

APPROVED BY

Director of the School of Advanced Manufacturing Technologies

Alexey N. Yakovlev

Course Name

Philosophical and methodological problems of science and technology

Field of Study: for all master's degrees of General Educational Programs

Programme name: Material Sciences

Level of Study: Master Degree Programme

Year of admission: 2020

Semester, year: 1 term

ECTS: 3 credits

Total Hours: 108

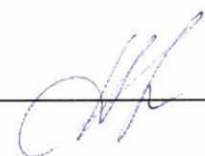
Contact Hours: 32

- **Lectures:** 16
- **Practical experience:** 16

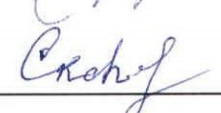
Assessment: exam

Division: Social Sciences and Humanities

Head of division


_____/ N.A. Lukianova

Instructor(s)


_____/ N.V. Skakovskaya

Course Name

Course Overview

Course Objectives	<i>The main objectives of the course are:</i> <i>to provide students with theoretical foundations and methods of philosophy of science and technology</i> <i>to form clear insight of main theories of science development</i> <i>to develop skills on scientific methodology application</i> <i>to develop skills to apply ethical principles in research and engineering activities</i>
Learning Outcomes	<i>the ability to use basic methodological approaches in research and technical activities</i> <i>the ability to search and analyze information for the purpose of effective decision making</i> <i>the ability to apply ethical principles in research and engineering activities</i> <i>the ability to understand and use the main theories of science development</i>
Course Outline	<i>Section 1. The main philosophical problems of science and scientific cognition</i> <i>Section 2. Classification of sciences and its value for scientific knowledge</i> <i>Section 3. The history and methodology of Science and Technology</i> <i>Section 4. The philosophy of Technology</i> <i>Section 5. Ethics of Science and Technology</i>
Prerequisites (if available)	-
Course Structure	<i>1. The main philosophical problems of science and scientific cognition.</i> <i>Philosophy of science: the basic concepts. Philosophy of science: sociological and methodological aspects. Science development: the revolutionary and evolutionary aspects.</i> <i>Philosophy and cognition: problem of synthesis. Rational and irrational in scientific cognition. Knowledge as philosophical problem.</i> <i>The philosophical problems of natural science (ontology, objectivity of knowledge, space-time, scientific method, determinism).</i> <i>2. Classification of sciences and its value for scientific knowledge.</i> <i>Kinds of sciences. Classification of science: necessity or way of science development.</i> <i>History of classification of science: Plato, Aristotle, F Bacon, A. Comte, H. Spencer.</i> <i>Contemporary approach to problem of classification. Science about “lifeless” nature: mathematics, physics, astronomy).</i> <i>The Earth sciences: geography, geology.</i> <i>Sciences about “alive” nature: biology, medicine, ecology.</i> <i>The chemistry science as a correlation problem of “alive” and “lifeless” nature.</i> <i>Mathematics is the universal science about relationship. The mathematic reality: the sing and significance.</i> <i>Humanitarian sciences as a branch of scientific knowledge. The human being as subject of the humanitarian sciences.</i> <i>Society is a subject of humanitarian sciences. History and development of sciences about a society.</i> <i>3. The history and methodology of Science and Technology</i> <i>Natural philosophy as science about nature of universe (history and development).</i> <i>The common fundamental principles (Thales, Anaksimandros, Anaximenes, Anaxagoras, Herakleitos, Demokritos, Epicuros, Titus Lucretius Carus). The ideal fundamental principle (Pythagoras, Socrates, Plato, Aristotle).</i> <i>The notion of scientific method. The levels of Scientific cognition. The forms of</i>

	scientific cognition: scientific issue, scientific hypothesis, scientific theory. The specifics of scientific fact. Modern tendencies in scientific methodology. 4. The Philosophy of Technology The technology as a subject of philosophical comprehension. Technology as a kind of human activity. The status of technology in humankind development The philosophy of technology as a branch of philosophy. Technics as a core of a technogenic civilization and destiny of mankind. The penetration of Technology and Culture. The Technology and Humankind Future: issues and perspectives. Creative principles in engineering activity. NBIC Technologies 5. The ethics of Science and Technology The development of ethics of Science and Technology. Formalization of ethical principles in scientific community. Technology assessment. Responsible Research Innovation. Ecological aspect of Science and Technology.
Facilities and Equipment	Personal computers with the operating system Windows
Grading Policy	In accordance with TPU rating system we use: - Current assessment which is performed on a regular basis during the semester by scoring the quality of mastering of theoretical material and the results of practical activities (performance tests, perform tasks, problem solving). Max score for current assessment is 60 points, min – 40 points. - Course final assessment (exam/ credit test) is performed at the end of the semester. Max score for course final assessment is 40 points, min – 22 points. The final rating is determined by summing the points of the current assessment during the semester and exam (credit test) scores at the end of the semester. Maximum overall rating corresponds to 100 points, min pass score is 56.
Course Policy	Class attendance will be taken into consideration when evaluating students' participation in the course. Students are expected to actively engage in class discussions about the assigned readings.
Teaching Aids and Resources	Compulsory Readings: 1. Philosophy of science: The Central Issues, Martin Curd and J.A. Cover, Norton &Co, 1998. 2. What is this Thing called Science? A.F. Chalmers, Open University Press, 3th edn, 1999. 3. Bird, Alexander. Thomas Kuhn Princeton and London: Princeton University Press and Acumen Press, 2000. 4. Kanke V.A., Philosophical problems of science and technology, student book, Moscow, Uright, 2016 5. Rosin V.M., Evolution of engineering and project activity and thought , Moscow, Lenand, 2016 Additional Readings: 1. A.A. Kornienko, I.B. Ardashkin, A Yu. Chmykhalo. The philosophy of science. Tomsk Polytechnic University. Tomsk, 2004. 2. A.A. Kornienko, I.B. Ardashkin, A Yu. Chmykhalo. Philosophical problems of scientific knowledge. Tomsk Polytechnic University. Tomsk, 2004. 3. Weinberg S., Explaining the world: the beginning of modern science, Moscow, Alpina non-fiction, 2016
Instructor (-s)	Nataliya Skakovskaya, associated professor of the Division of Social Sciences and Humanities, pogukaeva@mail.ru ; pnv@tpu.ru