MATRIX of existing Master course (Donetsk National Technical University)

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| Name of compulsory courses | Year | Semes-ter | Number of ECTS | Number of elective chairs | List of available elective courses | short description | relation between the contents and RETHINK’s theme |
| Name of the Master course | | | | | | | |
| Intellectual Property | 1st year | 1 semester | 2 | 3 |  | Within the framework of the subject being studied:  The concept of intellectual property.  Sources and objects of intellectual property.  Protection of the right to intellectual property objects.  Filing an application for a trademark.  Regulatory framework of patent activities and patent documentation.  Protection of intellectual property. | In this discipline students study problems of protection of intellectual property in the field of environmental. |
| Management in production | 1st year | 1 semester | 2 |  |  | The aim of this chair is to study the Fundamentals of Industrial Management, industrial strategy of the enterprise, design of a production system, managing exploitation of industrial system, management of industrial stocks, control system of quality. Preparation for the implementation of production management decisions. Planning of production processes and reserves in operations management. | In this discipline students study the organizational methods of reducing the pollution of the environment and rational use of natural resources. |
| Research methodology and computer processing of the results | 1st year | 1 semester | 3.5 |  |  | Modern methods of research. Organization of research.  Computer processing of the results of scientific research. | The subject includes the section on organization of scientific research to create a friendly and safe technologies |
| Labour protection in chemical Engineering | 1st year |  | 1.50 |  |  | Management system of labour protection is fundamental aspect in the chemical industry. Master students will study the International standards and main legislative acts of Ukraine on safety at major enterprises of the chemical industry. The content and meaning of these normative legal acts to provide safe and friendly working environment.  State insurance against accidents and occupational disease. Prevention of accidents, insurance expertise on health and safety.  Analysis of working conditions in the chemical industry. Indices for hazards and danger of environment factors, severity and intensity of the work process. The use of reasonable modes of work and rest, the rational organization of the labor process and employment, improvement of technological processes and equipment as factors reducing the severity and intensity of the production process (give some specific examples).  Analysis of industrial injuries by dangerous factors for major chemical enterprises,  General safety requirements for process equipment and process technology. Criteria for risk assessment work of basic professions of workers of chemical industry.  Еxplosion and fire danger of chemical plants. Preventing explosions and fires in the chemical industry. | Analysis of working conditions in the chemical industry for hazards and danger of environment factors, |
| Designing production processing combustible  resources and the use of computer technology | 1st year | 1 semester | 2 |  |  | Designing of production.  Сalculation of Material balance and choice of basic  technological equipment.  Design of the main process and equipment. | The use of computers for the process design allows to find the conditions under which the emissions into the environment will be minimal |
| Modern technologies of processing of fossil fuels | 1st year | 1 semester | 2 |  |  | The basic method of coal processing now is coke industry. The discipline includes Background of scientific and technological progress in the coking industry. Status and prospects of development of the coking resource base.  Modern tendencies in the development of blast-furnace technology. Social problems in coking industry.  Improvement of existing processes for coking coal preparation. Improvement of crushing coal technology. Drying technology. Thermal preparation of coal charge. Coking of thermally prepared charges.  Partial briquetting of coal and charges. Binding materials for technologies of partial briquetting. Seals made of coal charge by tamping. Coking coal blend with the addition of organic matter.  Modern coke ovens and prospects of improving their design and operation. The development of constructions of modern coke ovens. Areas of improvement equipment. Mechanization and automation of coke production. Actions to reduce emissions of coke production in the atmosphere and their environmental assessment. Receiving the formed coke and coal briquettes. Production of of special types of coke. Coke briquette fuel. High-ash coke. | Modern technology should be energy and resource efficient and environmentally friendly.  High consumption of the energy and fuels in industry is remarkable in high production of polluting substances which have a great influence not only for human health but also for the vegetation and ecosystem balance. |
| Civil defence | 1st year | 1 semester | 1.5 |  |  | Emergencies. Potentially dangerous objects. Protection of population and territories in emergency situations. Protection of chemical production in emergency situations. | Course is essential for ecologists, chemists, technologists. |
|  | 1st year | 1 semester | 6.5 |  | Technology of catching and processing chemical products | The main topics of the subject:  1. Volatile coking products;  2. The primary cooling coking gas;  3. Capturing of ammonia from coking gas;  4. Recycling of overtar water;  5. Decomposition of associated salts;  6. Water purification from phenols;  7. Biochemical purification of water;  8. Production of ammonium sulphate from coking gas;  9. Production of pyridine;  10. Methods of production of ammonium sulphate;  11. The final cooling;  12. Capturing benzene hydrocarbons;  13. Capturing of hydrogen sulfide gas from coking;  14. Production of sulfuric acid. | This course focuses on the need to reduce harmful pollutants emissions during coal processing. |
|  | 1st year | 1 semester | 7.0 |  | Technology of coal and coke industry | In the content of discipline was included a description of main stages of coking technology development in Ukraine and abroad, problems and prospects of the industry.  Coke and its properties. The requirements of various industries for coke quality. Preparation of charge for coking.  The main elements of modern coke ovens. Classification of furnaces.  Coking process: Heat flow in the coking camera. Isotherms and isochrones temperature distribution in a cross section of the camera.  Particle size distribution during coke formation. Material and heat balance of the coking process.  Calculations of gas combustion process. Calculation of surface heat regenerators. Hydraulics of coke ovens.  Methods of supporting and changing for the regime of pressure.  Building, exploitation and regulation of coke ovens. Principles of design and construction of coke oven batteries. Sequence of furnace service. Seriality, the requirements for it. Characteristics of methods for automation of heating for coke ovens. | The major part of wastes generated by the industry comes from coal mining, coking plants, power generation and metallurgy. The considerable part of these waste materials is ejected to atmosphere and  groundwater or stored in the conditions of limited area creating the contamination of the environment. |
|  | 1st year | 1 semester | 2 |  | Chemistry and chemical engineering gas | Primary energy consumption. The origin of the gas.  World reserves of gas. Nontraditional sources of natural gas.  The mechanism of formation of gas hydrates. The composition of natural gas.  Physical and chemical properties of the components of natural gas. Gas production. Classification of existing gas collection systems. Preparation of natural gas for transportation. Transportation of natural gas. | Providing people with high quality fuel and raw material for the chemical industry is a current ecologic problem. |
|  | 1st year | 1 semester | 2\* |  | Equipment coke-chemical plants, corrosion protection | This chair includes two blocks. The first one focuses on different aspects of corrosion of metals.  The second block is considering mass-transfer apparatus. | Equipment of a coking plant should provide the minimum pollution. |
| Total |  |  | 30 |  |  |  |  |
| Psychology and Methods of teaching subjects in high school | 1st year | 2 semester | 2.00 | 5 |  | Fundamentals of Pedagogic in high school..  General principles of educational psychology in high school. | The subject includes the section on teaching environmental thinking in higher education. |
| Research methodology and computer processing of the results | 1st year | 2 semester | 2.50 |  |  | 1.Modern methods of research. 2. Organization of study.  3.Сomputer processing of results. | This discipline provides methods to solve real problems (environmental, technical, scientific, managerial, etc.). |
| Designing production processing combustible  resources and the use of computer technology | 1st year | 2 semester | 3.00 |  |  | Computer systems of data processing.  Creating of mathematical models. | The use of computers for the process design allows to find the conditions under which the emissions into the environment will be minimal |
| Theoretical Foundations of technological processes of fossil fuels | 1st year | 2 semester | 4.00 |  |  | This chair focuses on the study of solid fossil fuels (SFF), the need for them to use in the national economy, existing methods for their processing and the products obtained. Theoretical bases of processing: stoichiometric, thermodynamic and kinetic features of these processes.  New ways of SFF processing by gasification and hydrogenation.  Gasification of SFF, the best feedstock, thermodynamics and kinetics of the derived products.  Gas generator apparatus. Technological scheme of gas plants.  An underground coal gasification.  Production of liquid fuel by hydrogenation. Theoretical foundations of existing technological schemes and equipment. | Analysis of Theoretical Foundations of technological processes of fossil fuels  is necessary to take into account the environmental conditions to save the health of people and working capacity of equipment. |
|  | 1st year | 2 semester | 2.50 |  | Economic grounds for innovative solutions | Students will learn about the nature and function of innovative solutions. Formation of flows of investment payments. Classification of methods estimation of economic efficiency of projects. Static methods to assess the economic impact of projects. Dynamic methods to assess the economic impact of projects. Financial plan of the investment project. | The sustainable development concept assumes change of priorities at the decision of ecologic-economic commitments. |
|  | 1st year | 2 semester | 4.50 |  | Internet technologies | Such questions are included in the work program of the discipline: general information, internet history and basic concepts, search engines, basics of HTML, structure of the document HTML, key tags, basic properties of CSS, graphics, text, voice and video in the Internet, animation and Multimedia, evolution of the Internet. | Internet technologies skills are necessary for any specialist, as they facilitate the search and treatment of information. |
|  | 1st year | 2 semester | 2.50 |  | Philosophy of science, technology and education. The Bologna Process | Philosophy of Science and Technology is considering the following issues:  science as a social and cultural phenomenon, scientific knowledge, the general laws of science, methodology of scientific knowledge, problems of ethics in science, philosophers of technology, machinery and people, the Bologna Process. | The subject includes the section on philosophical aspects of ecology and chemical technology |
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|  | 1st year | 2 semester | 3.00 |  | Modern instrumental methods of analysis of fossil fuels | The purpose of the discipline is the fundamental knowledge of modern physicochemical analytical methods studying which widely using for the analysis of technological organic substances (solid fuels, lubricants, fuel, process gases, etc.). The teaching modules are focused on:  - the application of various physicochemical methods in the analysis of raw materials and products of coke chemistry and petrochemical industries;  - operating rules and regulation of high-tech analytical equipments;  - rules of interpretation of the analytical signal;  - new methods designing principles of fuels, lubricants and coke chemistry products analyzes using modern physicochemical devices. | Development of powerful physical methods of research opens up new possibilities for modern science, in particular, the ability to establish objectively the structure of the substance and its changes under the influence of pollutants. |
|  |  |  | 1.50 |  | Communication Psychology and Public Speaking Skills |  | Subject is important for realizing the skill. |
|  |  |  | 1.50\* |  | Nanotechnologies and Nanomaterials | Nanotechnology is an extremely promising science at the present time that allows you to create new and high quality medicines, materials and produce any substances, using the principle of the construction of required molecules from atoms of initial elements.  New science requires a simple and transparent explanation of basic theory and the possibility of using nanotechnology within the frame of usual scientific and technical concepts. Nanotechnology is needed not only to specialists in the field of ecology, technology, but most of the people for whom this research could be useful in their activities in the near future. | Subject is important in the prospective of Sustainability, Environment and “Ecologization of Education”. |
|  |  |  | 1.50\* |  |  |  |  |
|  | 1st year | 1 semester | 1.50\* |  | Chemical Engineering of Oil and Gas | This course is an extension of the course with the same name (bachelor level S1). The course aims: increasing knowledge in the field of oil and gas processing; selecting algorithm of the best refining way studying; polymer technology basis in condition of oil refining factory learning. | This course focuses on the need to reduce harmful pollutants emissions during oil and gas processing. |
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| Total |  |  | 30 |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Assistant practice | 2nd year | 1 semester | 4 |  |  |  |  |
| Preparation of qualification master's work |  |  | 19.5 |  |  |  |  |
| Practice on the theme of master's work |  |  | 6.5 |  |  |  |  |
| Total |  |  | 30 |  |  |  |  |
| Total for Master course: | 2 years | 3 semesters | 90 |  |  |  |  |

MATRIX of existing PhD (Doctorate) course (Donetsk National Technical University)

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Name of compulsory chairs | Year | Semester | Number of ECTS | Number of elective chairs | List of available elective chairs | short description | relation between the contents and RETHINK’s theme |
| Name of the PhD course | | | | | | | |
| Philosophy | 1st year | 1 semester | 85 h. |  |  | Modern understanding of philosophical problems given the profile of technical university. Includes the following topics:  1) Philosophy, its subject and its role in the society.  2) The origin and the main stages of the development of philosophy.  3) The development of philosophical thought in Ukraine.  4) Philosophy of life.  5) The dialectic as a theory of development.  6) Philosophy as a subject of philosophical analysis.  7) The philosophy of Society.  8) Consciousness and Cognition.  9) The philosophy of man.  10) Global issues and prospects of modern civilization.  11) Philosophy of Technology.  Philosophy is essential knowledge for students because it helps them to build an adequate way of thinking, to find their place in life, to understand human destiny, serves as a theoretical stimulus to search for answers the questions about the meaning of life. | Modern understanding of philosophical problems given in the field of technology and ecology. |
| Foreign Language | 1st year | 1 semester | 85 h. |  |  |  |  |
|  |  |  | 68 h. |  | Computer simulation technology and computer technique | Computer technology acts as a research tool. The discipline allows students to evaluate the role of modern computer technology in scientific research. It reveals the methodology of the dissertation research. Particular attention is paid to the study of mathematical package Mathcad to carry out mathematical and engineering calculations. The acquisition of practical skills to use various functions, procedures, instructions, methods of preparation of algorithms in a given programming system. | Computer skills are necessary for any specialist, as they facilitate the search and treatment of information. Computer modeling is widely used to build complex systems, processes and describe functional relationships in various sections the natural sciences. |
| Total |  |  | 30 |  |  |  |  |
| Speciality | 1st year | 2 semester |  |  |  |  |  |
|  |  |  | 24 h. |  | Higher education in Ukraine and the Bolonia Process | Fundamentals of Bolonia Process.  General principles of Higher education in Ukraine. | The subject includes the section on teaching environmental thinking in higher education. |
|  |  |  | 24 h. |  | Psychology and pedagogy of higher education | Fundamentals of Pedagogic in high school.  General principles of educational psychology in high school. | The subject includes the section on philosophical aspects of ecology and chemical technology. |
| Total |  |  | 30 |  |  |  |  |
| -  - | 2nd year | 1 semester |  |  |  |  |  |
| Total |  |  | 30 |  |  |  |  |
| -  - | 2nd year | 2 semester |  |  |  |  |  |
| Total |  |  | 30 |  |  |  |  |
|  | 3rd year |  | 60 |  |  |  |  |
| Total: | 3 years |  | 180 |  |  |  |  |