3, 6	Discussion of new equipment development and schemes
Didactic unit: Using the energy of the Sun				
14. Physical bases for transformation of solar energy.		1	3, 4	Lecture
15. Types of collectors. Principles of collectors and calculation methods		1	3, 4, 5	Lecture
16. heat accumulation. Types of batteries and methods for their calculation		1	3, 5	Lecture
17. Solar power plants	2	2	3, 4, 5	Discussion of new equipment development and schemes
Didactic unit: Geothermal Energy				
18. Thermal regime of the earth's crust. Sources of geothermal heat		1	2, 6	Lecture
19. Methods and methods for using geothermal heat in heat supply systems		1	4, 6	Lecture
20. Schemes for geotes for electricity generation	2	2	3, 4, 5	Discussion of new equipment development and schemes
Didactic unit: Biomass				
21. Classification of biofuels, energy characteristics		2	1, 2, 7	Lecture
22. Biofuel processing technology (thermochemical, biochemical, agrochemical)		1	4, 6	Lecture
23. Production waste and agricultural waste		1	3	Lecture
24. Installations for heat production, Pyrolysis, gasification, biogas.	2	2	3, 4, 5, 6	Discussion of new equipment development and schemes
Didactic unit: Secondary energy resources (WER)				
25. Group regulation of active power TPP		1	6	Lecture
26. War Transformation Methods		1	2, 3, 4, 6	Lecture
27. Methods and the possibilities of using WER as primary sources for the production of electrical and thermal energy.	2	2	3, 4, 5	Discussion of new equipment development and schemes

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Hydropower				
1. Calculation of hydro turbine	4	6	3, 4, 5	of each system of the turbine and the type of working wheel corresponds to a certain area of ??work. in pressure. Sometimes or two turbine systems can be applied at a given pressure, or two types of impeller of the same system. 1. Determine the most favorable version of hydroturbic equipment 2. To add to the chosen version of the Huh.
Didactic unit: Use of ocean energy				
2. Energy resources of the ocean		4	3, 4	Calculate the reliability indicators of the scheme.
Didactic unit: Wind power				
3. Calculation of wind installation		6	3, 4, 5	Windaxes do not require fuel expenditures and are very attractive as sources of renewable energy. However, terrestrial winding plants have low power and uneven production due to wind instability. Determine whether wind installation works effectively at a given average monthly and average wind velocity for a given region.
Didactic unit: Using the energy of the Sun				
4. Calculation of a solar flat collector		6	3, 4, 5	Calculate the efficiency of the solar collector (average daily and mid-hour efficiency), to determine the full insolation, the proportion of direct, diffuse and reflected radiation. Determine the appropriate installation modes of the installation during the day.
5. Calculation of the battery		2	3, 4, 5	Calculate the battery tank capacity for home heating
Didactic unit: Geothermal Energy				

6. Calculation of a geothermal power station		6	3, 4, 5	the thermal potential of geothermal energy focuses in natural aquifers at a depth of the earth's surface. Determine the feasibility of extracting heat from the subsoil in a given area, the thermal efficiency of the station, the cost of water from geothermal wells and specific consumption of heat
Didactic unit: Biomass				
7. Biomass burning		4	2, 3, 4, 5	Evaluate the calorific value of biomass (waste of agricultural production, biomass of the food industry, household waste, etc.). Determine the use area.
Didactic unit: Secondary energy resources (WER)				
8. Calculation of the heat pump		2	3, 5	One of the useful use methods of scattered low-temperature (5-30 ° C) natural heat or discharge industrial heat for heat supply are heat pumps. Calculate the effectiveness of a single-stage parocompression thermal pump, if river water is used as a coolant, and the working fluid - reference R21

Literary sources

Main literature

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Internet resources

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Methodical support and software

Methodological support

1. Выбор гидротурбины и построение эксплуатационной характеристики : методические указания к расчетно-графической работе для 4 курса ФЭН всех форм обучения (специальности 140100, 140101)] / Новосиб. гос. техн. ун-т ; [сост. Н. И. Горлов, О. К. Григорьева]. - Новосибирск, 2009. - 17, [1] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000089584

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Technologies and object-oriented programming

Course: 3, semester : 6

		Semester
№	**Kind of activity**	**6**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	85
4	Lectures, hours	36
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	0
8	Consultations, hours	11
9	Independent work, hours	95

External requirements

is able to carry out professional activities, taking into account the regional features and needs of employers; *regarding the following learning results*:
is able to analyze the activities of enterprises and organizations of their profile industry.

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
is able to analyze the activities of enterprises and organizations of their profile industry.	
1. PC-6.V / PC. 2 2. Asking the activities of enterprises and organizations of the profile industry of their region.	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 6				
Didactic unit: Industry features of electric power				

1. Fuel and Energy Complex, Energy, Electric Power Industry. Features, structure, role of the industry in the country's economy. The current state of energy of Russia and Siberia.		1	1	Lecture
2. Hierarchy management in power engineering. The concepts of the regime, the balance of power, the balance of energy. Electricity consumers: Structure, Consumption mode parameters, Load graphics. Electricity manufacturers: operational properties of stations, power plant functions in the system. The concept of reliability, types and groups of reserves, economic assessment of damage due to unreliability		3	1	Lecture
Didactic unit: Economic resources of the enterprise				
3. Main production funds. Valuation assessment, wear, depreciation of fixed assets. Indicators of the efficiency of the use of fixed assets in natural and cost forms		4	1	Lecture
4. Current means. Ralmonation of raw materials and materials. Types of stocks. Indicators of turnover of working capital and ways to increase		2	1	Lecture
5. Labor resources. Organization and standardization of labor. Stimulation and motivation systems. Organizational structure of the enterprise. Labor remote systems		2	1	Lecture
Didactic unit: Economic indicators of the energy enterprise				
6. Concepts of costs, cost costs, costs. Permanent and variable costs. Types of cost. Classification of production costs for items. Calculation costs for expenses. Break-sufficiency point		2	1	Lecture
7. cost of electricity production at the CPP. Features of the separation of costs in combined energy production at the CHP. Calculation of the full commercial cost of electricity in EES		4	1	Lecture
8. Financial and economic indicators of the enterprise: revenue, profits, profitability. Profit distribution. Taxation		2	1	Lecture
Didactic unit: Pricing in power engineering				

9. Adjustable and free Market sectors. Reforming the industry. Wholesale electricity and power market. Model of marginal pricing. Retail market		5	1	Lecture
10. Principles of tariff formation. One-step, twin, zone, block tariffs. Tariffs for transmission of electricity. Tariff selection for various consumers and different types of EES	2	5	1	Lecture in the form of discussion
Didactic unit: Basics of investment design				
11. Investment, investment project, life cycle of an investment project. Capital construction and sources of its financing. Estimated cost of construction. Methods of approximate calculations of capital investments	2	4	1	Lecture in the form of discussion
12. Methods of economic assessment of the effectiveness of investment projects without taking into account and taking into account the time factor.		2	1	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Industry features of electric power				
1. Calculation of fuel consumption for electricity production		2	1	Calculation of the total and specific fuel consumption, fuel reserve
2. Economic assessment of the organization of the TEC fuel system system for the estimated period		4	1	Calculation of the price of fuel taking into account discounts and allowances for deviations of ash content, humidity level, calorie content, and the cost of its transportation
Didactic unit: Economic resources of the enterprise				
3. Fixed assets of the enterprise		4	1	Calculation of the value of the main Production funds, depreciation deductions. Calculation and analysis of indicators of efficiency use of basic production assets
4. Redeems of the enterprise		4	1	Calculation of the desired fuel reserve. Ramination of working capital. Assessment of turnovering indicators
Didactic unit: Economic indicators of the energy enterprise				
5. Cost of electricity production at the KES		2	1	Calculation of the cost of electricity production at the COP

6. The cost of electricity production to the CHP		4	1	Calculation of the cost of electricity production at the CHP in the heatrical mode
10. System-wide cost of electricity		2	1	Calculation of the system-wide cost of electricity, taking into account production costs, transmission, electricity purchases in other power systems, system-wide costs
11. Financial and economic indicators of the enterprise		4	1	Calculation of revenue from the sale of products, profits before and after taxation, general and specific profitability.
Didactic unit: Pricing in power engineering				
10. Pricing in energy		4	1	Calculation of the electricity board of an industrial enterprise for one-time, twin, block and block and Zone Tariffs
Didactic unit: Basics of investment design				
8. Evaluation of the economic efficiency of investments		4	1	Selecting the KES construction option from two alternative options. The calculation of the main indicators: the costs, the CDD, the payback period without and taking into account the time factor
9. Assessment of economic efficiency of investment, taking into account the uncertainty		2	1	Check the sustainability of the investment project. Calculation of the break-even point

Literary sources

Main literature

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2. Методические рекомендации по оценке эффективности и разработке инвестиционных проектов и бизнес-планов в электроэнергетике на стадии предТЭО и ТЭО (с типовыми примерами). Кн. 1 : Методические особенности оценки эффективности проектов в электроэнергетике : утверждено приказом ОАО РАО ЕЭС России от 31.03.2008 № 155 : заключение Главгосэкспертизы России от 26.05.99 г. № 24-16-1/20-113. – Текст : электронный // Кодекс : электронный фонд правовой и нормативно-технической документации : [сайт]. – URL: http://docs.cntd.ru/document/1200088779 (дата обращения: 01.03.2021).

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Methodical support and software

Methodological support

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Specialized software

1 Microsoft Office Application Pack

2 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

3 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Production safety

Course: 3, semester : 5

		Semester
№	**Kind of activity**	**5**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	61
4	Lectures, hours	36
5	Practical lessons, hours	0
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	0
8	Consultations, hours	5
9	Independent work, hours	83

External requirements

is able to create and maintain safe life conditions, including in emergency situations; *regarding the following learning results*:
Know the basics of life safety, has an idea of ??how to create safe conditions that ensure sustainable development of society in professional and daily activities and the preservation of the environment.
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
can collect and analyze the source data for the design of professional activity objects

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
Know the basics of life safety, has an idea of ??how to create safe conditions that ensure sustainable development of society in professional and daily activities and the preservation of the environment.	
1. UK-8. 1 1. Know the basics of life safety, has an idea of ??how to create safe conditions that ensure sustainable development of society in professional and daily activities and the preservation of the environment.	Lections; Laboratory works; Independent work
can collect and analyze the source data for the design of professional activity objects	
2. PC-8.V / PC. 1 1. Can collect and analyze the source data for the design of objects of professional activity	Lections; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Technological schemes of condensation power plants.				
1. The goal and the content of the course, its integrated nature. Action current per person		2	2	lectures. Writing the abstract.
2. Phenomena when flowing into the ground through a single earthing. Potential distribution on the ground surface. Single Ground Resistance.		2	2	lectures. Writing the abstract.
3. Flowing current into the ground through a group earthing. Distribution of potential on the ground surface with a group earthing. Resistance to the complex earthing		2	2	lectures. Writing the abstract.
4. Touch voltages and steps with single and group earthing. Accounting for the voltage drop in the base resistance on which a person stands.		2	2	lectures. Writing the abstract.
5. Analysis of the danger of damage to the current in various electrical networks: - single-phase insulated and connected to the ground; - three-phase with isolated and grounded neutrals.		4	2	lectures. Writing the abstract.
Didactic unit: Technical means of protection				
6. Protective grounding. Purpose, principle of operation and scope. Perform grounding devices. Calculation of the protective ground.		4	1	lectures. Writing the abstract.
7. Range. Purpose, principle of operation and scope. Calculation of reassembly. Control service life.		4	1	lectures. Writing the abstract.
8. Protective shutdown. Classification, scope. Requirements for protective disconnection devices. Devices reacting to the null sequence current and operational current.		4	1	lectures. Writing the abstract.

9. Measures to reduce the risk of electric shock: Applying low stresses; Electrical separation of networks; Danger protection during voltage transition from the high voltage winding of the transformer to the low voltage winding; compensation of the capacitive component of the earth closure; Protection against contacting to current parts. The means of protection used in electrical installations. Insulation control.		4	1	lectures. Writing the abstract.
Didactic unit: Organizational measures to ensure electrical safety				
10. Organization of safe operation of electrical installations		2	1	lectures. Writing the abstract.
Didactic unit: Smart Grid in Russian energy				
11. Vibroactic factors		2	1	lectures. Writing the abstract.
12. Ionizing and non-ionizing radiation		2	1	lectures. Writing the abstract.
13. Harmful substances in the air of the working area		2	1	lectures. Writing the abstract.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Technological schemes of condensation power plants.				
1. Laboratory work number 2 "Electrical safety network with an isolated neutral"		2	1, 2	Determination of phase insulation resistance relative to the Earth, the values ??of currents through a person who touched to different phases, voltages on the electrical installation case without and with the presence of a protective ground.
2. Crystallization.		4	1, 2	are studied the causes of the tensile and voltage of the step, as well as With the conditions affecting the magnitude of these stresses.
Didactic unit: Technical means of protection				
3. Laboratory work №1 "Rangered"		4	1, 2	Studying the principle of protective reassessing. Evaluation of the effect of speed protection for the danger of electric shock. Analysis of the consequences arising from the cliff of the zero protective conductor.

4. Laboratory work number 6 "Measurement of ground parameters"		4	1, 2	Production of measurements of insulation resistance with two methods: four electrodes and control electrodes using an appliance, as well as an ammeter and voltmeter method. Calculation of the resistivity of the soil.
Didactic unit: Organizational measures to ensure electrical safety				
5. Laboratory work number 3 "Security in the current electrical installations"		2	1, 2	Acquaintance with the model of the distribution device for a voltage of 10 kV and with insulating protective equipment. Filling out the outfit - tolerance. Production of technical measures specified in the outfit - tolerance: shutdowns, checking the absence of voltage on shut-off tires, navigate grounding - spin. After the production of work, the inclusion according to the adjustment is tolerance.
Didactic unit: Smart Grid in Russian energy				
6. Measuring noise levels (laboratory work No. 14)		2	1, 2	Get acquainted with methods and means of measuring production noise at workplaces.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Technological schemes of condensation power plants.				
1. Regulatory and technical documentation		7	2	Search for information on the Internet. Acquaintance with PUE, PTEEP, PTEES - structure, main sections, requirements
Didactic unit: Technical means of protection				
2. Calculation of protective ground		7	1, 2	Analysis of the types of earthing and the influence of various conditions for their placement on the compotent of the grounding device
Didactic unit: Organizational measures to ensure electrical safety				
3. Electroplature agents and safety devices		7	1, 2	On the basis of regulatory literature, the design of electrical equipment and safety devices is studied. Storage conditions and the organization of control over their condition
4. Safety techniques for installation and operation of electrical installations		8	1, 2	Learn safety techniques for electrical work, electrical tests, as well as rules for organizing safe operation of electrical installations.

Didactic unit: Smart Grid in Russian energy				
5. Study of regulatory and technical documentation for the studied manufacturing factors		7	1, 2	Studying methods and practical calculations By determining the energy consumption on the basis of curves by train consumed by the current

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Methodical support and software

Methodological support

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Specialized software

1 Microsoft Office Application Pack

2 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

ANNOTATION OF THE PROGRAM
Heat and Mathematics

Course: 2 3, semester ы : 4 5

		Semester	
№	**Kind of activity**	**4**	**5**
1	Total credits	5	4
2	Total hours	180	144
3	Total classes in the contact form, hours	84	68
4	Lectures, hours	36	36
5	Practical lessons, hours	18	18
6	Laboratory studies, hours	18	0
7	of them in an active and interactive form, hours	16	16
8	Consultations, hours	10	12
9	Independent work, hours	96	76

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. To be able to use Internet users	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
2. To be able to use reference literature	Lections; Seminars; Laboratory works; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	

3. to know the laws of conservation and turning energy in relation to the transformation and transformation systems, caloric and Portable properties of substances in relation to the working bodies of thermal machines and coolants, thermodynamic processes and cycles of energy conversion flowing in heat engineering installations	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
4. Laws and basic physical and mathematical models of heat and mass change in relation to heat engineering and heat technology and systems	Lections; Seminars; Laboratory works; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
5. To be able to calculate temperature fields (fields of substances concentrations) in flow fluids and gases, in elements of the design of thermal and heat technology plants in order to intensify the processes of heat and mass transfer, ensuring the normal temperature mode of the equipment and minimizing heat loss of heat	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
6. to be able to use professional literature, reference data, technical documentation, including use (with a dictionary) foreign technical literature	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Theory and methods for analyzing linear chains of sinusoidal current				
1. Heat conductivity in different environments	1	4	1, 2, 3, 4, 5, 6	The abstract
2. Stationary thermal conductivity	1	4	1, 2, 3, 4, 5, 6	The abstract
3. Non-stationary thermal conductivity	1	4	1, 2, 3, 4, 5, 6	Writes a summary, asks questions about incomprehensible points
Didactic unit: Production products. Registration of design documents.				
4. Basic concepts	1	2	1, 2, 3, 4, 5, 6	The abstract
5. The laws of radiant heat exchange	1	6	3, 4, 5, 6	Writes a summary, asks questions on incomprehensible places
Didactic unit: Heat transfer				
6. heat transfer through different walls	1	8	1, 2, 3, 4, 5, 6	The abstract
7. Calculation of heat exchangers	1	6	1, 2, 3, 4, 5, 6	Writes a summary, asks questions for incomprehensible moments
Didactic unit: Basic concepts of convection				
8. Forced and free convection	1	2	1, 2, 3, 4, 5, 6	The abstract
Semester: 5				

Didactic unit: Convective heat exchange				
9. Free convection	1	8	3, 4, 5, 6	Writes a summary
10. Forced convection	4	14	1, 2, 3, 4, 5, 6	Writes a summary, asks questions on incomprehensible places
Didactic unit: heat transfer by radiation.				
11. Teplobmman with steam condensation	1	3	3, 4, 5, 6	Writes a summary
12. Heat exchange for boiling liquids	1	3	3, 4, 5, 6	Writes a summary, asks questions about incomprehensible points
Didactic unit: Route technological processes of specific types of industries				
13. Mass exchange when condensation of vapors and boiling liquids	1	4	3, 4, 5, 6	Writes a summary
14. Heat and mass transfer in chemical transformations	1	4	3, 4, 5, 6	Writes a summary, asks questions on incomprehensible places

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 4				
Didactic unit: Theory and methods for analyzing linear chains of sinusoidal current				
1. Determination of thermal conductivity of materials by the cylindrical layer	1	4	1, 3, 4, 5, 6	Controls the establishment of a stationary mode, removes the testimony, performs the calculations, ophlins the report and protects it
Didactic unit: Production products. Registration of design documents.				
2. Determination of the degree of black sample for 2 standards	1	5	2, 3, 4, 5, 6	controls the establishment of a stationary mode, removes the testimony, makes calculations, depicts a graph, draws up a report and protects it
Didactic unit: Basic concepts of convection				
4. Definition of heat transfer to air during forced convection	1	5	3, 4, 5, 6	controls the establishment of a stationary mode, removes the testimony, makes calculations, depicts a graph, draws up a report and protects it
Didactic unit: Convective heat exchange				
9. Free convective heat transfer from horizontal cylinders to air	1	4	3, 4, 5, 6	Controls the establishment of a stationary mode, removes the readings, performs calculations, draws up the report and protects it

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities

Semester: 4				
Didactic unit: Theory and methods for analyzing linear chains of sinusoidal current				
1. thermal conductivity through flat and cylindrical walls	1	4	1, 3, 4, 5, 6	Solves the task under the guidance of the teacher
Didactic unit: Production products. Registration of design documents.				
2. Rady heat exchange	1	4	3, 4, 5, 6	Solves the task under the guidance of the teacher
Didactic unit: Heat transfer				
3. Heat transfer through flat and cylindrical walls	1	4	3, 4, 5, 6	Solves the task under the guidance of the teacher
4. Calculation of heat exchangers	1	6	2, 3, 4, 5, 6	Solves the task under the guidance of the teacher
Semester: 5				
Didactic unit: Convective heat exchange				
5. Free convection	1	4	3, 4, 5, 6	Solves the task under the guidance of the teacher
6. Forced convection	4	8	3, 4, 5, 6	Solves the task under the guidance of the teacher
Didactic unit: heat transfer by radiation.				
7. heat exchange in a multi-zone high-temperature electric heter of resistance	1	3	3, 4, 5, 6	Solves the task under the guidance of the teacher
8. Heat and mass exchange when boiling liquids	1	3	3, 4, 5, 6	Solves the task under the guidance of the teacher

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Methodical support and software

Methodological support

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3. Тепловая электростанция на базе ДВС : методические указания к лабораторным работам для ФЭН 2-4 курсов всех форм обучения и всех направлений / Новосиб. гос. техн. ун-т ; [сост. Г. В. Ноздренко, Ю. И. Шаров, И. В. Бородихин]. - Новосибирск, 2006. - 39 с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000059932

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM

Turbines of thermal electric stations and atomic electrical stations

Course: 3, semester ы : 5 6

		Semester	
№	Kind of activity	5	6
1	Total credits	5	6
2	Total hours	180	216
3	Total classes in the contact form, hours	62	104
4	Lectures, hours	36	36
5	Practical lessons, hours	18	54
6	Laboratory studies, hours	0	0
7	of them in an active and interactive form, hours	18	14
8	Consultations, hours	6	12
9	Independent work, hours	118	112

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. The main characteristics of the equipment of the main domestic and foreign manufacturers of energy turbines	Independent work
2. To be able to choose a turbine when sobering a professional literature, to determine its regime features, select a flow profile	Seminars; Independent work
3. on the main methods for regulating turbines and methods for synchronizing turbogenerators in the system.	Lections; Independent work
4. on the energy characteristics of turbo units.	Lections; Seminars; Independent work
5. On the prerequisites for the emergence of philosophy, direct conditions of its appearance in antiquity	Seminars; Independent work

Conduct a preliminary feasibility study of the project development of objects of professional activity	
6. Correct electromagnetic loads according to the results of thermal and ventilation Calculations	Lections; Seminars; Independent work
7. on the basics of government policies in the field of energy saving	Lections; Seminars; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
8.On the history of turbo construction, the value of the turbine drive of generators for energy, on the main technical and economic indicators of modern domestic and foreign turbines.	Lections; Seminars; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
11. Calculate the turbine rotor to a critical number of revolutions.	Lections; Seminars; Independent work
12. build a sketch of the flow part.	Lections; Seminars; Independent work
13. Perform calculations of typical parts of machines according to the criteria of performance, reliability and durability.	Lections; Seminars; Independent work
14. How profile and height of the blades in terms of high, medium and low pressure in the turbine.	Lections; Seminars; Independent work
15. Calculate losses and determine the effectiveness of the steps of the turbine and the overall turbine generator.	Lections; Seminars; Independent work
16. Modes of operation of the system "Source of electrical energy - consumer"	Lections; Seminars; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
17. On the regular nature of the change from the era to the era of the subject of philosophizing and the specific features of the cognitive activity of scientists, depending on the historical movement of the society of society	Lections; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
18. Determine the properties of the chemical element on electronic configuration and position in the periodic system	Lections; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Technologies for the development of intellectual systems				
1. History of automation development. The first industrial regulators		4	8	Lectures
2. Thermal cycles of steam turbine installations		2	4, 8	Lectures
3. The effect of parameters and intermediate overheating of steam on the efficiency of the cycle		2	4	Lectures
4. Regenerative heated nutrient water. Combined heat and electricity generation.		2	4	Lectures

Didactic unit: Basic equations of the theory				
5. The main equations of motion		6	7	Lectures
Didactic unit: Turbine grilles. Stage of the turbine.				
6. Geometric characteristics of turbine lattices		2	17	Lectures
7. Processes in turbine lattices.		4	17, 4	Lectures
8. Turban stage		2	15, 17, 4	Lectures
9. indicators of the efficiency of the stage. Steps of speed, with partial underwear of steam, big fans.		2	14, 4, 6	Lectures
10. Selection of characteristics and the calculation of the turbine stage.		2	15, 16, 4, 6	Lectures
Didactic unit: Multistage turbines.				
11. The advantages of a multistage turbine. Thermal process in a multistage turbine		2	17, 6	Lectures
12. Return coefficient of heat loss. Steam turbine vapor distribution		2	17, 4	Lectures
13. End seals. Balanting axial efforts		4	17	Lectures
Semester: 6				
Didactic unit: Designs of parts and steam turbine nodes				
14. Materials details Turbin		4	13, 17	Lectures
15. Working blades		2	13, 14, 17	Lectures
16. Rotor and steam turbine stator		2	11, 12, 16, 17	Lectures
17. Diaphragms, nozzle apparatus, seals, support bearings		2	17, 8	Lectures
18. Stubborn bearings, foundation of the turbine unit, grinding devices		2	17, 8	Lectures
19. Switching, ways to improve switching MPT		2	17	Lectures
Didactic unit: Systems of lubricant, regulation and protection systems. Calculations for strength.				
20. Bearing lubrication systems		2	17	Lectures
21. Regulatory and protection systems		2	3	Lectures
22. Calculations for strength		2	13, 16, 17	Lectures
Didactic unit: Fundamentals of steam turbine installations				
23. Classification of turbines. Condestation, heat and refractory turbines KTZ, LMZ, HTZ and TMZ		2	17, 8	Lectures

24. Classification of modes. Turbine operation with variable passage passage		4	3, 4	Lectures
25. The diagrams of the modes		4	18, 3, 4	Working with educational and professional literature
Didactic unit: Auxiliary technical systems and equipment.				
26. Thermal processes in gas turbine installations		2	4, 7, 8	Lectures
27. . Conpensators. The varieties of capacitors, the temperature coefficient of the container. Inductance coils. Equivalent schemes of passive elements		4	17, 4, 8	Lectures

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Technologies for the development of intellectual systems				
1. Constructing cycles of PTU in different diagrams of the state	6	6	4, 8	Forms practical skills to work with methodological tools for thermal and design calculation of turbines
Didactic unit: Basic equations of the theory				
2. Calculation of the energy characteristics of the turbine stage.	6	6	4, 5	Forms practical skills to work with methodological tools for thermal and design calculation of turbines
Didactic unit: Turbine grilles. Stage of the turbine.				
3. Calculation of the turbine level.	6	6	15, 16, 7	Forms practical skills to work with methodological tools for thermal and design calculation of turbines
Semester: 6				
Didactic unit: Designs of parts and steam turbine nodes				
4. Calculation of the thermal process of steam expansion. Building a turbine scheme. Definition of efficiency.	6	18	15, 16, 4, 6, 7	Formulation of the calculation task, reasoned justification Action to determine the geometry of the active nucleus EM, the fulfillment of calculations
5. Calculation of the steps of the turbine.	6	18	12, 13, 14, 15, 16, 2, 6, 7	Formulation of the calculation task, reasoned justification Action to determine the geometry of the active nucleus EM, the fulfillment of calculations
Didactic unit: Systems of lubricant, regulation and protection systems. Calculations for strength.				

6. calculations on strength. Calculation of the rotor.	2	18	11, 12, 13, 14, 16	Formulation of the calculation task, reasoned justification Action to determine the geometry of the active nucleus EM, the fulfillment of calculations

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Technologies for the development of intellectual systems				
1. Schemes and cycles of cycles		5	17, 8	Forms the skill of working with literature. It works on the RHZ on an individual task.
Didactic unit: Basic equations of the theory				
7. Basic equations of the theory.		6	4, 7	Forms the skill of working with literature. It works on the RHZ on an individual task.
Didactic unit: Turbine grilles. Stage of the turbine.				
8. turbine lattices. Stage of the turbine.		6	4, 6	Forms the skill of working with literature. It works on the RHZ on an individual task.
Didactic unit: Multistage turbines.				
28. Multistage turbines.		6	1, 17	forms the skill of working with literature.
Semester: 6				
Didactic unit: Designs of parts and steam turbine nodes				
29. Designs of parts and steam turbine nodes.		10	17, 2	Forms the skill of working with literature. Work on the term project on an individual task.
Didactic unit: Systems of lubricant, regulation and protection systems. Calculations for strength.				
30. Lubrication, regulation and protection systems. Calculations for strength.		9	3	Forms skill work with literature. Works on a course project according to an individual task.
Didactic unit: Fundamentals of steam turbine installations				
31. Fundamentals of steam turbine installations		10	3	forms the skill of working with literature.
Didactic unit: Auxiliary technical systems and equipment.				
28. Gas ??turbine installations.		9	1, 17, 7, 8	forms the skill of working with literature.

Literary sources

Main literature

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Methodical support and software

Methodological support

1. Турбины ТЭС и АЭС : методические указания к решению задач для 3 курса ФЭН направления 140100.62 - теплоэнергетика и теплотехника / Новосиб. гос. техн. ун-т ; [сост. П. А. Щинников]. - Новосибирск, 2015. - 18, [1] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000215425

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Boiler plants and steam generators

Course: 3 4, semester ы : 6 7

		Semester	
№	**Kind of activity**	**6**	**7**
1	Total credits	5	7
2	Total hours	180	252
3	Total classes in the contact form, hours	84	109
4	Lectures, hours	36	36
5	Practical lessons, hours	36	36
6	Laboratory studies, hours	0	18
7	of them in an active and interactive form, hours	8	8
8	Consultations, hours	10	17
9	Independent work, hours	96	143

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity
The ability to carry out project activities at all stages of the project's life cycle; *regarding the following learning results*:
to be able to organize and coordinate the work of the project participants

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. UK-1. 1 1. Search for the necessary information, its critical analysis and summarizes the results of the analysis to solve the task	Lections; Seminars; Laboratory works; Independent work
to be able to organize and coordinate the work of the project participants	
2. PC-7.V / PC. 2 2. To be able to organize and coordinate the work of the project participants	Lections; Seminars; Independent work

Conduct a preliminary feasibility study of the project development of objects of professional activity	
3. PC-8.V / PC. 2 2. Conduct a preliminary feasibility study of the design development of objects of professional activity	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Design of steam boilers				
1. The role of a steam boiler and steam generators in the schemes of thermal and nuclear power plants. Technological scheme of the boiler installation. Classification of steam boilers.		4	1, 2, 3	Conducting an abstract, study of the schemes and designs of steam boilers.
2. Survection surfaces of steam boilers		4	1, 3	Lecture classes, conducting an abstract on the subject of lectional classes
Didactic unit: Fuel combustion in steam boilers				
3. Types, classification of organic fuels and their characteristics. Elementary composition of fuel. Fuel characteristics. Specified fuel characteristics. The exit of volatile and coke. Fuel hardness and temperature coefficient.		4	1, 2, 3	conducts a summary of lecture / lecture on the subject of lecture on the following questions.
4. Methods of combustion of organic fuel. The main technological schemes and designs of the elements of the fuel preparation system and fuel feeds. Fuel preparation for burning. The mechanism of combustion of organic fuel. Theoretical consumption of air on burning. Theoretical volume of combustion products. Full volumes of combustion products. Enhaulpia products of combustion and air.		4	1	The abstract
5. Loading. Bedded chain grilles. Chamber burning. Low-temperature burning. Combustion in a boiling layer.		2	1, 3	The conduct of the abstract lectures, the discussion of materials
6. Pull-shaped burning of solid fuels. The tract of fuel feeds. Dipper preparation systems. Coal dust and its properties. Carbon-free mills. Dust separators.		2	1	Maintaining the abstract lectures, consideration of the fuel-feeding schemes
7. Dust burners. Avichry burners. River burners. The location of the burner in the heat chamber.		8	1, 3	Consideration of burner designs, features of fuel sprayed

8. Burning liquid and gaseous fuels. Gas-databases. Combined burners. Gas preparation and fuel oil to burning.		2	1, 3	Consideration of structural elements and features of the burner devices of gas-gas boilers.
Didactic unit: Fundamentals of thermal calculation of the steam boiler				
9. The thermal balance of the steam boiler. Thermal loss of the steam boiler. Fuel coefficient and fuel consumption.		2	3	Lectures
10. Heat exchange in a fire chamber, semiradiation and convective heating surfaces. Methods for calculating heat exchange in the heat chamber. Geometric and optical characteristics of flue chambers. The main analytical dependences of heat exchange radiation in the heat chamber. Posonal methods of calculation (approach).		2	3	Lectures
11. Gas ??dynamics of air and gas tracts. The system of energy equations for gases and the working fluid under heat exchange. Geometric characteristics of heating surfaces. Speed ??of gases and working fluids. Heat transfer coefficient.		2	3	Lectures
Semester: 7				
Didactic unit: Resistance and heat exchange of air and gas tracts.				
12. Aerodynamic calculation of boiler installations. Groups of resistance for the gas-air path. Fans and smokers for boiler installations and their choice.		2	3	Lecturing abstract.
23. Processes from the gas side of the surfaces of the boiler plants.		2	1, 3	Lecturing abstract.
Didactic unit: Introotile hydrodynamics				
13. Movement of the heated medium in the pipes. Characteristics of two-phase flow. Structure of the stream of a steam mixture. Speed ??of steaming mixture. Parostering. Pressure loss when driving a steam mixture.		2	3	Lectures
14. The principle of natural circulation. Reliability of the continuity of the contours of natural circulation.		2	3	Lectures

15. Forced movement of water and steam in power pipes. boilers. Features of the medium movement in pipe systems under supercritical pressure. Scroll and unevenness in the surfaces of heating. Steaming pulsation. Hydraulic schemes of steps.		2	3	Lectures
Didactic unit: Reliability and efficiency of the operation of heating surfaces.				
16. The effect of thermal heat drum to the operation of stepshelters. Temperature mode of heating surfaces.		2	3	Lectures
17. Features of the metal in steam boilers. Steel used in boiler construction. Calculations for the strength of the main elements of the boiler.		2	3	Lecturing abstract.
18. External and internal contamination of heating surfaces. Corrosion of heating surfaces from the work environment and flue gases. Erosion of heating surfaces. Cleaning the heating surfaces from outdoor sediments.		2	3	Lecturing abstract.
20. Elements of chemical thermodynamics		2	1, 3	Lectures
22. Technological schemes of the aspore and the design of their cleaning system elements		2	1, 3	Lectures
Didactic unit: Methods for obtaining pure steam and maintaining cleanliness of heating surfaces.				
19. Water mode. The behavior of impurities in the work environment. Requirements for nutritious water quality and steam. Methods for removing impurities from the cycle. Balance of impurities and purge. Water mode of drum boilers. Water mode of direct flow boilers. Methods for obtaining pure steam. Separation steam.		2	2	Lecturing abstract.
28. Water-chemical modes of direct-flow and drum boilers.		2	2	Lectures
Didactic unit: Energy of Russia				
21. Boiler operation modes. Starting a steam boiler to work. Service. Methods of operation. Stop boiler.		4	3	Lectures
24. Recycling type steam generators for vapor structures			1, 3	Lectures
25. Building structures and auxiliary equipment of the boiler.		2	3	Lectures
27. Features of the work of boiler units in transient modes		4	3	Lectures

Didactic unit: Prospects for the development of boiler units and steam generators.				
26. Perspective boiler units and steam generators. Evaporator capacitors. Pair generators of low-boiling workers tel.	1	2	1, 3	Lecturing abstract.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Resistance and heat exchange of air and gas tracts.				
5. Study of the principle of action and design of instruments for measuring pressure, speeds, air and gases, as well as the analysis of the composition of gases.		2	1, 3	Laboratory work
7. Mastering the pressure measurement methodology using primary and secondary instruments, measuring speed and expenses, measuring the resistance of various areas of gas and air tracts.		4	3	Studying the features of the degree of digital devices on integrated elements
Didactic unit: Energy of Russia				
1. Selection of fuel sampling for analysis. Fuel preparation for analysis.	1	2	1	Laboratory work
2. Determination of the moisture of working and analytical, ash, the exit of volatile, heat of combustion, the determination of hydrogen and carbon, nitrogen and sulfur.	1	2	1	Laboratory work
3. Determination of the chemical composition and temperature characteristics of ash.		4	1	Laboratory work
4. Determination of the subtleties of dust grinding with a sieve analysis by weighing the source sample and residues on the respective sits.		2	1	Laboratory work
6. Determination of the composition of flue gases based on voltometric methods using OSA and VTI-2 devices.	1	2	1	Laboratory work

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Fuel combustion in steam boilers				

2. Input control of the quality of organic fuel on boiler rooms.		2	1	Study of literature on sampling methods Fuel and preparation for various types of analysis. Solving specific tasks in accordance with individual tasks.
3. Study of regulatory literature on conducting technical and complete analysis of organic fuels.		2	1	Determination of moisture of working and analytical, ash, the exit of volatile, heat of combustion, determination of hydrogen and carbon, nitrogen of sulfur.
9. Study of regulatory methods for analyzing the mineral part of various types of fuel.	1	2	1	apparatus determination of the chemical composition and temperature characteristics of ash.
10. Studying methods for determining the particle size composition of coal dust.	1	2	1	Definition The subtleties of dust grinding with a sieve analysis by weighing the original sample and residues on the respective sints
11. Studying methods for practical determination of the composition of flue gas installations.	1	2	1	Definition The composition of flue gases on the basis of voltometric methods using OSA and VTI-2
Didactic unit: Fundamentals of thermal calculation of the steam boiler				
4. Calculations of theoretical consumption of air on boiler, theoretical volumes of combustion products, deassive amounts of combustion products, enthalpia products Combustion.	1	8	3	Performs the calculation of the gas path of the steam boiler
5. Determination of the thermal balance of the steam boiler, heat losses, efficiency of the steam boiler, fuel consumption.	1	6	3	Drawing up the thermal balance and definition of the efficiency of the steam boiler
6. Determination of air flow and flue gases in accordance with the individual task.	1	4	3	Performance of the RHZ: calculation, design. Writing conclusions.
12. Solving tasks for calculating the efficiency of boiler equipment	2	8	3	Calculation of the characteristics of boilers on solid, liquid and gas fuels.
Semester: 7				
Didactic unit: Reliability and efficiency of the operation of heating surfaces.				
5. Determination of thermal characteristics of the furnace chamber.		4	3	Calculation on source data
7. Determination of the structural characteristics of the furnace chamber.	1	3	3	Calculation of characteristics according to methodological manual
8. Determination of the heat heater, economizer, air heater, and the reduction of the thermal balance of the steam boiler. Determination of the structural characteristics of the steamer, economyzer and air heater.	1	9	3	Calculation of the characteristics of heat exchange and heating surfaces.

13. Calculation of the thickness of the wall of the pipe under strength conditions		2	2, 3	Conducting calculations on source data using regulatory documents
14. Calculation of the rate of formation of in-pipe sediments	1	2	2, 3	Calculation in accordance with the source data
16. Calculation of thinning of the pipe wall due to corrosion of its inner and outer surfaces.	1	2	2, 3	Calculation on the initial data
Didactic unit: Methods for obtaining pure steam and maintaining cleanliness of heating surfaces.				
15. Calculation of temperature mode of HPC pipes of the steam boiler of the CCD, taking into account in-pipe sediments.		6	2, 3	solving problems on the source data.
Didactic unit: Energy of Russia				
1. Study of the circuit, structural elements, cooking technologies and fuel combustion, flue gases, steam and thermal distribution systems in the gas steam boiler .		8	1, 2, 3	carrying out practical classes on the current boiler house "Novosibirsk Core Bar" .

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Methodical support and software

Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Automation of heat and power processes

Course: 4, semester : 7

		Semester
№	**Kind of activity**	**7**
1	Total credits	6
2	Total hours	216
3	Total classes in the contact form, hours	103
4	Lectures, hours	36
5	Practical lessons, hours	36
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	16
8	Consultations, hours	11
9	Independent work, hours	113

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
uses a systematic approach to solve problems
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity
The ability to carry out project activities at all stages of the project's life cycle; *regarding the following learning results*:
to be able to determine the problem and how to solve it in the project

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
to be able to determine the problem and how to solve it in the project	
1. Know the technical means of automation	Lections; Seminars; Independent work
2. Know the volume of automation TPP	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
3. to know the tasks of controlling the technological process on the TPP	Lections; Seminars; Laboratory works; Independent work

uses a systematic approach to solve problems	
4. Know the features of the equipment of the TPP as objects of control	Lections; Independent work
to be able to determine the problem and how to solve it in the project	
5. Know the ways to control the operating modes of the TPP equipment	Lections; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
6. To be able to program controllers in the IEC standard languages ??	Lections; Seminars; Laboratory works; Independent work
uses a systematic approach to solve problems	
7. To be able to control the modes of operation of the TPP using automated systems	Lections; Seminars; Laboratory works; Independent work
8. Uses the system approach to solve the tasks	Lections
to be able to determine the problem and how to solve it in the project	
9. To be able to determine the goal, describe the main steps to achieve the goal, concentrate on the achievement of the target	Laboratory works
Conduct a preliminary feasibility study of the project development of objects of professional activity	
10. Conducts a preliminary feasibility study of the design developments of professional activity objects	Seminars

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results
Semester: 7			
Didactic unit: Technologies for developing cross-platform applications			
1. Features of the technological process of the TPP from the point of view of automation		2	3, 4, 7
8. Place of power plants in UES of Russia		2	3, 4, 8
9. Automatic boiler power control system		2	4, 5
Didactic unit: Automated TPP control systems			
2. History of appearance. Such difficulties of working with large data. General analysis scheme. Forms of data representation, types and types of data.		2	1
3. Architecture of automation TPP with autonomous subsystems. Hierarchy subsystems.		2	3
4. Architecture of automation TPP with ACS TP.		2	3
5. Functions of automated systems on TPPs		2	2
6. Technological protection of the main and auxiliary equipment TPP		10	2, 5
7. Functional automation schemes		6	1, 3
Didactic unit: Programmable logic controllers			
10. Aries PLC and CodeSys V2.3 development environment		2	6

11. 1. Stiffness, determination of various types of rigidity in water. Methods of softening. 2. Ionic exchange and electrodialysis - Water purification methods from ion impurities.		2	6
12. IEC Standard Programming Languages: CFC		2	6

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Technologies for developing cross-platform applications				
1. Automatic boiler power control system		4	7	Manages the boiler model in order to maintain a level in the boiler drum on a constant value
Didactic unit: Programmable logic controllers				
2. 1. Stiffness, determination of various types of rigidity in water. Methods of softening. 2. Ionic exchange and electrodialysis - Water purification methods from ion impurities.	2	4	3, 6, 9	programms the controller Aries PLC 150 in the ST
3. Libraries in the CodeSys V network. 2.3.	1	5	2, 6	Explores the main libraries of CodeSys V 2.3: Standart and Util. Programs the Aries controller PLC 150 using the functional blocks of the main libraries
3. IEC Standard Programming Languages: CFC	2	5	3, 6, 9	Programs the controller Aries PLC 150 in CFC

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Automated TPP control systems				
1. Functional automation schemes	4	6	3, 7	Reads and is the functional automation schemes
2. Technological protection of the main and auxiliary equipment TPP	4	8	1, 2	reads relay-contact equivalents of boolean operations and is the truth table for them. Ready the technological protection algorithms recommended by regulatory documents.
3. Algebra Bouleva		4	6, 7	Learn the laws of milk algebra, converts boolean expressions, constitutes the truth table for them.
4. Regulatory documents	6	8	10, 2, 3	Works with regulatory documents on automated control systems for TPP, studies the most important provisions of regulatory mines

Didactic unit: Programmable logic controllers				
5. Aries PLC and CodeSys V2.3 development environment	1	2	6	Creates a project and Reads CodeSys V2.3 design environment
6. 1. Stiffness, determination of various types of rigidity in water. Methods of softening. 2. Ionic exchange and electrodialysis - Water purification methods from ion impurities.	2	4	6	Methods for preliminary calculation of the power of the electric motor
7. IEC Standard Programming Languages: CFC	2	4	6	Methods for preliminary calculation of the power of the electric motor

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Specialized software

1 Microsoft Office Application Pack

2 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

3 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM

Coolants and their properties

Course: 3, semester : 5

		Semester
№	**Kind of activity**	**5**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	65
4	Lectures, hours	18
5	Practical lessons, hours	18
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	16
8	Consultations, hours	9
9	Independent work, hours	79

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. To be able to use reference literature	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
2. To be able to determine the problem and ways to solve it in the project	Lections; Seminars; Laboratory works; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	

3. Obtain the basics of calculating the processes of heat and mass transfer in elements of heat engineering and heat engineering equipment	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
4. Know the standard status diagrams	Lections; Seminars; Laboratory works; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
5. To be able to calculate temperature fields (fields of substances concentrations) in flow fluids and gases, in elements of the design of thermal and heat technology plants in order to intensify the processes of heat and mass transfer, ensuring the normal temperature mode of the equipment and minimizing heat loss of heat	Lections; Seminars; Laboratory works; Independent work
6. to be able to use professional literature, reference data, technical documentation, including use (with a dictionary) foreign technical literature	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Air as a coolant				
1. Air properties as almost perfect gas.	1	4	1, 2, 3, 4, 5, 6	The abstract
Didactic unit: Smoke gases as a coolant				
2. Properties of flue gases obtained when burning fuels in thermal motors	1	4	3, 4, 5	conducts a summary, asks about incomprehensible things
Didactic unit: Water as a coolant				
3. Technical and economic evaluation of changes in the technological scheme of industrial CHP and condensation TPP.	1	2	1, 2, 3, 4, 5, 6	The abstract
Didactic unit: Water steam as a coolant				
4. Water steam, obtained on TPPs	1	4	4, 5	conducts a summary, asks questions on incomprehensible things
5. water vapor, obtained on a thermal boiler room	1	2	4, 5	The abstract
Didactic unit: low-boiling liquids as coolants				
6. Refrigeration plants and heat pumps	1	2	4, 5	The abstract

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Air as a coolant				

1. Determination of mass isobar air heat capacity	1	4	2, 4, 5, 6	It is waiting for the stationary mode to establish the readings, makes the calculations, draws up a report and protects it
2. Determination of air adiabat	1	5	1, 3, 4, 5	It is waiting for the stationary mode to establish the readings, makes the calculations, draws up a report and protects it
Didactic unit: low-boiling liquids as coolants				
3. Definition of heat transfer coefficient when condensing vapors in a refrigeration condenser	1	4	4, 5	It is waiting for the establishment of a stationary mode, removes the readings, makes the calculations, builds a refrigeration cycle in PS coordinates. Protects it
4. Determination of heat transfer coefficient when boiling liquid refrigerant	1	5	4, 5	It is waiting for the establishment of a stationary mode, removes the readings, makes the calculations, builds a refrigeration cycle in PS coordinates. Protects it

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Air as a coolant				
1. Basic laws of technical thermodynamics	1	4	1, 2, 3, 4, 5, 6	Solves typical tasks
Didactic unit: Smoke gases as a coolant				
2. Determination of flue gas properties by formulas Mixtures	1	4	4, 5	Calculates the basic properties of flue gases
Didactic unit: Water as a coolant				
3. Definition of thermodynamic properties of water	1	2	4, 5	Determines the thermodynamic properties of water according to tables and status diagrams
Didactic unit: Water steam as a coolant				
4. Determination of thermodynamic properties of steam depending on the pressure and temperature	1	4	4, 5	Determines the properties of steam on tables and diagrams
Didactic unit: low-boiling liquids as coolants				
5. Determination of the thermodynamic properties of refrigerants	2	4	1, 2, 3, 4, 5, 6	Determines the properties of refrigerators on tables and diagrams

Table 3.4

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: low-boiling liquids as coolants				

1. Refrigeration agents			1, 2, 3, 4, 5, 6	Acquaintance with the properties of freon

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Methodical support and software

Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM

Environmental technologies on thermal power plants

Course: 4, semester : 8

		Semester
№	**Kind of activity**	**8**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	70
4	Lectures, hours	28
5	Practical lessons, hours	28
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	46
8	Consultations, hours	12
9	Independent work, hours	110

External requirements

Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity
is able to develop and ensure energy and resource saving measures at the objects of professional activity; *regarding the following learning results*:
Able to develop events on energy and resource saving on The teks of professional activity
has knowledge of regulatory techniques for energy and resource saving at labor activities

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
Conduct a preliminary feasibility study of the project development of objects of professional activity	
1. PC-8.V / PC. 2 2. Conduct a preliminary feasibility study of the design development of objects of professional activity	Lections; Seminars; Independent work
Able to develop events on energy and resource saving on The teks of professional activity	
2. PC-9.V / PC. 1 1. Solving Energy and Resource Saving Events at Professional Operations	Lections; Seminars; Independent work
has knowledge of regulatory techniques for energy and resource saving at labor activities	
3. PC-9.V / PC. 2 2. Has knowledge of regulatory techniques for energy and resource saving on labor activity	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Electromechanical transient processes in DC electric drive				
1. Introduction to energetics. Essence of an environmental aspect in energy. The interaction of the TPP with the environment. The requirement for environmentally friendly TPP. Material balance of fuel, waste and emissions. MPC of harmful substances. Concepts and definitions.	1	2	3	Lecture
Didactic unit: Improvement of flue stairs.				
2. Fuel cycle and its technological impact on the habitat. Transformation of harmful emissions of TPPs in atmospheric air. Effect of harmful emissions of power plants (SO2, NOx, solid particles) on nature.	2	4	2, 3	Lecture
3. Features of environmental protection measures for TPPs (brief Review of environmental technologies). Perspective directions of environmental technologies. Flue gas purification systems as an element base of creating new technologies. Improvement of flue processes as an element of prospective production of electricity and heat: intra-protein gasification of fuel; boilers with circulating boiling layer (CCS); improvement of flare combustion methods; Preliminary thermal preparation of solid fuel with partial gasification; Plasma lighting of the main dust torch, etc. Generalization of the prospects for the development of environmental technologies.	4	4	2, 3	Lecture
Didactic unit: Cleaning flue gases from ash.				
4. Management of virtual machines	3	5	2, 3	Lecture
Didactic unit: Cleaning flue gases from SO2.				

5. Methods and technology for cleaning flue gases from sulfur oxides. General information, an assessment of the reduction of sulfur oxides, taking into account world experience. Classification of drying methods. Wet Cleaning Methods: Experimental Installation (OEU) of the wet limestone method of the Gubkin CHP; An experimental installation on the ammonium-cyclic method on the example of a roadworking CHP. Some foreign methods of "wet" sulfurist: the "chemical" method (USA); Method "Saarberg Helter-Lurga" (USA); Method "Hitachi" (Japan); Method of the company "Bishoff" (Germany); Method "Knaff-Reserch-Korter" (Germany); Ozone method. Semi-drying (wet dry) Purification methods: Niro-Atomizer (USA) method; "Drip" method (Sweden). Dry methods of grayers: dry addive method; The Lifak method (Finland).	3	5	2, 3	Lecture
Didactic unit: Cleaning flue gases from NOX.				
6. Methods and technologies for cleaning flue gases from nitrogen oxides. General. Gas-phase (dry) methods of gases denturation: adsorption methods; high-temperature noncatalogium methods; Heterogeneous catalytic methods (high-temperature catalytic recovery, selective catalytic reduction. The effect of oxygen conversion to the degree of conversion NO. Ammonia oxidation and reduction of nitrogen oxide on the vanadium-containing catalyst . Gas dantitization liquid phase methods: oxidative-absorption, absorption-oxidative, oxidative-absorption-reduction, absorption-reductive; non-generative methods; regenerative methods.	2	4	2, 3	Lecture
Didactic unit: The principle of dispersion				

7. Dispersion in an atmosphere of emissions of power plants. Chimneys: types and designs. Methods for calculating the dispersion of harmful substances and the choice of the optimal height of the chimney. Control of the composition and concentration of harmful substances in the outgoing gases of boilers (control methods). Automation of control of precipitation of atmospheric air.	2	2	1, 2, 3	Lecture
Didactic unit: Waste waters of TPPs and their cleaning.				
8. Classification of companies in the type of innovation strategy. Competitiveness of products	1	2	1, 2, 3	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Selects the environmental equipment of thermal power plants or boiler room.				
1. Practical work on the rationale for the choice of equipment for rowing equipment for TPP or boiler room based on the environmental aspects in power engineering.	4	4	1, 2, 3	Practice
Didactic unit: work in the package To calculate the current short circuit currents of AWP CRPs				
2. Calculation of dry apparatuses of goldening (cyclones).	2	2	1, 2	Practice
3. Calculation of battery cyclones.	2	2	1, 2	Practice
4. Calculation of the WTT scrubber.	2	2	1, 2	Practice
5. Calculation of the Wenturi scrubber.	2	2	1, 2	Practice
6. Calculation of the electrostilifer.	2	2	1, 2	Practice
7. Calculation of the coal warehouse.	2	2	1	Practice
8. Calculation of the height of the chimney.	2	2	2, 3	Practice
9. Selection of technology and equipment for cleaning flue gases from sulfur oxides in relation to specific fuels combined with TPPs or Boiler room.	2	2	2, 3	Practice
Didactic unit: Selection of environmental technology for flue gases From sulfur oxides.				

10. The choice of technology and equipment for the seroids, taking into account the world experience of purification of flue gases from Sulfur oxides in relation to the combustion of a particular fuel on a TPP or boiler room.	2	2	2	Practice
Didactic unit: Selection of technology and equipment for cleaning flue gases from nitrogen oxides.				
11. Development of environmental protection requirements Environment for various types of power units and various types of fuel.	2	2	1, 2, 3	Practice
Didactic unit: Selection of technology and wastewater treatment equipment.				
12. Selection of wastewater treatment technology System of hydroxolving TPP.	2	2	3	Practice
Didactic unit: Setting the environmental protection problem				
13. Determination of the effects of TPPs and boiler rooms on the habitat at the global, regional and local levels.	2	2	2, 3	Practice

Literary sources

Main literature

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Methodical support and software

Methodological support

1. Построение характеристики загрязнения атмосферы теплоэнергетической установкой : методические указания к лабораторной работе для ФЭН направления 140100 всех форм обучения / Новосиб. гос. техн. ун-т ; [сост.: П. А. Щинников, А. А. Францева]. - Новосибирск, 2014. - 13, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000192929

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Anti-emergency control in power systems

Course: 3, semester : 5

		Semester
№	**Kind of activity**	**5**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	66
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	0
8	Consultations, hours	10
9	Independent work, hours	78

External requirements

Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
Conduct a preliminary feasibility study of the project development of objects of professional activity	
1. PC-8.V / PC. 2 2. Conduct a preliminary feasibility study of the design development of objects of professional activity	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 5				
Didactic unit: Hydraulics				

1. The main concepts of hydrodynamics. Equation of continuity flow. Liquid motion modes. Full hydrodynamic pressure. Equation D. Bernoulli. The relationship between speed and pressure.		2	1	Lecture
2. Determination of pressure loss in length and in local resistances. Shzi equation. Calculation of pipelines. The expiration of the fluid through the hole and nozzle.		4	1	Lecture
3. Basic hydrostatic equations.		2	1	Lecture
4. Kinematics and fluid dynamics. Types of fluid movement. Bernoulli equation, practical application.		4	1	Lecture
5. Liquid motion modes. Hydraulic resistance. Pattern losses in pipes.		2	1	Lecture
6. Main types of local resistance. Basics of the theory of hydraulic similarity		2	1	Lecture
7. Expiration Liquids from holes and nozzles. Hydraulic calculation of pipelines. Hydraulic blow.		4	1	Lecture
Didactic unit: Pumps				
8. Local computing networks. TCP / IP stack levels and protocols.		6	1	Lecture
Didactic unit: Volumetric hydraulic equipment				
9. Basic concepts. Principle of operation of the volume hydraulic drive. Applied working fluids.		2	1	Lecture
10. Hydroofrapping and other hydraulic elements. Schemes and methods for controlling hydraulic drive		4	1	Lecture
11. Pneumatic reception The main elements and schemes. PneumaticAutomatomy tools.		4	1	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Hydraulics				
1. The main physical properties of the liquid		2	1	Calculation of a given method
2. Hydrostatics		2	1	Calculation of a given method
3. Kinematics and fluid dynamics		2	1	Calculation of a given method
4. Hydrodynamic semblance and fluid flow modes in pipes		2	1	Calculation of a given method

5. Laboratory work №17 "Touch voltage and step"		2	1	Calculation of a given method
6. Turbulent current		2	1	Calculation of a given method
Didactic unit: Volumetric hydraulic equipment				
7. Hydraulic calculation of pipelines		4	1	Calculation of a given method
8. Local hydraulic resistance		2	1	Calculation of a given method

Literary sources

Additional literature

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Methodical support and software

Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Technical dimensions and instruments

Course: 3, semester : 6

		Semester
№	**Kind of activity**	**6**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	83
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	0
8	Consultations, hours	9
9	Independent work, hours	97

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
can collect and analyze the source data for the design of professional activity objects

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. to know ways of assessing the error of indirect measurements	Lections; Seminars; Laboratory works; Independent work
can collect and analyze the source data for the design of professional activity objects	
2. to be able to conduct Verification of devices and complexes of various purposes	Lections; Seminars; Laboratory works; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
3. Know the basic principles of the organization of the educational process	Lections; Seminars; Laboratory works; Independent work

can collect and analyze the source data for the design of professional activity objects	
4. To be able to measure using analog and digital measuring instruments	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Means of measurement of electrical values.				
1. Means of measuring electrical values. Analog devices.		5	1, 2, 3, 4	Lecture.
2. Instant, amplitude, secondary, rms and medium-sized signal value. The accuracy class of the device and the number of scale divisions.		6	3	Lecture.
3. Digital devices. Analog-to-digital converters (ADC), type of ADC: a parallel comparison, deploying transformation, parallel action, with two-stroke integration. ADC of time, frequency, phase differences.		8	1, 2, 3, 4	Lecture.
4. oscilloscopes, digital oscilloscope.		4	1, 2, 3, 4	Lecture.
Didactic unit: Means of measurement of magnetic and non-electrical values.				
5. Virtual measuring instruments.		4	1, 2, 3, 4	Lecture.
6. Primary converters (sensors). Resistance sensors, magnetoresistance sensors, containers, inductance. Sensors for accurate measurement of geometric sizes, roughness, movement, temperature.		6	1, 2, 3, 4	Lecture.
7. Measuring information systems.		3	3	Lecture.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Means of measurement of electrical values.				
1. Measurement of combined devices. Evaluation of the basic instrumental errors of measurement results		9	1, 2, 3, 4	Laboratory work ..
2. Signal observation and measurement of their parameters with electronic oscilloscopes		9	1, 2, 3, 4	Laboratory work.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Means of measurement of electrical values.				
1. Evaluation of methodological and additional instrumental errors in measurements		6	1, 2, 3, 4	Practice .
2. Structural schemes and properties of measuring instruments in static mode - direct transformation and compensatory means; Their additive and multiplicative error. Means of measurements in the dynamic mode - links of the first and second orders; Dynamic error.		4	1, 2, 3, 4	Practice .
Didactic unit: Means of measurement of magnetic and non-electrical values.				
3. Means of measurement of magnetic and non-electrical values.		8	1, 2, 3, 4	Practice .

Table 3.4

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Means of measurement of magnetic and non-electrical values.				
1. Virtual measuring instruments.		10	1, 2, 3, 4	Independent work.

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6. http://znanium.com/

Methodical support and software

Methodological support

1. Основы метрологии : программа, методические указания, вопросы для самопроверки и контрольные задания для 2 и 3 курсов технических факультетов заочной формы обучения / Новосиб. гос. техн. ун-т ; [сост. Г. Г. Матушкин]. - Новосибирск, 2008. - 62, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000088374

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
thermal and nuclear power plants

Course: 4, semester : 8

		Semester
№	**Kind of activity**	**8**
1	Total credits	7
2	Total hours	252
3	Total classes in the contact form, hours	86
4	Lectures, hours	28
5	Practical lessons, hours	28
6	Laboratory studies, hours	14
7	of them in an active and interactive form, hours	46
8	Consultations, hours	14
9	Independent work, hours	166

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
uses a systematic approach to solve problems
is able to carry out professional activities, taking into account the regional features and needs of employers; *regarding the following learning results*:
has The features of regional development and knows the specifics of the labor market in the field of professional activity.

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
uses a systematic approach to solve problems	
1. To be able to present the results of the solution of individual tasks in a form convenient to perceive, to be able to conduct studies of accuracy and performance indicators of information and power systems	Seminars; Laboratory works; Independent work
has The features of regional development and knows the specifics of the labor market in the field of professional activity.	
2. Know the thermal Schemes	Lections; Seminars; Independent work
3. On modern energy development trends	Lections; Seminars; Independent work
4. Know the basic principles of production of electricity and heat	Lections; Seminars; Laboratory works; Independent work

uses a systematic approach to solve problems	
5. apply methods for comparing the effectiveness of the use of different energy resources.	Lections; Seminars; Laboratory works; Independent work
6. To be able to choose computing tools for designing devices and control systems	Lections; Seminars; Laboratory works; Independent work
7. Modes of operation and optimal parameters of power equipment and in general TPP, NPP	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Three-phase electrical circuits				
1. Modern trends in energy development.		2	3	Lecture
2. Types of power plants. Energy Indicators of Condensation TPPs, NPPs, PSU, GTU -TPP, Energy Indicators, CHPP with Steam, Gas Turbines and Steel Installations.		2	4	Lecture
Didactic unit: Thermal schemes of power plants and their calculation.				
3. Specificity of the conditions of operation of structural materials in this. Summary, thermal insulation and heat-resistant materials used in EPS. Technical and economic indicators, physical characteristics, working conditions. Basics of choosing materials.	4	6	2, 5, 6, 7	Calculation of thermal circuits, development of optimal variants
Didactic unit: Method of energy balance, thermal efficiency, regeneration.				
4. Thermal efficiency and energy phaseners. Energy Balance and efficiency. Modes of operation. Graphics of thermal loads. Fuel economy when combined energy production on external thermal consumption. Regenerative heated nutrient water. Couple heat and production selection. Methods for calculating thermal circuits.		6	2, 4, 5, 6, 7	Lecture
Didactic unit: Choosing equipment TPP, NPPs and questions of its maneuverability and equipment characteristics.				
5. Nutritious and deaeratorics. Selection of auxiliary equipment. Energy maneuverable characteristics of TPP equipment and nuclear power plants. Methods of covering the peaks and load failures by power systems. Starting schemes of power units.		4	5, 7	Lecture
Didactic unit: Technical systems of the TPP, NPP.				

6. Technical water supply. Fuel economy. Gas cleaning, ashlacking.		4	3	Lecture
Didactic unit: Layout of the TPP and NPP.				
7. Choosing a construction site. General Plans for TPP and NPP. Basic requirements for the layout of the main buildings of the TPP, NPP. Types of layouts.		4	3	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Three-phase electrical circuits				
1. Construction of power installation energy installation	4	4	1, 4, 6, 7	Laboratory work is performed in the laboratory of thermal power plants using a teacher. Protection of work.
Didactic unit: Method of energy balance, thermal efficiency, regeneration.				
2. Determination of the efficiency of the heat power plant operation.	4	4	1, 5, 6, 7	Laboratory work is performed in the laboratory of heat energy installations using a teacher. Protection of work.
Didactic unit: Technical systems of the TPP, NPP.				
3. Research of thermodynamic processes Piston compressor	6	6	1, 4, 6, 7	Laboratory work is performed in the laboratory of heat energy installations using a teacher. Protection of work.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Three-phase electrical circuits				
1. TPPs in the EE and heat production system.	2	2	4	Solving tasks
Didactic unit: Thermal schemes of power plants and their calculation.				
2. Thermodynamic bases of the operation of thermal power plants	6	6	1, 4, 7	Solution of the tasks.
3. Heat schemes	4	4	1, 2, 6	Solving tasks
4. Definition of the regeneration system.	2	2	2, 7	Solving tasks
Didactic unit: Method of energy balance, thermal efficiency, regeneration.				
5. Energy and exergic analysis of the operation of the TPP	4	4	1, 5, 6, 7	Solving tasks
6. Calculation of the mixing point.	2	2	2, 6	Solution of the problem of regeneration system
7. Calculation of performance of the efficiency of the power unit at a given mode.	2	2	1, 4, 5, 7	Solving tasks

Didactic unit: Choosing equipment TPP, NPPs and questions of its maneuverability and equipment characteristics.				
8. Calculation of the network installation. Calculation of regenerative heaters.	2	2	2, 6	Solving tasks
9. Calculation of deaerator.	2	2	2, 6	Solving tasks
Didactic unit: Technical systems of the TPP, NPP.				
10. TES Systems	2	2	1, 3, 5, 7	Choosing equipment

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Additional literature

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Methodical support and software

Methodological support

1. Расчет тепловых схем теплофикационных паротурбинных установок : методические указания к курсовому и дипломному проектированию для 4 и 5 курсов ФЭН всех форм обучения (специальности 140100, 140101, 220301, 220700) / Новосиб. гос. техн. ун-т ; [сост.: О. К. Григорьева, О. В. Боруш]. - Новосибирск, 2014. - 62, [1] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000199746

2. Расчет тепловых схем паротурбинных ТЭС : методические указания к курсовому и дипломному проектированию для 4 и 5 курсов ФЭН всех форм обучения (специальности 140100, 140101, 140104, 220301, 140204) / Новосиб. гос. техн. ун-т ; [сост.: О. К. Григорьева, О. В. Боруш]. - Новосибирск, 2010. - 57, [1] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000148924

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Heat engines and superchargers

Course: 4, semester : 8

		Semester
№	**Kind of activity**	**8**
1	Total credits	7
2	Total hours	252
3	Total classes in the contact form, hours	86
4	Lectures, hours	28
5	Practical lessons, hours	28
6	Laboratory studies, hours	14
7	of them in an active and interactive form, hours	46
8	Consultations, hours	14
9	Independent work, hours	166

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
uses a systematic approach to solve problems
is able to carry out professional activities, taking into account the regional features and needs of employers; *regarding the following learning results*:
has The features of regional development and knows the specifics of the labor market in the field of professional activity.

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
uses a systematic approach to solve problems	
1. To be able to use reference literature	Lections; Seminars; Laboratory works; Independent work
has The features of regional development and knows the specifics of the labor market in the field of professional activity.	
2. to have an idea of ??the approach to solving processing tasks data in high-tech technologies; On the problems arising in solving multidimensional inverse problems, and how to solve them	Lections; Seminars; Laboratory works; Independent work
3. to be able to use professional literature, reference data, technical documentation, including use (with a dictionary) foreign technical literature	Lections; Seminars; Laboratory works; Independent work
uses a systematic approach to solve problems	

4. Own modern means of automated control	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Internal combustion engines (DVS)				
1. The principle of the operation of four-stroke DVS		2	1, 3, 4	There is a summary, asks questions about incomprehensible places
2. Theoretical DVS cycles and their comparison		4	2, 3, 4	The abstract
3. Indicator diagram of four-stroke engine, medium-indicator pressure		2	3, 4	leads a summary, sets questions
4. Principle of operation and indicator diagram of two-stroke engine		2	3, 4	The abstract
Didactic unit: Steam and gas turbines				
5. The simplest technological scheme of TPPs		2	3, 4	There is a summary, asks questions about incomprehensible places
6. Cycles of steam-turbine installations		4	3, 4	The abstract
7. cycles of gas turbine settings		2	3, 4	The abstract
8. Cycles of the vapor-gas installations		2	3, 4	The abstract
Didactic unit: Superchargers				
9. Compressors, pumps, fans		4	3, 4	The abstract
10. Principle of operation and compressor cycles		4	3, 4	The abstract

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Internal combustion engines (DVS)				
1. Construction of the energy characteristics of the engine)	8	4	1, 3, 4	Get acquainted with the main graphic formats. Reading the editor Photoshop
2. Determination of the efficiency of the operation of the heat energy installation based on the DVS	8	4	3, 4	Get acquainted with the main graphic formats. Reading the editor Photoshop
Didactic unit: Superchargers				
3. Study of the properties of Linear and corner movements	8	6	2, 3, 4	Get acquainted with the main graphic formats. Reading the editor Photoshop

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Internal combustion engines (DVS)				
2. Calculation of OTTO cycles, a diesel engine and a trinker with the same compression degrees	12	18	2, 3, 4	Calculates the efficiency and compares them among themselves for Otto cycles, a diesel engine and trinker, depicts cycles in PV and TS diagrams, designs The report and protects it
Didactic unit: Steam and gas turbines				
1. Calculation of the thermal circuit of a steam turbine unit	10	10	1, 3, 4	Calculates regenerative feeding water heaters, deaerator and other vocational elements, builds cycle PPU in the PS diagram, draws up a report and protects it

Table 3.4

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Superchargers				
1. Principle of operation and cycles of compressors			1, 2, 3, 4	Acquaintance with the Module "Education Environment": Presentations, regulatory documentation.

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3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

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Methodical support and software

Methodological support

1. Теплопередача : методические указания к лабораторным работам для ФЭН всех форм обучения и всех направлений / Новосиб. гос. техн. ун-т ; [сост.: Ю. И. Шаров, П. А. Щинников]. - Новосибирск, 2018. - 36, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000238839

2. Шаров Ю. И. Основы теплотехники и перенос энергии и массы (ОТиПЭМ) [Электронный ресурс] : слайд-конспект лекций / Ю. И. Шаров ; Новосиб. гос. техн. ун-т. - Новосибирск, [2015]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000214445. - Загл. с экрана.

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Electrical equipment of power plants

Course: 4, semester : 8

		Semester
№	**Kind of activity**	**8**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	66
4	Lectures, hours	14
5	Practical lessons, hours	28
6	Laboratory studies, hours	14
7	of them in an active and interactive form, hours	16
8	Consultations, hours	8
9	Independent work, hours	114

External requirements

is able to determine the range of tasks in the framework of the target and choose the best ways to solve them, based on existing legal norms, resources available and restrictions; *regarding the following learning results*:
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	
1. UK-2. 2 2. Selects the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	Lections; Seminars; Laboratory works
Conduct a preliminary feasibility study of the project development of objects of professional activity	
2. PC-8.V / PC. 2 2. Conduct a preliminary feasibility study of the design development of objects of professional activity	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Creating three-dimensional objects by the method of lofting.				
1. Basic information about the power system. The power system and its components. Requirements for quality of electricity. Power loss, energy in electrical network elements, loss and voltage drop. Mode of operation of electrical installations. Electric load graphs.		2	1, 2	Lecture
Didactic unit: Basic equipment of power plants				
2. Turbogenerators and hydrogenerators. General principles of the device. Main parameters, types.		2	1, 2	Lecture
3. Power transformers and autotransformers. Types and main characteristics. Features of autotransformers.		2	1, 2	Lecture
Didactic unit: Switching and measuring devices				
4. Select switching devices. Types and causes of short circuits. Calculation of short circuit currents. Characteristics of the transition process with a three-phase short circuit. Selection of measuring devices.		2	1, 2	Lecture
Didactic unit: Main schemes of power plants and substations				
5. Main circuits of electrical compounds of power plants. Distributional circuits.		2	1, 2	Lecture
Didactic unit: Own power plants				
6. Own items of thermal power plants. Equity mechanisms. Power supply schemes.		2	1, 2	Lecture
Didactic unit: Repair controls				
7. Relay protection and automation of power plants. Appointment and basic requirements for relay protection and automation. Characteristics of the main types of protection of electrical equipment of power plants.		2	1, 2	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				

Didactic unit: Basic equipment of power plants				
1. Restriction of short circuit currents		5	1, 2	Laboratory work.
Didactic unit: Switching and measuring devices				
2. Acquaintance with the designs of high-voltage devices		5	1, 2	Laboratory work
Didactic unit: Main schemes of power plants and substations				
3. Operational switching in distribution device circuits		4	1, 2	Laboratory work

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Basic equipment of power plants				
2. Selection of generators, transformers and autotransformers in the main schemes of power plants, selection of sectional reactors for CHP	4	6	1, 2	Practical lesson
6. Selection of linear and sectional reactors in the CHP Schemes		2	1, 2	Practical lesson
Didactic unit: Switching and measuring devices				
3. Choosing switches and disconnectors in the main schemes of power plants	4	6	1, 2	Practical lesson
4. Selection of measuring transformers of current and voltage		4	1, 2	Practical lesson
Didactic unit: Main schemes of power plants and substations				
1. Development of the block diagram of a thermal power station	4	6	1, 2	Practical lesson
5. Selection of distribution devices and compilation of main electrical compounds of power plants and substations	4	4	1, 2	Practical lesson

Literary sources

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Additional literature

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4. https://e.lanbook.com/

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6. http://www.iprbookshop.ru/

7. http://znanium.com/

Methodical support and software

Methodological support

1. Электрическая часть электрических станций и подстанций [Электронный ресурс] : электронный учебно-методический комплекс / М. А. Купарев [и др.] ; Новосиб. гос. техн. ун-т. - Новосибирск, [2020]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000242619. - Загл. с экрана.

2. Электрические станции и подстанции : методические указания к выполнению лабораторных работ № 1, 2, 3, 4 для факультета энергетики по направлению 140400.62 "Электроэнергетика и электротехника" всех форм обучения / Новосиб. гос. техн. ун-т ; [сост.: В. И. Ключенович, Г. А. Сарапулов, Л. Б. Быкова]. - Новосибирск, 2014. - 58, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000186143

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5. Организация самостоятельной работы студентов Новосибирского государственного технического университета : методическое руководство / Новосиб. гос. техн. ун-т ; [сост.: Ю. В. Никитин, Т. Ю. Сурнина]. - Новосибирск, 2016. - 19, [1] с. : табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000234042

Specialized software

1 Operating System Microsoft Windows

ANNOTATION OF THE PROGRAM
Heat-shared equipment of enterprises

Course: 4, semester : 8

		Semester
№	**Kind of activity**	**8**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	66
4	Lectures, hours	14
5	Practical lessons, hours	28
6	Laboratory studies, hours	14
7	of them in an active and interactive form, hours	16
8	Consultations, hours	8
9	Independent work, hours	114

External requirements

is able to determine the range of tasks in the framework of the target and choose the best ways to solve them, based on existing legal norms, resources available and restrictions; *regarding the following learning results*:
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	
1. To be able to use the Internet	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
2. to have experience working with reference literature	Lections; Seminars; Laboratory works; Independent work
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	

3. to know the main physical properties of liquids and gases, general laws and equations of the statics, kinematics and dynamics of liquids and gases, the features of physical and mathematical modeling of one-dimensional and three-dimensional, subsonic and supersonic, laminar and turbulent flows of perfect and real incompressible and compressible liquids	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
4. To be able to calculate temperature fields (fields of substances concentrations) in flow fluids and gases, in elements of the design of thermal and heat technology plants in order to intensify the processes of heat and mass transfer, ensuring the normal temperature mode of the equipment and minimizing heat loss of heat	Lections; Seminars; Laboratory works; Independent work
Chooses the optimal way to solve problems, given the current legal norms and the existing conditions, resources and restrictions	
5. to be able to use professional literature, reference data, technical documentation, including use (with a dictionary) foreign technical literature	Lections; Seminars; Laboratory works; Independent work
6. Read drawings and schemes, perform technical images in accordance with the requirements of ECD standards, perform sketching, detailing, assembly drawings, technical schemes, including using computer graphics: Factors affecting the efficiency of the team and the conditions for effective teamwork	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
7. Obtain the basics of calculating the processes of heat and mass transfer in elements of heat engineering and heat engineering equipment	Lections; Seminars; Laboratory works

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Modes of operation of the traction electric motor				
1. Network heaters	1	2	1, 3, 4, 5, 6, 7	The abstract
2. Regenerative feeding water heaters	1	2	2, 3, 4, 5, 6, 7	leads a summary, sets questions
3. Condestator Couple	1	2	3, 4, 5, 6, 7	The abstract
4. Water economizer	1	2	3, 4, 5, 6, 7	leads a summary, sets questions
5. Air heater	1	2	3, 4, 5, 6, 7	The abstract
Didactic unit: Random Vectors, Numerical Characteristics, Difference Models				
6. Deaerator	1	2	3, 4, 5, 6, 7	leads a summary, sets questions
7. Cooling Movement	1	2	3, 4, 5, 6, 7	The abstract

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities

Semester: 8				
Didactic unit: Modes of operation of the traction electric motor				
1. Calculation of heat transfer in heating convector	2	14	1, 2, 3, 4, 5, 6, 7	Calculates heat transfer from water inside the pipes, heat transfer to the surrounding air from the finned outer surface, determines the coefficient heat transfer, the average temperature difference between the coolants and the given warmth

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Modes of operation of the traction electric motor				
1. Calculation of recovery heat exchangers	5	20	1, 3, 4, 5, 6, 7	solves the task of calculating recovery heat exchangers under the guidance of the teacher
Didactic unit: Random Vectors, Numerical Characteristics, Difference Models				
2. Calculation of mixing heat exchangers	2	8	2, 3, 4, 5, 6, 7	solves the task of calculating recovery heat exchangers under the guidance of the teacher

Table 3.4

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Random Vectors, Numerical Characteristics, Difference Models				
1. Calculation of mixing heat exchangers			1, 2, 3, 4, 5, 6	Acquaintance with mixing heat exchangers

Literary sources

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Internet resources

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3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

5. http://znanium.com/

Methodical support and software

Methodological support

1. Теплопередача : методические указания к расчетно-графической работе для ФЭН всех форм обучения / Новосиб. гос. техн. ун-т ; [сост. Ю. И. Шаров]. - Новосибирск, 2012. - 17, [2] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000168175

2. Теплопередача : методические указания к лабораторным работам для ФЭН всех форм обучения и всех направлений / Новосиб. гос. техн. ун-т ; [сост.: Ю. И. Шаров, П. А. Щинников]. - Новосибирск, 2018. - 36, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000238839

3. Расчет теплообменника ЦТП : методические указания к расчетно-графической работе для ФЭН всех форм обучения и всех направлений / Новосиб. гос. техн. ун-т ; [сост. Ю. И. Шаров]. - Новосибирск, 2013. - 29, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000185213. - Загл. обл.: Расчет теплообменника ЦПТ.

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Industrial power engineering

Course: 3, semester : 6

		Semester
№	**Kind of activity**	**6**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	66
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	8
8	Consultations, hours	10
9	Independent work, hours	78

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. On the basic methods for calculating the efficiency of PP power consumption.	Lections; Seminars; Independent work
2. on the basic methods of improving the efficiency of heat and power processes in industrial energy installations.	Lections; Seminars; Independent work
3. on the main types of thermalnergetic installations of PP	Lections; Seminars; Independent work
4. Basic machines of thermal system systems.	Lections; Seminars; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	

5. Calculate regulators of typical structures of electric drive control systems and choose elements of power electronics.	Lections; Seminars; Independent work
6. The structure of technological thermal power systems PP.	Lections; Independent work
7.Calculate the energy balance and corresponding indicators of the effectiveness of technological apparatus.	Lections; Seminars; Independent work
8. Conducting preliminary design development of professional activity objects	Seminars

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results
Semester: 6			
Didactic unit: Fuel and energy complex (TEK).			
1. Fuel-Energy Complex (TEK) - a large energy system. TEK region, industrial enterprise (PP). Vertical and horizontal connections. Interchangeability of energy resources.		3	3
Didactic unit: Energy technologies on PP			
2. Thermal power system of industrial enterprises (TPP PP). Heat and power balance of PP. Methods for rationalizing power consumption of PP. Energy technological approach to technological scheme PP.		3	1, 2, 6
Didactic unit: Heat-energy systems and their elements.			
3. Thermal power schemes of PP and their main elements. - gas and heat supply systems, heat exchangers: recuperators and regenerators. Methods of engineering calculation of heat exchangers. - Furnaces, types of furnaces, thermal calculation. Regeneration in the furnaces. Features of high-temperature industrial heat exchangers. - Medium-potential heat release systems: heat exchangers with phase transition, evaporator installations.		14	1, 6
Didactic unit: air technology systems, devices.			
4. Systems using air. - Moisturizing and drying processes, thermal calculation. - Physico-chemical bases of drying materials. Drying settings, calculation of drying.		4	3, 4, 5
Didactic unit: System devices, Use physico-chemical processes.			
5. Technological systems of chemical production using thermal energy. - distillation and evaporation. - Rectification.		4	1, 4, 7
Didactic unit: Cold manufacturing systems, Cryogenic devices.			
6. Types of innovative behavior of firms in the market. Integrated Evaluation of the Efficiency of the Chosen Innovation Strategy		4	3, 6, 7
Didactic unit: High-temperature industrial technological installations			

7. Scope of high-temperature technological installations. Classification, types, designs, energy balance and characteristics of industrial furnace installations.		4	1, 2, 6

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Energy technologies on PP				
4. Calculation of thermal batteries installed on the process line with The purpose of reducing energy consumption.	2	5	3, 5	The student meets the accumulation of heat energy in the heat supply schemes of technological processes to rationalize energy spending.
Didactic unit: Heat-energy systems and their elements.				
1. Energy balance and the super-energetic efficiency of the parokompression of the refrigeration unit, aerialized installation, operating along the cycle of the heyland, cryogenic gas machine.	2	4	4, 5, 7, 8	Students analyze conflicts according to the given video phrases
Didactic unit: Cold manufacturing systems, Cryogenic devices.				
2. Technological scheme of heat units. Thermal efficiency and energy indicators. Energobalance. Fuel consumption, warmth and steam. Modes of operation. Environmental peculiarities of the work of power plants TPP	2	4	1, 2, 7, 8	The student learns to conduct technical and economic calculations and assess the consequences of rationalizing proposals from the standpoint of engineering analysis.
Didactic unit: High-temperature industrial technological installations				
3. Calculation of the energy characteristics of high-temperature technological equipment (industrial furnace installation). Drawing up the energy balance.	2	5	1, 7	The student receives a practical acquaintance with the energy characteristics, learns to use the energy characteristic to solve practical issues.

Literary sources

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2. Чередниченко В. С. Физические основы преобразования энергии. Теплопередача в упражнениях и задачах. Ч. 3 : учебное пособие [для 3 курса ЭМФ дневного отделения] / В. С. Чередниченко, А. И. Алиферов, В. А. Синицын ; Новосиб. гос. техн. ун-т. - Новосибирск, 2003. - 76 с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000023793

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Methodical support and software

Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
technological energy carriers

Course: 3, semester : 6

		Semester
№	**Kind of activity**	**6**
1	Total credits	4
2	Total hours	144
3	Total classes in the contact form, hours	66
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	8
8	Consultations, hours	10
9	Independent work, hours	78

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. To be able to use reference literature	
Conduct a preliminary feasibility study of the project development of objects of professional activity	
2. have experience in finding infractions on the Internet	
3. To be able to calculate temperature fields (fields of substances concentrations) in flow fluids and gases, in elements of the design of thermal and heat technology plants in order to intensify the processes of heat and mass transfer, ensuring the normal temperature mode of the equipment and minimizing heat loss of heat	Lections; Seminars; Independent work

4. to be able to use professional literature, reference data, technical documentation, including use (with a dictionary) foreign technical literature	Lections; Seminars; Independent work
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
5. Know the standard status diagrams	Lections; Seminars; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
6. Laws and basic physical and mathematical models of heat and mass change in relation to heat engineering and heat technology and systems	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Memory and microprocessors				
1. Basic energy resources		4	3, 4, 5, 6	The abstract
Didactic unit: Designing relay protection, automation and telemechanics as an integrated system of electricity control system				
2. Energy installations of thermal power plants	1	10	3, 4, 5, 6	leads a summary, sets questions
Didactic unit: Energy production on heating and industrial boiler houses				
3. Energy installations of boiler houses	1	6	3, 4, 5, 6	The abstract
Didactic unit: System-forming Properties				
4. Heat supply systems	1	6	3, 4, 5, 6	The abstract
5. Systems of heating	1	6	3, 4, 5, 6	The abstract
6. Ventilation and air conditioning systems	1	4	3, 4, 5, 6	The abstract

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Designing relay protection, automation and telemechanics as an integrated system of electricity control system				
1. Calculation of the thermal diagram of PTU	1	6	3, 4, 5, 6	Calculates the main elements of PTU, builds graphic dependencies, draws up a report and protects it
3. Calculation of the CTP heat exchanger	1	6	3, 4, 5, 6	Calculates the necessary surface of the heat exchanger, selects the section , Determines the number of sections, builds the temperature schedule, draws up the report and protects it

Didactic unit: Energy production on heating and industrial boiler houses				
2. Calculation of the heating and production boiler room	1	6	3, 4, 5, 6	calculates the elements of the heating and production boiler room, builds graphs, draws up a report and reaches it

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: System-forming Properties				
1. Ventilation and air conditioning systems			3, 4, 5, 6	Acquaintance with the designs of fans and compressors

Literary sources

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Methodical support and software

Methodological support

1. Основы теплопередачи : сборник лабораторных работ : методические указания для ФЭН всех форм обучения и всех направлений / Новосиб. гос. техн. ун-т ; [сост.: Ю. И. Шаров, П. А. Щинников]. - Новосибирск, 2011. - 37, [1] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000156002

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Mathematical analysis

Course: 4, semester : 7

		Semester
№	**Kind of activity**	**7**
1	Total credits	6
2	Total hours	216
3	Total classes in the contact form, hours	93
4	Lectures, hours	36
5	Practical lessons, hours	36
6	Laboratory studies, hours	8
7	of them in an active and interactive form, hours	32
8	Consultations, hours	11
9	Independent work, hours	123

External requirements

Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity
is able to prepare design and working documentation for individual sites and elements, on plans and heat profiles OS Networks; *regarding the following learning results*:
performs drawings and represents the circuits of nodes and elements of heat networks based on the task of the manager
Performs drawings of plans and profiles of the highway trails

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs drawings and represents the circuits of nodes and elements of heat networks based on the task of the manager	
1. Present the results of the solution of individual tasks in the form convenient for perception, use computer modeling and processing and processing technologies.	Seminars; Laboratory works; Independent work
2. Object (energy installations of thermal power plants, centralized production of heat-electricity) and the subject of the course (methods of energy balance and the extracetic), course tasks (the choice of methods of calculation); The place of the theory of power plants of the TPP, NPPs as one of the main theoretical disciplines for thermal power engineering.	Lections; Seminars; Laboratory works; Independent work
3. Technological schemes for the production of heat and electricity, operation modes, load graphs.	Lections; Seminars; Laboratory works; Independent work

4. Apply methods for analyzing, synthesis and optimization of technological processes.	Lections; Seminars; Laboratory works
Performs drawings of plans and profiles of the highway trails	
5. Spot and interval statistical assessments of the number characteristics of random variables	Lections; Independent work
6. Basic methods for calculating the thermal economy of power plants and emergency components of thermal power plants.	Lections; Seminars; Laboratory works; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	
7. Use the basics of a systematic approach, formulate tasks, to identify priorities for solving problems.	Seminars; Laboratory works; Independent work
8. on the composition of distribution devices, transformer substations, furnace units	Lections; Seminars; Laboratory works; Independent work
9. Methods for calculating technical and economic indicators.	Lections; Seminars; Laboratory works; Independent work
10. Calculate material, energy and super-energetic balances of power plants, their units and technical systems, efficiency, compare the results obtained by various methods, evaluate the proceeds and non-productive costs for ensuring the specified quality level.	Lections; Seminars; Independent work
11. On the methods of creating environmentally friendly CHP.	Lections; Laboratory works
12. about trends Development of various sectors of energy.	Lections; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results
Semester: 7			
Didactic unit: Computer graphics technology			
1. Basic concepts, definitions. CHP - as technological systems of centralized production of thermal and electrical energy. Fuel and energy resources. Energy and power plant. Basic specifications. Electrical and thermal consumption. The principal tkhanic scheme for the production of thermal and electrical energy.		2	12, 8
Didactic unit: Stability of linear SAU			
2. Technological scheme of heat uniforms. Thermal efficiency and energy phase. Energy Balance and efficiency. Modes of operation. Graphics of thermal loads. Fuel, TPLC and steam costs. Fuel economy in combined energy production on external thermal consumption.		4	10, 2, 3
Didactic unit: Heating gas cycles			
3. Technological scheme of condensation power units. Thermal efficiency and energy indicators. Energobalance. Fuel consumption, warmth and steam. Work modes.		4	2, 3, 6
Didactic unit: Electromechanical properties and characteristics of electric motors used in electricity			
4. extergive method. Exsergency balance and extergesic efficiency of condensing and heat units. Conditions for obtaining maximum work and maximum efficiency. Real processes in elements of power units. Losses of the exxition.		4	10, 4, 8, 9
Didactic unit: Estimates of the quality of information transmission, telemechanics systems			

5. Steam parameters and TPP circuits. Influence on efficiency. Steating steam. Intermediate overheating. Economic values ??of parameters. Heat and steam costs.		4	3, 8, 9
Didactic unit: heat regeneration.			
6. regenerative heated nutrient water. Consumption of steam and warmth. Efficiency. Optimal heating temperature. Distribution of regenerative heating in steps. Couple parameters in selections. Generalized regenerative selection. Heat and industrial selection. Non-profit coefficients.		8	10, 5, 8, 9
Didactic unit: Robotic complexes management issues			
7. Auxiliary technical systems and equipment. Systems of heat and energy. Schemes. Network heaters. Evaporators and steamers. PVD, PND. Regeneration systems schemes. Deaerators. Systems of technical water supply, fuel preparation and fuel directors, purification and evacuation of flue gases, traction and blast.		10	11, 3, 5, 8

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Heating gas cycles				
1. Acquaintance with the thermal power plant based on the DVS		2	11, 2, 8	gets acquainted with the concept of power fields. Considers conservative and dissipative forces.
2. Rachsets of the coefficient of excess air or chemical injecting fuel when burning fuel. Evaluation of Fuel Consumption TEU		2	1, 11, 6	Launch of the DVS on the specified modes, removal of readings, calculation; Registration of the report and protection
Didactic unit: Estimates of the quality of information transmission, telemechanics systems				
2. Calculation of technical and economic indicators of TEU in various ways of energy conversion		2	4, 7, 9	Heating of water in the electric heater and gas burner. Evaluation of installation performance indicators. Comparison of the results obtained. Registration of the report. Protection
3. Determination of the energy characteristics of the TEU based on the DVS		2	12, 3, 6	Calculation of performance of TEU in various modes, building an energy chart, assessing the effectiveness of TEU; Registration of the report; Protection

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Stability of linear SAU				

1. KES, annual: electricity generation, fuel consumption, average load; Number of power hours.	4	4	2, 4, 8, 9	Uses load graphs and operation modes of the COP; draws up the results of the calculation; Evaluates the calculation results.
Didactic unit: Heating gas cycles				
3. CHP, annual: generating electricity and heat, fuel consumption, average loads; The number of power hours by electric and thermal power.	4	4	2, 4, 9	Uses load graphs and CHP operation modes; draws up the results of the calculation; Evaluates the calculation results.
Didactic unit: Electromechanical properties and characteristics of electric motors used in electricity				
4. KES, efficiency, extergobalance, steam and fuel costs.	4	4	1, 10, 7	Uses load graphs and operation modes of the COP; draws up the results of the calculation; Evaluates the calculation results.
5. CHP, the loss of the exxition in the processes and aggregates.	4	4	1, 10, 3, 6	Uses the extradergo balance method for the calculation; draws up the results of the calculation; Evaluates the results of calculations.
Didactic unit: Estimates of the quality of information transmission, telemechanics systems				
6. CPP, efficiency, Energy Balance, steam and fuel costs.	4	4	10, 6, 7, 9	Uses the vector form of displacement, speed, acceleration. Selects the calculation method.
7. CHP, efficiency, energy balance, steam and fuel spending.	4	4	1, 10, 6, 9	Uses the extracetic balance method for calculating the COP scheme and the extracetic economy; draws up the results of the calculation; Evaluates the results obtained.
8. Combined state policy. Economic safety	2	4	3, 6, 9	uses the energy balance method to calculate; draws up the results of the calculation; Evaluates the results of calculations.
Didactic unit: heat regeneration.				
9. Uniform regenerative pregenerative heating of nutritious water, drafting thermal and material balances	6	8	1, 4, 6, 9	Used thermal circuits of steam turbine power units TPP

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Internet resources

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2. http://elibrary.nstu.ru/

3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

5. http://znanium.com/

Methodical support and software

Methodological support

1. Энергетический и эксергетический балансы паротурбинных энергоблоков : методические указания к расчету РГР для 4 курса ФЭН всех форм обучения (специальности 140100, 140101, 140104, 220301, 140204) / Новосиб. гос. техн. ун-т ; [сост.: Г. В. Ноздренко, О. К. Григорьева]. - Новосибирск, 2010. - 27, [1] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000148917

2. Теплоэнергетика : методические указания к лабораторным работам для 3-5 курсов ФЭН всех форм обучения / Новосиб. гос. техн. ун-т ; [сост.: П. А. Щинников, А. С. Кутузова]. - Новосибирск, 2009. - 45, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000113635

3. Ноздренко Г. В. Технологии централизованного производства электроэнергии и теплоты [Электронный ресурс] : электронный учебно-методический комплекс / Г. В. Ноздренко, П. А. Щинников ; Новосиб. гос. техн. ун-т. - Новосибирск, [2012]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000173975. - Загл. с экрана.

4. Расчет тепловых схем теплофикационных паротурбинных установок : методические указания к курсовому и дипломному проектированию для 4 и 5 курсов ФЭН всех форм обучения (специальности 140100, 140101, 220301, 220700) / Новосиб. гос. техн. ун-т ; [сост.: О. К. Григорьева, О. В. Боруш]. - Новосибирск, 2014. - 62, [1] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000199746

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Automated electric drive

Course: 4, semester : 7

		Semester
№	**Kind of activity**	**7**
1	Total credits	6
2	Total hours	216
3	Total classes in the contact form, hours	93
4	Lectures, hours	36
5	Practical lessons, hours	36
6	Laboratory studies, hours	8
7	of them in an active and interactive form, hours	32
8	Consultations, hours	11
9	Independent work, hours	123

External requirements

Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity
is able to prepare design and working documentation for individual sites and elements, on plans and heat profiles OS Networks; *regarding the following learning results*:
performs drawings and represents the circuits of nodes and elements of heat networks based on the task of the manager
Performs drawings of plans and profiles of the highway trails

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs drawings and represents the circuits of nodes and elements of heat networks based on the task of the manager	
1. PC-5.V / PC. 1 1. Perform drawings and represents the circuits of nodes and elements of thermal networks based on the assignment of the head	Lections; Seminars; Independent work
Performs drawings of plans and profiles of the highway trails	
2. PC-5.V / PC. 2 2. Performs drawings of plans and profiles of heat networks	Lections; Seminars; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	

3. PC-8.V / PC. 2 2. Conduct a preliminary feasibility study of the design development of objects of professional activity	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: CAP and CHP - as technological systems for the production of electric power.				
1. Basic concepts, definitions. Technological systems for the production of thermal and electrical energy. Fuel and energy resources. Energy and power plant. Basic specifications. Electrical and thermal consumption. The fundamental tchnological scheme for the production of thermal and electrical energy.		2	3	Lecture
Didactic unit: Technological schemes of the TPP.				
2. Technological scheme of condensation power units. Thermal efficiency and energy phase. Energy Balance and efficiency. Modes of operation. Graphics of thermal loads. Fuel, TPLC and steam costs. Fuel economy in combined energy production on external thermal consumption.		4	1, 2, 3	Lecture
3. technological cryogenic systems and cold production systems. - Refrigerated technological installations. - Installations for the production of liquid nitrogen and oxygen.		4	1, 2	Lecture
Didactic unit: Estimates of the quality of information transmission, telemechanics systems				
5. Parameters of steam and circuit of steam turbine TPPs. The effect of steam parameters on the efficiency. Steating steam. Intermediate overheating. Economic values ??of parameters. Heavy and steam costs.		4	3	Lecture
Didactic unit: Energy and superkering efficiency of energy technologies.				
4. The extracetic method. ECERGETISTIC BALANCE AND EXERGETIC EXECUTIVE EXPERIENCE. Conditions for obtaining maximum work and maximum efficiency. Real processes in energy installation elements. Losses of the exxigience.		4	3	Lecture

Didactic unit: Methods for improving the efficiency of thermal power plants.				
6. Regenerative heated nutrient water. Consumption of steam and warmth. Efficiency. Optimal heating temperature. Distribution of regenerative heating in steps. Schemes for the inclusion of regenerative heaters. Couple parameters in selections. Generalized regenerative selection. Heat and industrial selection. Non-performance factors.		8	3	Lecture
Didactic unit: Heat system systems.				
7. Systems of heat and energy. Schemes. Network heaters. Classification of heat supply systems.		10	1, 2	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Technological schemes of the TPP.				
1. Acquaintance with the thermal power plant based on the DVS	2	2		gets acquainted with the concept of power fields. Considers conservative and dissipative forces.
Didactic unit: Estimates of the quality of information transmission, telemechanics systems				
3. Determination of the energy characteristics of the TEU based on the DVS	2	2	3	Calculation of performance of TEU in various modes, building an energy chart, assessing the effectiveness of TEU; Registration of the report; Protection
Didactic unit: Energy and superkering efficiency of energy technologies.				
4. Calculation of technical and economic indicators of TEU in various ways of energy conversion	4	4	3	Heating of water in the electric heater and gas burner. Evaluation of installation performance indicators. Comparison of the results obtained. Registration of the report. Protection

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Technological schemes of the TPP.				
1. Annual electricity generation for KES, fuel consumption, average load; Power usage hours.	2	4	3	Uses load graphs and operation modes of the COP; draws up the results of the calculation; Evaluates the calculation results.

2. Annual electricity generation and heat for CHP, fuel consumption, average loads; The number of hours of power use by electric and thermal.	2	4	3	Uses load graphs and CHP operation modes; draws up the results of the calculation; Evaluates the calculation results.
Didactic unit: Estimates of the quality of information transmission, telemechanics systems				
5. CPP, efficiency, Energy Balance, steam and fuel costs.	4	4	3	Uses the vector form of displacement, speed, acceleration. Selects the calculation method.
6. CHP, efficiency, energy balance, steam and fuel spending.	4	4	3	Uses the extracetic balance method for calculating the COP scheme and the extracetic economy; draws up the results of the calculation; Evaluates the results obtained.
7. Combined state policy. Economic safety	2	4	1, 2	uses the energy balance method to calculate; draws up the results of the calculation; Evaluates the results of calculations.
Didactic unit: Energy and superkering efficiency of energy technologies.				
3. KES, efficiency, extergobalance, steam and fuel costs.	4	4	3	Uses load graphs and operation modes of the COP; draws up the results of the calculation; Evaluates the calculation results.
4. CHP, the loss of the exxition in the processes and aggregates.	4	4	3	Uses the extradergo balance method for the calculation; draws up the results of the calculation; Evaluates the results of calculations.
Didactic unit: Methods for improving the efficiency of thermal power plants.				
8. Uniform regenerative pregenerative heating of nutritious water, drafting thermal and material balances	2	8	3	Used thermal circuits of steam turbine power units TPP

Literary sources

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Additional literature

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2. http://elibrary.nstu.ru/

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Methodological support

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2. Теплоэнергетика : методические указания к лабораторным работам для 3-5 курсов ФЭН всех форм обучения / Новосиб. гос. техн. ун-т ; [сост.: П. А. Щинников, А. С. Кутузова]. - Новосибирск, 2009. - 45, [2] с. : ил., табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000113635

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Special Power Supply Questions

Course: 3, semester : 5

		Semester
№	**Kind of activity**	**5**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	66
4	Lectures, hours	18
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	16
8	Consultations, hours	10
9	Independent work, hours	114

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity
The ability to carry out project activities at all stages of the project's life cycle; *regarding the following learning results*:
To be able to identify the necessary resources for the implementation of project tasks

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. Finds the necessary information, its critical analysis and Summarizes the results of the analysis to solve the task	Lections; Seminars; Independent work
To be able to identify the necessary resources for the implementation of project tasks	
2. to be able to implement and justify the choice of project decisions by type of information systems	Lections; Seminars; Independent work

Conduct a preliminary feasibility study of the project development of objects of professional activity	
3. Conducts a preliminary feasibility study of the design developments of professional activity objects	Lections; Seminars

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Heat exchange when changing the aggregate state of the substance				
1. Cycles of piston engines of internal combustion		2	3	Lecture
2. cycles of gas turbine settings		2	3	Lecture
Didactic unit: Heating steam cycles				
3. Renkina cycle on overheated pair. The effect of cycle parameters on thermal efficiency Renkina cycle. Cycle PTU with intermediate overheating of steam. Regenerative cycle. The main characteristics of the cycle. Heat Installations.		2	1, 3	Lecture
Didactic unit: The super-acetic method of thermodynamic analysis				
4. EURTRIZY. Types of exxigating and its components.	2	4	2	Lecture
5. ECERGETIC ANALYSIS OF RECEPRENTIVE HEATINGS		1	3	Lecture
5. Extergic losses. Guy-Stodla's law.		2	3	Lecture
6. EXERGETICAL ANALYS ANALYSIS OF INTERGETATING HEAT EQUIPMENT		1	3	Lecture
7. ECERGETIC ANALYSIS OF PARROTURBINING INSTALLATION		2	3	Lecture
8. ECERGETIC ANALYSIS OF GEATURBINE INSTALLATION		2	3	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Heat exchange when changing the aggregate state of the substance				
1. Dissoliaries of cycles Piston internal combustion engines		4	3	Practical lesson
2. Expert cycles of gas turbine installations		4	3	Practical lesson
Didactic unit: Heating steam cycles				

3. Calculation of renkin cycle on overheated pair with / without intermediate steam overheating. Determination of steam consumption in regenerative selection. Calculation of the basic characteristics of the cycle.		4	3	Practical lesson
Didactic unit: The super-acetic method of thermodynamic analysis				
4. Calculation of various types of exserved and its components	2	2	3	Practical lesson
5. Calculation of the exargetical efficiency and the extracetic losses of recuperative heat exchangers	2	2	3	Practical lesson
6. Calculation of the extracetic efficiency and the extracetic losses of mixing heat exchangers	2	2	3	Practical lesson
7. Calculation of the exargetary efficiency and the extracetic losses In the elements of a steam turbine unit	2	2	3	Practical lesson
8. Calculation of the extracetic efficiency and the extracetic losses in the elements of the gas turbine unit	2	2	3	Practical lesson
9. Calculation of the supercective efficiency and the extracetic losses of fuel-separating settings	2	2	3	Practical lesson
10. Calculation and comparison of the energy and exergic balance of the steam boiler	2	12	1, 2, 3	Maintaining the calculation on the proposed method

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Methodological support

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Specialized software

1 OS for Application on Microsoft Windows

2 Creating reports for laboratory work. Microsoft Microsoft Office

ANNOTATION OF THE PROGRAM

Mathematical modeling of thermal power systems

Course: 3, semester : 5

		Semester
№	Kind of activity	5
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	66
4	Lectures, hours	18
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	16
8	Consultations, hours	10
9	Independent work, hours	114

External requirements

is able to search, critical analysis and synthesis of information, apply a systematic approach to solving the set Tasks; *regarding the following learning results*:
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task
Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity
The ability to carry out project activities at all stages of the project's life cycle; *regarding the following learning results*:
To be able to identify the necessary resources for the implementation of project tasks

Requirements for the results of mastering the discipline

The results of the study of the discipline	Forms of organizing classes
performs the search for the necessary information, its critical analysis and summarizes the analysis results for the analysis for Solutions of the task	
1. to be able to design robotic systems.	Lections; Seminars; Independent work
To be able to identify the necessary resources for the implementation of project tasks	
2. To be able to distinguish scientific knowledge from unscientific	Seminars; Independent work
Conduct a preliminary feasibility study of the project development of objects of professional activity	

3. To be able to conduct an economic substantiation of investments in the development of production	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: General concepts of modeling				
1. The concept of model and modeling. Removing dynamic characteristics. Properties of models. Basic operations on models. Classification of models.	2	9	1	Lecture
2. Approximation Object without self-leveling. Approximation Object with self-leveling. Cycle of the computing experiment.	2	9	1, 3	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit: Creating and analyzing the work of mathematical models				
1. Removing dynamic characteristics. Approximation Object without self-leveling. Approximation Object with self-leveling.	4	12	1, 2	Practical lesson
2. Approximation Object without self-leveling. Approximation Object with self-leveling. Cycle of the computing experiment. Random search methods.	4	12	1, 2, 3	Practical lesson
3. Approximation Object without self-leveling. Approximation Object with self-leveling. Cycle of the computing experiment. Implementation of the method of calculating the reverse heat balance in the MATLAB environment.	4	12	1, 2, 3	Practical lesson

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results
Semester: 5			
Didactic unit: General concepts of modeling			
1. The concept of model and modeling. Properties of models. Basic operations on models.		40	1, 3
Didactic unit: Creating and analyzing the work of mathematical models			

2. SIMULINK package.		44	1, 2

Literary sources

Main literature

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Methodical support and software

Methodological support

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Specialized software

1 Scientific and Technical Computing Program Mathworks Matlab

2 Creating reports for laboratory work. Microsoft Microsoft Office

ANNOTATION OF THE PROGRAM
Water treatment

Course: 4, semester : 7

		Semester
№	**Kind of activity**	**7**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	65
4	Lectures, hours	18
5	Practical lessons, hours	18
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	16
8	Consultations, hours	9
9	Independent work, hours	115

External requirements

Calculates on typical methods, design technological equipment in accordance with the technical assignment; ***regarding the following learning results*****:**
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
Conduct a preliminary feasibility study of the project development of objects of professional activity	
1. PC-8.V / PC. 2 2. Conduct a preliminary feasibility study of the design development of objects of professional activity	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 7				
Didactic unit: Examples of Class Development.				

1. Structure and course content. The subject of "water treatment" and its connection with other special disciplines. Water as starting raw materials for the production of steam, like a coolant and cooler. Characteristics of the water balance of the TPP. Losses of steam and condensate, refill losses. Admission impurities into the water. Characteristics of impurities according to the degree of dispersion, for chemical composition and physico-chemical state. Water quality indicators. Classification of natural waters, the choice of water source and the performance of water preparation installation (PPU).		4	1	Lecture
Didactic unit: Water purification by coagulation methods and precipitation				
2. Preliminary water purification (water lightening). Coagulation of colloid water impurities. Reagents and optimal conditions for their use for coagulation of natural waters. Schemes of coagulation installations and their operation. The device and the principle of operation of the clarifier. Change water quality during coagulation. LIBE, MAGNEZIAL DESIGNING AND WATER COLORING - METHODS OF COLLECTION. Methods for calculating reagents. Change water quality during lime. Clamps for coagulation and lime. Water filtration. Designs of clarifying filters. Effect of water clarification by filtering.		5	1	Lecture
Didactic unit: Methods of water purification from ion impurities.				

3. Water treatment by ion exchange. Physico-chemical bases of ion exchange. Ion exchange materials and their characteristics. Ionic exchange technology. Appointment and scope of Na - cationis, n - cation, ammonium - cationing. Principles of chemical water desalination. Schemes of desalting installations with drum and direct-flow boilers. Operation of ion exchange plants. Unless water preparation methods. Desorption of gases from water. Deaerators, decarbonizers, principles of their work and design. Chemical methods for removing gases from water. Electrodialysis, ion-exchange membranes. Reverse osmosis and ultrafiltration. The design of the devices and material for membranes used in the installations of the reverse osmosis. Thermal desalination of water in boiling type evaporators. Getting distillate in instant type evaporators. Schemes of evaporative and steam mills.		4	1	Lecture
Didactic unit: corrosion and corrosion protection methods.				

4. Water TES mode. Corrosion of thermal power equipment and warning methods. The formation of deposits in the steam road of the TPP. Methods for preventing the formation of deposits. Couple pollution. Influence of the type of boiler, operational regime and quality of boiler water on the quality of the couple in the drum boilers. Ways to combat pollution steam. Separation devices. Water modes of drum and straight-flow boilers. Features of the water regime of high and ultra-high pressure drum boilers. Methods of correctional processing of boiler and nutritious water. Features of the water mode of the direct-flow boilers. The dependence of the purity of the steam from the quality of nutrient water and pressure. The quality rate of the pair and the nutrient water of the direct-flow boilers. Nutrient water quality boilers and turbine condensate with natural circulation. Condensation rate of condensate returned from production. Water quality norms for feeding thermal networks and power water for heat supply systems.		5	1	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Examples of Class Development.				
1. Physico-chemical indicators of water quality and carbon dioxide equilibrium.		4	1	Laboratory work: 1. Represents water quality indicators used in the course, in terms of terms; 2. Measures the values ??of the quality indicators of multiple water samples; 3. Plans to determine the forms of carbon dioxide in water; 4. Determines the forms of carbon dioxide in water samples; 5. Summarizes the results obtained on specified criteria and discusses with the teacher.

2. Technological indicators of water quality.	2	4	1	Laboratory work: 1. Represents water quality indicators used in the course, in terms of terms; 2. Measures the parameters of the quality indicators of multiple water samples using well-known methods; 3. Summaries the results obtained on specified criteria and discusses with the teacher.
Didactic unit: Water purification by coagulation methods and precipitation				
3. Reagent methods of water preparation (coagulation and ion exchange).	2	4	1	Laboratory work: 1. Plans to solve the task; 2. Measures water quality indicators before processing and after reagent processing; 3. Interprets the results obtained by certain criteria; 4. Declares the results in the language of formulas and graphs and discusses with the teacher.
Didactic unit: Methods of water purification from ion impurities.				
4. Receive water preparation method (electrolysis)	2	4	1	Laboratory work: 1. Plans to solve the task; 2. Measures values ??using known patterns; 3. Declares the experiment in the language of formulas and graphs; 4. Assesses the efficiency of the method and discusses with the teacher.
Didactic unit: corrosion and corrosion protection methods.				
5. Corrosion of heat reduction equipment.	1	2	1	Laboratory work: 1. Plans to solve the task; 2. Measures values ??using known patterns; 3. Declares the experiment in the language of formulas and graphs; 4. Assesses the efficiency of the method and discusses with the teacher.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Examples of Class Development.				
1. solutions dissociation of electrolytes pH		2	1	Practical lesson

2. Hydrolysis of salts	2	2	1	Practical lesson
3. The product of solubility	2	2	1	Practical lesson
Didactic unit: Water purification by coagulation methods and precipitation				
4. Rigidity. Methods for elimination.	2	4	1	Practical lesson
Didactic unit: Methods of water purification from ion impurities.				
5. ion exchange methods for eliminating impurities	2	4	1	Practical lesson
Didactic unit: corrosion and corrosion protection methods.				
6. The design of carts and bridges of rolling stock.	1	4	1	Practical lesson

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

ANNOTATION OF THE PROGRAM

Water-chemical modes of thermal electric stations

Course: 4, semester : 7

		Semester
№	**Kind of activity**	**7**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	65
4	Lectures, hours	18
5	Practical lessons, hours	18
6	Laboratory studies, hours	18
7	of them in an active and interactive form, hours	16
8	Consultations, hours	9
9	Independent work, hours	115

External requirements

Calculates on typical methods, design technological equipment in accordance with the technical assignment; *regarding the following learning results*:
Conduct a preliminary feasibility study of the project development of objects of professional activity

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
Conduct a preliminary feasibility study of the project development of objects of professional activity	
1. PC-8.V / PC. 2 2. Conduct a preliminary feasibility study of the design development of objects of professional activity	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 7				
Didactic unit: Examples of Class Development.				

1. Water as starting raw materials for the production of steam, like a coolant and cooler. Characteristics of the water balance of the TPP. Losses of steam and condensate, refill losses. Admission impurities into the water. Characteristics of impurities according to the degree of dispersion, for chemical composition and physico-chemical state. Water quality indicators. Classification of natural waters, the choice of water source and the performance of water preparation installation (PPU).		4	1	Lecture
Didactic unit: Water purification by coagulation and precipitation methods.				
2. Preliminary water purification (water lightening). Coagulation of colloid water impurities. Reagents and optimal conditions for their use for coagulation of natural waters. Schemes of coagulation installations and their operation. The device and the principle of operation of the clarifier. Change water quality during coagulation. LIBE, MAGNEZIAL DESIGNING AND WATER COLORING - METHODS OF COLLECTION. Methods for calculating reagents. Change water quality during lime. Clamps for coagulation and lime. Water filtration. Designs of clarifying filters. Effect of water clarification by filtering.		5	1	Lecture
Didactic unit: Methods of water purification from ion impurities.				

3. Water treatment by ion exchange. Physico-chemical bases of ion exchange. Ion exchange materials and their characteristics. Ionic exchange technology. Appointment and scope of Na - cationis, n - cation, ammonium - cationing. Principles of chemical water desalination. Schemes of desalting installations with drum and direct-flow boilers. Operation of ion exchange plants. Unless water preparation methods. Desorption of gases from water. Deaerators, decarbonizers, principles of their work and design. Chemical methods for removing gases from water. Electrodialysis, ion-exchange membranes. Reverse osmosis and ultrafiltration. The design of the devices and material for membranes used in the installations of the reverse osmosis. Thermal desalination of water in boiling type evaporators. Getting distillate in instant type evaporators. Schemes of evaporative and steam mills.		5	1	Lecture
Didactic unit: corrosion and corrosion protection methods.				

4. Water TES mode. Corrosion of thermal power equipment and warning methods. The formation of deposits in the steam road of the TPP. Methods for preventing the formation of deposits. Couple pollution. Influence of the type of boiler, operational regime and quality of boiler water on the quality of the couple in the drum boilers. Ways to combat pollution steam. Separation devices. Water modes of drum and straight-flow boilers. Features of the water regime of high and ultra-high pressure drum boilers. Methods of correctional processing of boiler and nutritious water. Features of the water mode of the direct-flow boilers. The dependence of the purity of the steam from the quality of nutrient water and pressure. The quality rate of the pair and the nutrient water of the direct-flow boilers. Nutrient water quality boilers and turbine condensate with natural circulation. Condensation rate of condensate returned from production. Water quality norms for feeding thermal networks and power water for heat supply systems.		4	1	Lecture

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Examples of Class Development.				
1. Solutions of electrolytes. Hydrolysis of salts. Water quality indicators.		2	1	Laboratory work

1. Physico-chemical indicators of water quality and carbon dioxide equilibrium.	0	4	1	Laboratory work: 1. Represents water quality indicators used in the course, in terms of terms; 2. Measures the values ??of the quality indicators of multiple water samples; 3. Plans to determine the forms of carbon dioxide in water; 4. Determines the forms of carbon dioxide in water samples; 5. Summarizes the results obtained on specified criteria and discusses with the teacher.
Didactic unit: Water purification by coagulation and precipitation methods.				
2. Reagent methods of water preparation (coagulation and ion exchange).	2	4	1	Laboratory work: 1. Eliminates its activities to solve the problem; 2. Measures water quality indicators before processing and after processing with reagents; 3. Interprets the results obtained according to certain criteria; 4. Forms the results in the language of formulas and graphs and discusses with the teacher.
2. Technological indicators of water quality.	2	2	1	Laboratory work
Didactic unit: Methods of water purification from ion impurities.				
3. Receive method of preparation of water (electrodialysis).	2	4	1	Laboratory work: 1. Eliminates its activities to solve the problem; 2. Measures values ??using well-known patterns; 3. Orifies the experiment in the language of formulas and graphs; 4. Rights the effectiveness of the method and discusses with the teacher.
Didactic unit: corrosion and corrosion protection methods.				
4. Corrosion of heat reduction equipment.	2	2	1	Laboratory work: 1. Plans to solve the task; 2. Measures values ??using known patterns; 3. Declares the experiment in the language of formulas and graphs; 4. Assesses the efficiency of the method and discusses with the teacher.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Water purification by coagulation and precipitation methods.				
2. Carbon dioxide equilibrium. Technological indicators of water quality.	2	8	1	Practical lesson
Didactic unit: Methods of water purification from ion impurities.				
3. 1. Operations with integers.	2	6	1	Practical lesson
Didactic unit: corrosion and corrosion protection methods.				
4. The structure of colloid particles. Coagulation with the help of iron hydroxide and aluminum sulfate. Corrosion of metals and protection from it.	4	4	1	Practical lesson

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Specialized software

1 Microsoft Office Application Pack

2 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

3 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM

Energy Saving In Heat Power Engineering and Heat Engineering

Course: 4, semester : 8

		Semester
№	**Kind of activity**	**8**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	62
4	Lectures, hours	24
5	Practical lessons, hours	12
6	Laboratory studies, hours	12
7	of them in an active and interactive form, hours	16
8	Consultations, hours	12
9	Independent work, hours	118

External requirements

is able to develop and ensure energy and resource saving measures at the objects of professional activity; *regarding the following learning results*:
Able to develop events on energy and resource saving on The teks of professional activity
has knowledge of regulatory techniques for energy and resource saving at labor activities

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
Able to develop events on energy and resource saving on The teks of professional activity	
1. PC-9.V / PC. 1 1. Solving Energy and Resource Saving Events at Professional Operations	Lections; Seminars; Laboratory works; Independent work
has knowledge of regulatory techniques for energy and resource saving at labor activities	
2. PC-9.V / PC. 2 2. Has knowledge of regulatory techniques for energy and resource saving on labor activity	Lections; Seminars; Laboratory works; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 8				

Didactic unit: Types of heat-energy resources				
1. Classification of pressure sensors		2	1	Common familiarization with traditional and promising energy resources for use in thermal power technologies
Didactic unit:				
2. Natural and man-made sources of low-precious heat. Energy installation on low-boiling working bodies for the disposal of thermal waste. The effectiveness of thermodynamic cycles on low-boiling working bodies. Schemes and efficiency of application in industry.		2	1	Acquaintance with heat sources of various nature.
Didactic unit: The relevance of the rational use of energy resources for Russia.				
3. Dynamics of the fuel and energy balance and consumption of energy resources in Russia and the world. The relevance of energy saving for the Russian economy. The structure of Russia's energy and comparative indicators of its effectiveness. The concept of power saving potential.		2	1	The features of the calculations of gear and worm gears are studied.
Didactic unit: Methods and criteria for assessing the efficiency of use Energy.				
4. General provisions. Thermodynamic indicators of energy efficiency and features of their use in heat and thermal technologies. Natural (technical) indicators of energy efficiency. Economic and environmental indicators of energy efficiency. Communication between environmental pollution and exergetic losses in production technologies, distribution and energy consumption.		2	1, 2	Acquaintance with the main indicators of energy efficiency
Didactic unit: Rationing of energy consumption				
5. General provisions. The rationing of energy consumption in industry, buildings and facilities. The normalization of the operational technological costs and the loss of thermal energy in thermal networks. The concept of a high energy efficiency building.		2	1	Familiarization with the principles of rationing energy costs and energy loss.
Didactic unit: Consumer Energy Analysis Fuel and energy resources				
6. Balances of consumption and use of energy at an industrial enterprise. Consumer Energy Passport TER. Energy Balance and Energy Passport Buildings. The concept of a high energy efficiency building.		2	1, 2	Familiarization with the basics of energy saving at industrial enterprises.

Didactic unit: Methods of energy saving in the production of heat Energy				
7. Classification of thermal energy sources. Energy saving in boiler rooms. Features of energy saving at the CHP of industrial enterprises.		2	1, 2	Familiarization with the main industrial heat sources.
8. Energy saving in high-temperature and low-temperature technologies.		2	1, 2	Acquaintance with the heat engineering features of industrial high and low-temperature technologies.
Didactic unit: Trees of Electrical Machines				
9. thermal energy transport technology. Consumer connection schemes to thermal networks. Losses of energy and resources in thermal networks. Measures to reduce thermal energy losses and resources in thermal networks.		2	1, 2	Acquaintance with thermal energy transport technology
Didactic unit: Accounting for energy resources				
10. General provisions. Normative energy base. Types and objectives of energy audit. Methodology of energy audit of an industrial enterprise. Instrument accounting of energy resources in the enterprise. Energy audit firm dashboard.		2	1, 2	Studying the issues of the energy audit of industrial enterprises and organizations.
Didactic unit: Heat pumps and systems based on them.				
11. Parokompression thermal pumps. Thermodynamic processes and cycles. Working bodies. Comparative exary efficiency. Schemes of heat-pump installations.		2	1	Studying the work of thermal transformers of a parocompression type. Determination of a comparative energy-saving effect
12. Absorption and adsorption heat pumps. Schemes of heat pump installations. Thermodynamic cycles and working bodies. Comparative thermal and exsertive efficacy. Calculation of parameters of bromide-lithium heat pumping installation.		2	1	Studying the features of the technology of utilization of heat drains of polysiness enterprises using sorption thermotransformers

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Accounting for energy resources				
1. Instruments for metering thermal energy and coolant.		2	1	Acquaintance with accounting devices and controlling the release of heat energy installed in the thermal bunch of educational institution.
Didactic unit: The basics of energy audit				

2. Thermal imaging diagnostics heat loss.	4	4	1	Acquaintance of students with a thermal imager and methodology for processing primary thermal imaging images. Processing of thermal imaging images with a view of the results in the form of graphs and processed thermograms.
Didactic unit: Heat pumps and systems based on them.				
3. Determination of the effectiveness of the parokompassing heat pump.	4	6	1, 2	Students study the device of a parocompression thermal pump and a heat pumping unit. Parameters are measured at the key points of the working cycle on the operating unit, determine the streams of low-precision heat generated heat, the consumption of electricity, determine the conversion coefficient under specified conditions for the operation of the heat pump unit.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Rationing of energy consumption				
1. solution Practical tasks to determine the energy-saving effect.	4	4	1, 2	Solving problems to determine the energy efficiency indicators of production technologies, transportation and consumption of fuel and energy resources, thermal energy,
Didactic unit: The basics of energy audit				
2. Acquaintance with the instrumental park of the International Eneaudiology Firm for the implementation of instrumental energy audit.	2	4	1	familiarization with the devices used by the professional energy audit company for conducting experimental energy audit.
Didactic unit: low-power energy.				
3. Familiarization at the international exhibition with advanced energy saving and energy efficient equipment.	2	4	1, 2	Drawing up a report on work at the international exhibition containing an analysis of information on energy resources, energy-efficient equipment and energy-saving technologies

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Specialized software

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2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Modern Energy Problems

Course: 4, semester : 8

		Semester
№	**Kind of activity**	**8**
1	Total credits	5
2	Total hours	180
3	Total classes in the contact form, hours	62
4	Lectures, hours	24
5	Practical lessons, hours	12
6	Laboratory studies, hours	12
7	of them in an active and interactive form, hours	16
8	Consultations, hours	12
9	Independent work, hours	118

External requirements

is able to develop and ensure energy and resource saving measures at the objects of professional activity; *regarding the following learning results*:
Able to develop events on energy and resource saving on The teks of professional activity
has knowledge of regulatory techniques for energy and resource saving at labor activities

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
has knowledge of regulatory techniques for energy and resource saving at labor activities	
1. Prospects for development.	Lections; Independent work
Able to develop events on energy and resource saving on The teks of professional activity	
2. Energoblands of Russia and Siberia.	Lections; Independent work
has knowledge of regulatory techniques for energy and resource saving at labor activities	
3. Assess the prospects for the development of regional energy, taking into account the limit complex.	Lections; Laboratory works; Independent work
4. Practical skills on the integrated analysis of the new technology.	Laboratory works
5. Energy problems in Russia and the world.	Lections
6. The prospects for the development of the material and technical base of power.	Lections
Able to develop events on energy and resource saving on The teks of professional activity	
7. Material and technical base of modern energy of Russia.	Seminars; Laboratory works
8. Purpose and the applications of the main methods of computational mathematics.	Seminars; Laboratory works

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Modern energy development trends				
1. Forecast of the development of world energy.		4	1, 6	Lectures
2. Fuel and Energy Surgical Complex		4	2	Lectures
5. Forecast of energy consumption of energy resources		4	3	Lectures
Didactic unit: Large Data Processing System Architecture.				
3. Energy of Russia in the energy strategy		4	2, 5	Lectures
4. Traditional and non-traditional sources of energy		4	2	Lectures
6. Production and consumption of TER		4	1, 2	Lectures

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Large Data Processing System Architecture.				
1. Comparison of energy generation technologies	6	6	3, 4, 7, 8	Performance of laboratory work on an individual task in the composition Groups.
2. Study of promising energy generation technologies.	6	6	3, 8	Performance of laboratory work on an individual task in the composition Groups.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 8				
Didactic unit: Modern energy development trends				
1. New technologies in power engineering	2	6	7, 8	Studying network of Kohonen, learning procedures, operation modes.
Didactic unit: Large Data Processing System Architecture.				
2. New technologies in power engineering	2	6	7, 8	Studying network of Kohonen, learning procedures, operation modes.

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Methodical support and software

Methodological support

1. Расчет двухтопливной ПГУ с параллельной схемой работы : [учебное пособие / П. А. Щинников и др.] ; Новосиб. гос. техн. ун-т. - Новосибирск, 2019. - 109, [3] с. : ил.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000241185

Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Modern video systems

Course: 4, semester : 7

		Semester
№	**Kind of activity**	**7**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	62
4	Lectures, hours	18
5	Practical lessons, hours	36
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	0
8	Consultations, hours	6
9	Independent work, hours	46

External requirements

is able to carry out social interaction and implement its role in the command; ***regarding the following learning results*****:**
interacts with other team members to achieve the task

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
interacts with other team members to achieve the task	
1. Knowledge of the main methods of theoretical and experimental research using Mathematical and physical models	Lections; Seminars; Independent work
2. Associates an opponent's speech in various forms of communication, including virtual (when communicating on forums, chat rooms, etc.)	Lections; Seminars; Independent work
3. Owns the main norms of the modern Russian language	Lections; Seminars; Independent work
4. knows the features of business correspondence, including in virtual communication	Lections; Seminars; Independent work
5. knows the main communicative and speech requirements that are presented to oral and written speech, including in Internet communications	Lections; Seminars; Independent work
6. Conducts a business correspondence in accordance with the rules of business communication, including on the Internet	Lections; Seminars; Independent work
7. has an idea of ??the features of business communication, including Internet communications	Lections; Seminars; Independent work

8. Know the types of electrical machines and their main characteristics	Lections; Seminars; Independent work
9. knows how to conduct bibliographic and information and search work, use its results when solving professional tasks and design of scientific papers	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				
Didactic unit: Internet environment as a special modern subculture				
1. The ratio of concepts language - computer slang, regulatory lexicography - amateur lexicography, folklore - Internet ENT (Internet-LOR), Literature - Settings, etiquette - Neticket .	2	2	2, 3, 9	Receive "Conceptual Table".
Didactic unit: Language molds and linguistic means of Internet communication				
2. Concept of Internet Communication. Characteristics of the Internet language. The normalized literary language and the non-normalized (subtennade) in the Internet communication space. The concept of "social stratification of the national language" and "Internet language". The impact of the Internet language on the national language	2	2	2, 3, 5, 9	Lecture in the format of "ZhU".
3. Communication of Internet computer slang with codified informatics and information technologies. Expansion of English computer terms - the emergence and operation of "computer English" on the Internet and its influence on a common language. Expressive-game modification of "Computer English"		2	6, 9	Lecture-conversation.

4. The concept of iconic systems (semiotics). Unbelled Internet signs and combinations of signs on the Internet and beyond. Creative signs (emoticons) - Emoticons, pictograms. Phonetic and incalculable use of numbers and letters. Runet Bay (Latin and Cyrillic Mixing): Alphabetical Games, Keyboard Tags, graphic lexical hybrids. Gaming phonetization letters - jesting phonetic spelling: Albanian or Padona letter. Internet innovation in a nationwide language. "Internet" words and values ??in non-special use. Popular Dictionaries Internet Slang.	2	2		problem lecture "Innovations on the Internet and their influence on a national language: evil or benefit?"
5. Strengthening oral-conversational start in Internet communications. Compound "Machinery" and mass flow of oral speech in chat rooms, Internet forums, blogs, guest books, emails.	2	2	2, 7	Problem lecture
6. Features of business communication on the Internet. Business speech genres, their features in comparison with traditional business communication.	4	4	1, 2, 4, 6, 7	Lecture-conversation.
Didactic unit: Internet as a communicative information environment				
7. Internet as hypertext. Internet and journalism: news sites, comments, assessment of the accuracy of information. Blog as a means of distributing information and the way to influence the audience. Internet and literature (setting). Network author and Internet reader. Copyright on the Internet.	2	2	4, 9	Problem lecture
8. Virtuality of communication on the Internet. The role of the Internet in expanding public dialogue. Strengthening the interactive principle in virtual communication and its impact on real communication.		2	2, 4, 8, 9	Lecture-conversation.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 7				

Didactic unit: Internet environment as a special modern subculture				
1. The ratio of the concepts "culture" and "subculture". The concept of an Internet computer subculture: history and mythology, social hierarchy.	2	2	2, 9	Reception "Read--summing in pairs." An independent analysis of the corresponding examples from Internet resources.
2. The ratio of concepts language - computer slang, regulatory lexicography - amateur lexicography, folklore - Internet ENT (Internet-LOR), Literature - Settings, etiquette - Neticket .	2	2	1, 3, 9	Work in small groups with new information, its presentation in the form of graphic organizers: Rings of Venna, Conceptual Table, Time-Line.
Didactic unit: Language molds and linguistic means of Internet communication				
3. The concept of "social stratification of the national language." Normated literary language. The norms of the modern Russian language. Portal of gramota.ru and other sites of cultural and speech orientation. The Internet and its capabilities of consulting on the problems of speech culture.	4	4	3	reception "ZhU".
4. The concept of the subtennte (jargon). Abnormal substandard in Internet communication space.	2	2	2	Work in pairs. Selection of material on Internet resources.
5. Impact of the language of the Internet on the national language.	2	4	3	Educational discussion "Corners".
6. "Computer English" on the Internet. Expressive-game modification of "Computer English".	2	2	3, 5, 8, 9	Reception "Six Hats".
7. Runet divertility (latice mixing and cyryl lines): Alphabetical games, keyboard tracing, graphic lexical hybrids. Gaming phonetization letters - jesting phonetic spelling: Albanian or Padona letter.	4	4	2, 3, 9	Work in pairs with various Internet resources. Preparation of presentation on the topic.
8. Penetration of Internet Sleangems into modern Russian. Popular Dictionaries Internet Slang.	2	4	3	Reception Zigzag. Work with various Internet dictionaries. Their assessment (reception "PMI").
9. "Machinery" and a massive stream of oral speech in chat rooms, online forums, blogs, guest books, emails.	2	2	2, 3	Reception "Cube". Working in groups.

10. Features of business communication on the Internet. Business speech genres, their features in comparison with traditional business communication. Acquaintance with Internet resources "Consultant +", Termika.ru.	4	4	1, 4, 6, 7	Reading texts with marking. Preparation of instructions for a student "Business Communication on the Internet".
Didactic unit: Internet as a communicative information environment				
11. Internet as a hypertext. Search for information on the Internet, evaluability of its authenticity.	2	2	8	Reception "Fishbon".
12. Presentation of prepared projects.	2	2	2, 3, 8, 9	Mini conference on completed projects.
13. discussion of the main problems of the course. Course estimate.	2	2	2, 3, 8, 9	Reception "Aquarium".

Literary sources

Main literature

1. Риски интернет-коммуникации детей и молодежи : учебное пособие / Т. Н. Владимирова, Е. В. Бродовская, А. Ю. Домбровская [и др.] ; под редакцией Н. Ю. Лесконог, И. В. Жилавской, Е. В. Бродовской. — Москва : Московский педагогический государственный университет, 2019. — 80 c. — ISBN 978-5-4263-0723-0. — Текст : электронный // Электронно-библиотечная система IPR BOOKS : [сайт]. — URL: http://www.iprbookshop.ru/92893.html (дата обращения: 03.03.2021). — Режим доступа: для авторизир. пользователей

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3. Кротова А. Г. Стилистика русского языка в заданиях и упражнениях : учебное пособие / А. Г. Кротова ; Новосиб. гос. техн. ун-т. - Новосибирск, 2014. - 50, [1] с.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000203081

4. Володенков, С. В. Интернет-коммуникации в глобальном пространстве современного политического управления / С. В. Володенков. — Москва : Московский государственный университет имени М.В. Ломоносова, 2015. — 320 c. — ISBN 978-5-19-010946-7. — Текст : электронный // Электронно-библиотечная система IPR BOOKS : [сайт]. — URL: http://www.iprbookshop.ru/97478.html (дата обращения: 03.03.2021). — Режим доступа: для авторизир. пользователей

Additional literature

1. Дубровская Е. М. Практикум по документной лингвистике [Электронный ресурс] : электронный учебно-методический комплекс / Е. М. Дубровская ; Новосиб. гос. техн. ун-т. - Новосибирск, [2018]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000238417. - Загл. с экрана.

2. Лосева О. А. Культура делового общения [Электронный ресурс] : конспект лекций / Лосева О. А. - М., 2006. - 1 электрон. опт. диск (CD-ROM). - Загл. с контейнера.

Internet resources

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3. https://e.lanbook.com/

4. Грамота.Ру : справочно-информационный портал «Русский язык». – Москва, 2000– . – URL: http://gramota.ru/slovari/ (дата обращения: 24.02.2021). – Текст : электронный.

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6. http://www.iprbookshop.ru/

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Methodical support and software

Methodological support

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Specialized software

1 Calculator of the cost and timing of the project and its stages according to the COCOMO COCOMO® II.2000.4 methodology

2 Microsoft Office Application Pack

ANNOTATION OF THE PROGRAM
Language and logic of public speech

Course: 3, semester : 6

		Semester
№	**Kind of activity**	**6**
1	Total credits	3
2	Total hours	108
3	Total classes in the contact form, hours	64
4	Lectures, hours	36
5	Practical lessons, hours	18
6	Laboratory studies, hours	0
7	of them in an active and interactive form, hours	0
8	Consultations, hours	8
9	Independent work, hours	44

External requirements

is able to carry out business communication in oral and written forms in the state language of the Russian Federation and foreign language (AH); *regarding the following learning results*:
demonstrates the ability to exchange business information in oral and written forms of at least one foreign language

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
demonstrates the ability to exchange business information in oral and written forms of at least one foreign language	
1. UK-4. 2 2. Demonstrates the ability to exchange business information in oral and writing forms of at least one foreign language	Lections; Seminars; Independent work

Content and structure of the discipline

Table 3.1

Themes	**Active forms, hours**	**Hours**	**Links to learning results**	**Learning activities**
Semester: 6				
Didactic unit: Speech interaction. Basic units and logical foundations of speech communication.				

1. IEC standard programming languages: ST		3	1	Drawing up an abstract lecture.
2. The conditions for effective communication. Ethical standards as mechanisms for resolving communication process. Communicative speech standards. The main components of the speech situation.		3	1	Drawing up an abstract lecture.
3. Evaluation of speaker (self-esteem), assessment of the audience (objective and subjective parameters). Speech aggression as one of the problems of modern communication, the ways to overcome it.		4	1	Drawing up an abstract lecture.
4. The process of creating a statement. "Invention" of speech content. Awareness and formulation of the goal of the presentation, its tasks and superficials. Classification of speeches for the target. Select the theme and speech name. Thesis, requirement for the wording of the thesis. Forms of deviation from the thesis.		4	1	Drawing up an abstract lecture.
5. Modern requirements for the construction of speech. The main structural elements of speech, their functions, meaningful features. Types of plans of the main part of the text. Features of the introductory and final part		2	1	Drawing up an abstract lecture.
6. Methods of presentation of the material (main, auxiliary). Logic connection between thesis and arguments.		2	1	Drawing up an abstract lecture.
7. Typology of arguments. Logic (rational) arguments, psychological (irrational) arguments. Errors and tricks of disputes belonging to the arguments.		4	1	Drawing up an abstract lecture.
8. Selection of language funds in an official-business style. Business Correspondence.		4	1	Drawing up an abstract lecture.
Didactic unit: Principles of constructing automatic control systems in power engineering				
9. Public speech (oratorio). Genres of argumental (convincing) speech: discussion (in the business sector).		2	1	Drawing up an abstract lecture.
10. Public speaking (oratorio). Genres of argumental (convincing) speech: Business negotiations.		2	1	Drawing up an abstract lecture.

11. Public speech (oratorio). Informing Speech Genres: Report, Speech-presentation with a device for work.		2	1	Drawing up an abstract lecture.
12. Public speaking (oratorio). Genres of epidectic speech: speech on the presentation.		2	1	Drawing up an abstract lecture.
13. Public speech (oratorio). Genres of epidectic speech: congratulatory speech (address).		2	1	Drawing up an abstract lecture.

Table 3.2

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Speech interaction. Basic units and logical foundations of speech communication.				
1. The concept of language and speech (in its writing and oral form).		2	1	determining the role of verbal and non-verbal means of communication in speech activity. Analysis of the audience (on the materials of the texts). Training on speech technique. Self-analysis of the speaker (absence / availability of communicative qualities of speech, the use of non-verbal communication tools) - Filling a questionnaire.
2. Communicative techniques.		2	1	Performing tasks for the formation of the ability to analyze the speech situation: Depending on the audience, determine the purpose and objectives of the statements, be able to reformulate the topic. Role-playing game for the application of protection strategies in a speech aggression situation.
3. Building text.		2	1	Performing tasks to work out the ability to formulate the thesis, find in oral and written voice errors in the wording of the thesis and correct them. Perform the tasks to determine the method of presenting the material in the text. Analysis Official-business style texts.
4. Logic bases of argument.		2	1	Perform the tasks to determine the types of arguments used in speech (analysis of business negotiation texts). Educational discussion on a given topic.

5. Structural semantic text models. Speech techniques of effective communication.		2	1	Creating your own statements on specified text models.
Didactic unit: Principles of constructing automatic control systems in power engineering				
6. Argument speeches.		2	1	Participation in a business conversation - meeting (a quasiprofessional situation on the choice of students).
7. Argument speeches.		2	1	Participation in business negotiations (quasiprofessional situation on the choice of students).
8. Informing speeches.		2	1	Business game "Interview with a device for work".
9. Epidactic speech.		2	1	performances with presentation or congratulatory speeches written independently. Analysis of speeches.

Table 3.3

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 6				
Didactic unit: Principles of constructing automatic control systems in power engineering				
1. Genres of formal business style.		10	1	Study of scientific literature on the topic of course work.

Literary sources

Main literature

1. Малинина М. Г. Риторика и основы ораторского искусства. Ч. 1 : учебное пособие / М. Г. Малинина, И. Б. Леонова ; Новосиб. гос. техн. ун-т, Фак. гуманитар. образования. - Новосибирск, 2010. - 115, [1] с. : табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000132398

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Additional literature

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Internet resources

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2. http://elibrary.nstu.ru/

3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

5. http://znanium.com/

Methodical support and software

Methodological support

1. Голышкина Л. А. Основы педагогической деятельности в системе высшего образования. Технологии публичных выступлений [Электронный ресурс] : электронный учебно-методический комплекс / Л. А. Голышкина ; Новосиб. гос. техн. ун-т. - Новосибирск, [2015]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000214225. - Загл. с экрана.

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3. Малинина М. Г. Культура научной и деловой речи [Электронный ресурс] : электронный учебно-методический комплекс / М. Г. Малинина, Н. И. Колесникова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2019]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000241318. - Загл. с экрана.

Specialized software

1 Database management system (DBMS) Microsoft Access

2 Calculation of established and limit on static stability of Energy Systems Ekaterinburg, Regional Public Association "Department of Automated Electrical Systems" named after D.A. . Arzamasseva »Rastrwin, Student Version

ANNOTATION OF THE PROGRAM
Project activities

Course: 3 4, semester ы : 5 6 7

		Semester		
№	**Kind of activity**	**5**	**6**	**7**
1	Total credits	2	2	2
2	Total hours	72	72	72
3	Total classes in the contact form, hours	39	39	39
4	Lectures, hours	0	0	0
5	Practical lessons, hours	36	36	36
6	Laboratory studies, hours	0	0	0
7	of them in an active and interactive form, hours	0	0	0
8	Consultations, hours	1	1	1
9	Independent work, hours	33	33	33

External requirements

The ability to carry out project activities at all stages of the project's life cycle; *regarding the following learning results*:
to be able to determine the problem and how to solve it in the project
To be able to identify the necessary resources for the implementation of project tasks
to be able to organize and coordinate the work of the project participants

Requirements for the results of mastering the discipline

The results of the study of the discipline	**Forms of organizing classes**
to be able to determine the problem and how to solve it in the project	
1. PC-7.V / PC. 1 1. To be able to determine the problem and ways to solve it in the project	Seminars; Independent work
to be able to organize and coordinate the work of the project participants	
2. PC-7.V / PC. 2 2. To be able to organize and coordinate the work of the project participants	Seminars; Independent work
To be able to identify the necessary resources for the implementation of project tasks	
3. PK-7.V / PC. 3 3. To be able to identify the necessary resources to implement the design tasks	Seminars

Content and structure of the discipline

Table 3.1

Themes	Active forms, hours	Hours	Links to learning results	Learning activities
Semester: 5				
Didactic unit:				
1. Concepts and types of projects. Project Life Cycle.	4	6	1	Teamwork of project participants. Overlapping the idea of ??the project, its life cycle from the problem to Ruzeltat.
2. Problematization.	4	6	1	Teamwork of project participants. Questions are being worked out: What is the problem? What problem does the project solve? How to associate the problem and possible solutions?
3. Program achievement of the project results.	4	6	1	Teamwork of project participants. Project planning, partitioning project on tasks, resource planning, definition of responsibility zones and ways to adjust the plan.
4. Resource support project.	4	6	2	Teamwork of project participants. Calculations of the planned resource need.
5. Organization of teamwork.	4	6	2	Teamwork of project participants. Teamwork techniques.
6. Project results: presentation, examination, results.	4	6	1	Teamwork of project participants. Examination and reflection on the results of the project.
Semester: 6				
Didactic unit:				
7. Problematization in the design stage	4	6	1	Teamwork of project participants. Questions are being worked out: What kind of problem is the project at this stage? How to associate the problem and possible solutions?
8. Program to achieve the results of the current stage of the project	4	6	1	Teamwork of project participants. Planning the current stage of the project, breaking tasks, resource planning, definition of responsibility zones and ways to adjust the plan.
9. Resource provision of project implementation stages	4	6	2	Teamwork of project participants. Calculations of the planned resource need.
10. Organization of teamwork	4	6	2	Teamwork of project participants. Teamwork techniques.

11. Project Results (Project Stage): Examination, Representation, Results.	8	12	1	Project results: presentation, examination, results.
Semester: 7				
Didactic unit:				
12. Problematization in the design stage.	4	6	1	Teamwork of project participants. Questions are being worked out: What kind of problem is the project at this stage? How to associate the problem and possible solutions?
13. The program to achieve the results of the current stages of the project	4	6	1	Teamwork of project participants. Planning the current stage of the project, breaking tasks, resource planning, definition of responsibility zones and ways to adjust the plan.
14. Resource provision of project implementation stages	4	6	2, 3	Teamwork of project participants. Calculations of the planned resource need.
15. Organization of teamwork	4	6	2	Teamwork of project participants. Teamwork techniques.
16. Project results: presentation, examination, results.	8	12	1	Teamwork: Preparation for the presentation of the project results, examination of the result. Summing up.

Literary sources

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Additional literature

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Internet resources

1. 10 прорывных идей в энергетике на следующие 10 лет. – Текст : электронный / Ассоциация по развитию международных исследований и проектов в области энергетики «Глобальная энергия» : [сайт]. – URL: https://globalenergyprize.org/ru/wp-content/uploads/2020/12/GE_verstka_-itog-RUS.pdf (дата обращения: 18.03.2021).

2. http://elibrary.nstu.ru/

3. https://e.lanbook.com/

4. http://www.iprbookshop.ru/

5. http://znanium.com/

Methodical support and software

Methodological support

1. Организация самостоятельной работы студентов Новосибирского государственного технического университета : методическое руководство / Новосиб. гос. техн. ун-т ; [сост.: Ю. В. Никитин, Т. Ю. Сурнина]. - Новосибирск, 2016. - 19, [1] с. : табл.. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000234042

2. Куликова Д. Н. Проектная деятельность [Электронный ресурс] : электронный учебно-методический комплекс / Д. Н. Куликова ; Новосиб. гос. техн. ун-т. - Новосибирск, [2019]. - Режим доступа: http://elibrary.nstu.ru/source?bib_id=vtls000239899. - Загл. с экрана.

Specialized software

Использование специализированного программного обеспечения для изучения дисциплины не требуется

АННОТАЦИЯ к рабочей программе дисциплины (модуля)
ФИЗИЧЕСКАЯ КУЛЬТУРА и СПОРТ

Общая трудоемкость дисциплины составляет 2 зачетные единицы, 400 часов.

Освоение студентами модуля «Физическая культура и спорт» включает изучение двух частей:

- Базовая часть модуля - «Физическая культура» - 2 семестра. Раздел обязателен для изучения, включает в себя теоретический, методико-практический и контрольный разделы программы. Итоговая аттестация - зачет, с получением 2-х зачетных единиц (не менее 72ч).
- Вариативная часть модуля - «Прикладная физическая культура» - 1-8 семестр. Раздел обязателен для изучения, включает в себя учебно-тренировочный и контрольный разделы программы. Итоговая аттестация - зачет (не менее 328 ч).

Учебный материал базовой части модуля – дисциплины «Физическая культура» – реализуется в рамках методико-практических занятий на следующих отделениях кафедры:

- лыжные гонки (для юношей);

- аэробика (для девушек).

Для изучения материала в вариативной части модуля студенту необходимо выбрать одно из следующих учебных отделений кафедры: атлетизм, аэробика, спортивные игры, единоборства, плавание, гимнастика, легкая атлетика.

Изучение модуля «Физическая культура и спорт» в рамках ВО (бакалавриат) направлено на формирование у студентов следующей основной общекультурной компетенции:

способность использовать методы и средства физической культуры для обеспечения полноценной социальной и профессиональной деятельности (ОК8)

В результате изучения модуля студент должен

Знать:

- основы здорового образа жизни;
- последствия отклонения от здорового образа жизни.

Уметь:

- поддерживать здоровый образ жизни.

Учебно-методическое и информационное обеспечение дисциплины.
Основная литература:

1. Педагогика физической культуры : учебник / [С. Д. Неверкович и др.] ; под ред. С. Д. Неверковича. – 3-е изд., стер. – М. : Академия , 2014. – 361, [1] с.
2. Казакова Т. Н. Теория и методика адаптивной физической культуры : учебное пособие / Т. Н. Казакова, Новосиб. гос. техн. ун-т. – Новосибирск : Изд-во НГТУ , 2015. – 24, [2] с.

3. Казакова Т. Н. Теория и методика адаптивной физической культуры [Электронный ресурс] : электрон.учебно-метод. комплекс / Т. Н. Казакова ; Новосиб. гос. техн. ун-т. – Новосибирск, 2014. – Режим доступа : http://dispace.edu.nstu.ru/didesk/course/show/4778. – Загл. с экрана
4. Кузнецов В. С. Теория и методика физической культуры : учебник / В. С. Кузнецов. – М. : Академия , 2012. – 409, [1] с. ил.

Периодические издания:

1. Физкультура культура и спорт [Текст] : науч.-метод. журн. / РА Образования РГУФКСМиТ; Вест. ПСФК РА Образования; Науч.-издат. центр "Теория и практика физической культуры и спорта". – Период.: 6 раз в год. – 80 с. – Изд. с 1996 г. – ISSN 1817-4779.
2. Теория и практика физической культуры [Текст] : ежемес. науч.-теорет. журн. – Период.: 12 раз в год. – ISSN 0040-3601

Программное обеспечение и Интернет-ресурсы:

1. Центральная отраслевая библиотека по физической культуре и спорту [Электронный ресурс] : портал. – Режим доступа : http://lib.sportedu.ru. – Загл. с экрана.
2. Научная электронная библиотека eLIBRARY.RU [Электронный ресурс] : портал. – Режим доступа : http://www.elibrary.ru. – Загл. с экрана.
3. Teoriya.ru. Журнал «Теория и практика физической культуры» [Электронный ресурс] : портал. – Режим доступа : http://teoriya.ru/ru. – Загл. с экрана.
4. Teoriya.ru. Журнал «Физическая культура: воспитание, образование, тренировка» [Электронный ресурс] : портал. – Режим доступа : http://teoriya.ru/ru. – Загл. с экрана.