



Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»



Chemical, polymer and
silicate engineering

Innovative engineering practice

Work program of the discipline (Syllabus)

Details of the discipline

Level of higher education	<i>Third (educational and scientific)</i>
Branch of knowledge	<i>13 Mechanical engineering</i>
Specialty	<i>133 Industrial engineering</i>
Educational program	<i>Industry engineering</i>
Discipline status	<i>Selective</i>
Form of study	<i>full-time (day) / full-time (evening) / part-time / remote / mixed</i>
Year of preparation, semester	<i>2nd year, spring semester</i>
The scope of discipline	<i>5 (150)</i>
Semester control / control measures	<i>Test</i>
Timetable	<i>2 hours per week (2 hours of lectures and 1 hour of practical classes)</i>
Language of instruction	<i>Ukrainian</i>
Information about course leader / teachers	<i>http://intellect.cpsm.kpi.ua/profile/sde9 http://intellect.cpsm.kpi.ua/profile/koe10</i>
Course placement	<i>Sikorsky platform</i>

Curriculum of the discipline

1. Description of the discipline, its purpose, subject of study and learning outcomes

Innovative activity is, along with scientific activity, the main task of a highly qualified specialist. Innovative practice is the work on the development of new systems, equipment, processes, projects, programs that characterize their focus on development and include actually implemented innovations.

To a large extent, the solution to the innovation problem will be determined by the level of training of specialists working in a particular field. Therefore, the combination of professional training and knowledge in the field of methodology of innovation processes will be decisive for the successful solution of this problem.

The subject of the discipline "Innovative engineering practice" - implementation of approaches to own innovation activity, innovation activity of the enterprise.

The purpose of the discipline "Innovative engineering practice»

The purpose of studying this discipline is to participate in the formation of students' complex knowledge about their own innovation, enterprise innovation, a set of skills needed to conduct their own

research, create new and modernize existing innovation objects. In accordance with the purpose of training doctors of philosophy in this specialty, the discipline strengthens the following competencies:

- Ability to rethink existing and create new holistic knowledge and / or professional practice and to solve significant social, scientific, cultural, ethical and other problems.
- Ability to develop and implement projects, including own research.
- Ability to initiate research and innovation projects and work autonomously during their implementation.

According to the requirements curriculum of the discipline «**Innovative engineering practice** », students after mastering it must demonstrate the following learning outcomes:

- To know the priority state directions of development of science, equipment and technologies in professional and related fields.
- Initiate the creation of the latest scientific and technological goals based on productive thinking.
- To know and understand the basic provisions of general scientific methodological methods of organizing scientific research.
- To know the priority state directions of development of science, equipment and technologies in professional and related fields.
- Work independently or in a team during the formation and implementation of a research and innovation research project.

2. Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)

Study of the discipline «*Innovative engineering practice*» is based on the principles of integration of various knowledge acquired by graduate students during the bachelor's and master's degree in the study of general and engineering disciplines. Welcome general knowledge of disciplines in economics and engineering. The discipline belongs to the cycle of elective disciplines. Strengthens the competencies of disciplines of the normative part of the educational and scientific program.

3. The content of the discipline

What is engineering. The emergence of the concept and types of engineering. Development of international engineering. World trends in engineering. Domestic realities.

Innovations. Content and stages of innovation processes. Technical, organizational, informational, social, economic innovations. Stages of the innovation process. Life cycle of machine-building products.

Research work. Product design. Research and development work.

Phase and life cycle of the product. Factors forming an adequate understanding of customer needs. Stakeholders.

Dynamics, forecasting and modeling, technology capabilities, personnel.

Choosing the direction of innovation. Strategy and choice of innovation. Planning of innovative activity of the enterprise. Approaches, principles, components, services of the enterprise.

Innovative policy of the enterprise and sustainable development of the enterprise. Some issues of internet technology.

Technological innovation. Example: reducing the duration of the production cycle. Designing a new product.

Principles of evaluation of innovative projects. Theory of innovation processes. Risk of failure.

4. Training materials and resources

Basic literature:

1. Requirements of Matchtech Engineering Recruitment Specialists to the specialist. <https://www.matchtech.com/job/EMP404273/innovation-engineer--product-development-havant-england>.
2. Semyon Yesilevsky. Lip. 24, 2017. About science, innovation and the big difference between them. <https://innovationhouse.org.ua/columns/o-nauke-ynnovatsyyah-y-bolshoj-raznytse-mezhdunymy-2/>
3. Tugay OA, Vlasenko TV General basics of engineering activity and its current state in Ukraine. // New technologies in construction. № 34. 2018. http://ntinbuilding.ndibv.org.ua/archive/2018/34_2018/5.pdf
4. Kondratyuk AA Development of international engineering: world trends and domestic realities / A.A. Kondratyuk, IM Manaenko. // Collection of scientific works of young scientists of FMM NTUU "KPI named after Igor Sikorsky". - 2017. - № 11.
5. Yaroshchuk AO Ukraine in the international exchange of engineering and technical services / A.O. Yaroshchuk // **Management of economic processes in the world and national economy: collection. thesis science. works. - Kyiv: Analytical Center "New Economy", 2015. - 144 p.**

Additional literature:

1. Ikhtlaq Sidhu. Innovation Engineering: Principles and Methodology. May 22, 2019. <https://scet.berkeley.edu/innovation-engineering-principles-and-methodology/>.
2. Technological innovations and practices in engineering education: a review. Marcela Hernandez-de-Menendez & Ruben Morales-Menendez. International Journal on Interactive Design and Manufacturing (IJIDeM) volume 13, pages 713–728 (2019).
3. Osika LK Modern engineering: definition and subject area / L.K. Aspen. // Energy market. - 2010. - № 76. - p. 10
4. Kondratiev VV You give engineering! Methodology of project business organization / V.V. Kondratiev, V.Ya. Lorentz; 2nd ed. - M: Эксмо, 2007. - 568 с.
5. Engineering News Record [Electronic resource]. http://www.enr.com/toplists/2015_Top_225_International_Design_Firms1.
6. Kuzmin OE Foreign experience of engineering activity / O.Ye. Kuzmin, V.Y., **Жежуха, Н.А. Horodyska** // **Problems of economy. - 2014. - №3. - P. 240 - 245.**
7. Myasnikov V. Fictitious modernization will be stopped by engineering companies / V. Myasnikov // Nezalezhna Gazeta. - 2013. - №7. - P.26 - 32.
8. Rumyantsev AP World services market: [teaching. aid.] / A.P. Rumyantsev, Yu.O. **Kovalenko**. - K: Center for Educational Literature, 2006. - 456 p.

Information resources on the Internet

1. <https://www.spiedigitallibrary.org/conference-proceedings-of-spie/10452/1045240/To-promote-the-engineering-innovative-bilities-of-undergraduates-by-taking/10.1117/12.2266119.full?SSO=1>

2. <https://genderedinnovations.stanford.edu/methods/innovation.html>
3. <https://www.sciencedirect.com/science/article/pii/B9780123973108000038>
4. <https://www.researchgate.net/publication/293313054> *Innovation Engineering The Skills Engineers Need to be Innovative*
5. <https://link.springer.com/article/10.1007/s12008-019-00550-1>
6. <https://www.asme.org/topics-resources/content/10-innovative-engineering-institutes>
7. Ministry of Environmental Protection and Natural Resources of Ukraine - <https://mepr.gov.ua/>
8. Industrial ecology. Community of Environmentalists -<http://www.eco.com.ua/>
9. Professional Association of Ecologists of Ukraine (PAEU) - <https://paeu.com.ua/>

Educational content

5. Methods of mastering the discipline (educational component)

Lectures

Lectures are aimed at:

- providing modern, holistic, interdependent knowledge of the discipline «Innovative engineering practice», the level of which is determined by the target setting for each specific topic;
- providing creative work of postgraduate students together with the teacher during the lecture;
- education of postgraduate students of professional and business qualities and development of their independent creative thinking;
- formation of the necessary interest in graduate students and providing direction for independent work;
- determination at the current level of development of science in the field of modern methods, processes, forecasting the development of the industry in the coming years;
- reflection of methodical processing of material (selection of the main provisions, conclusions, recommendations, clear and adequate to their formulations);
- use for demonstration of visual materials, combination, if possible, with demonstration of results and samples;
- teaching research materials in clear and high-quality language with observance of structural and logical connections, explanation of all newly introduced terms and concepts;
- accessibility for perception by this audience.

Practical (seminar) classes

In the system of professional training of graduate students in this discipline, practical classes occupy 30% of the classroom workload. As a supplement to the lecture course, they lay and form the basis of the qualification of the doctor of philosophy. The content of these classes and methods of conducting them should ensure the development of creative activity of the individual. They develop scientific thinking and the ability to use special terminology, allow you to test knowledge. Therefore, this type of work is an important means of operational feedback. Practical classes perform not only cognitive and educational functions, but also to promote the growth of graduate students as creative workers in the field of interests of researchers.

The main tasks of the cycle:

- *to help graduate students to systematize, consolidate and deepen theoretical knowledge in the field of their own innovations;*

- to teach graduate students in the methods of solving practical problems, to promote the acquisition of skills and abilities to communicate the results of their own research to colleagues and the scientific community;
- to teach to work with scientific and reference literature and schemes;
- to form skills learn independently, ie master the methods, techniques and techniques of self-learning, self-development and self-control.

6. Independent work of a student / graduate student

Independent work takes up to 65% of the time studying the credit module, including preparation for the test. The main task of independent work of graduate students is to master scientific knowledge in areas that are not included in the list of lecture questions through personal search for information, the formation of an active interest in the creative approach in educational work. In the process of independent work within the educational component, the graduate student must learn to deeply analyze modern approaches to the development and implementation of new technologies and innovations in the direction of their own research.

Policy and control

7. Course policy (educational component)

Rules for attending classes and behavior in class

Attendance is a mandatory component of assessment. Postgraduate students are obliged to take an active part in the educational process, not to be late for classes and not to miss them without good reason, not to interfere with the teacher to conduct classes, not to be distracted by actions that are not related to the educational process.

Rules for assigning incentive and penalty points

- Incentive points can be awarded by the teacher only for the performance of creative work in the discipline, but their amount may not exceed 25% of the rating scale.
- penalty points within the academic discipline are not provided.

Policy of deadlines and rearrangements

In the event of arrears of the discipline or any force majeure, graduate students should contact the teacher through available (provided by the teacher) communication channels to resolve problems and agree on an algorithm for practice.

The policy of academic integrity

Plagiarism and other forms of dishonesty are not allowed. Plagiarism includes the lack of links when using printed and electronic materials, citations, opinions of other authors. Inadmissible hints and write-offs when writing tests, conducting classes; passing the test for another graduate student; copying of materials protected by the copyright system without the permission of the author of the work.

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Kyiv Polytechnic Institute named after Igor Sikorsky". Read more: <https://kpi.ua/code>

Policy of academic behavior and ethics

Postgraduate students must be tolerant, respect the opinion of others, formulate objections in the correct form, constructively maintain feedback in the classroom.

Norms of ethical behavior of students and employees are defined in Section 2 of the Code of Honor of the National Technical University of Ukraine "Kyiv Polytechnic Institute named after Igor Sikorsky". Read more: <https://kpi.ua/code>

8. Types of control and rating system for evaluation of learning outcomes (RSO)

Distribution of study time by types of classes and tasks in the discipline:

Semester	Training time		Distribution of teaching hours				Control measures		
	Loans	acad. year	Lectures	Practical (seminar)	Lab. slave.	CPC	MCR	RR	Semester control
4	5	150	36	18	-	96	-	-	test

The student's rating in the discipline consists of points that he receives for:

The graduate student's rating from the credit module consists of the points he receives for his work in practical classes.

Semester control is a test.

System of rating (weight) points and evaluation criteria

Rating points system and evaluation criteria:

Performing tasks in practical (seminar) classes.

The weight score is 20 points; 5 tasks are provided.

Criteria for evaluating the implementation of a practical task

Completeness and signs of task performance	Bali
The task is completed in full	Until 20
Minor shortcomings under paragraph 1	Until 16
Late performance of the task	Until 10
Untimely performance of the task, shortcomings under item 1	Until 9
Poor, untimely performance of the task	Up to 2
Failure to complete the task	0

Thus, the rating semester scale of the credit module is:

$$R = 20 \cdot 5 = 100 \text{ points}$$

According to the results of educational work for the first 7 weeks, the "ideal graduate student" must score 40 points. At the first certification (8th week) the graduate student receives "credited" if his current rating is at least 20 points.

According to the results of educational work for 13 weeks of study, the "ideal graduate student" must score 90 points. At the second certification (14th week) the graduate student receives "credited" if his current rating is not less than 40 points.

The maximum amount of points is 100. To get credit from the credit module "automatic" you must have a rating of at least 60 points.

A necessary condition for admission to the test is a rating of at least 40% of the rating scale (R), ie 40 points.

Postgraduate students who scored less than 0.6 R during the semester, as well as those who want to increase the overall rating, perform a test. In this case, all points obtained by them during the semester are canceled. Test tasks contain questions that relate to different sections of the credit module. The list of test questions is given in Section 9.

To obtain a credit score, the sum of all received during the semester rating points R is translated according to the table:

Scores	Rating
95 ... 100	perfectly
85 ... 94	very good
75 ... 84	fine
65 ... 74	satisfactorily
60 ... 64	enough
RD < 60	unsatisfactorily
Admission conditions are not met	not allowed

9. Additional information on the discipline (educational component)

The following courses are credited:

<https://ipp.eng.unimelb.edu.au/for-students>

<https://au.linkedin.com/in/innovation-practice-program-0a0180171>

https://www.udemy.com/course/disruptive-innovation-business-model-startup/?qclid=Cj0KCQiAhP2BBhDdARIsAJEzXIEAPgUz7YsRXKKgnO_OK-7CEfjGcMhq9amr7VpYYPYmWeIE5o4QXHYaAr0qEALw_wcB&matchtype=b&utm_campaign=LongTail_la

[.EN cc.ROW&utm_content=deal4584&utm_medium=udemyads&utm_source=adwords&utm_term=.aq 84635077608 . ad 388109814158 . kw % 2Binnovation +% 2Bcourse . de c . dm . pl . ti kwd-519656023575 . li 9061016 . pd .](https://www.udemy.com/course/disruptive-innovation-business-model-startup/?qclid=Cj0KCQiAhP2BBhDdARIsAJEzXIEAPgUz7YsRXKKgnO_OK-7CEfjGcMhq9amr7VpYYPYmWeIE5o4QXHYaAr0qEALw_wcB&matchtype=b&utm_campaign=LongTail_la)

<https://www.port.ac.uk/study/courses/beng-hons-innovation-engineering>

Other courses can be credited by agreement with a teacher.

Work program of the discipline (syllabus):

Compiled by Prof., Doctor of Technical Sciences, Kolosov OE; Assoc. Prof., Ph.D., Sidorov DE

Approved at the meeting of the Department of Machines and Apparatus of Chemical and Oil Refining (Protocol № 26 of 19 June 2021)

Agreed metodic commission of the Faculty of Engineering and Chemistry (Protocol № 11 of June 25, 2021)