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

Ecology and technology of plant polymers

Information systems in scientific research
Working program of the discipline (Syllabus)

Details of the discipline	
Level of higher education	***Second (master's degree)***
Branch of knowledge	*16 Chemical and bioengineering*
Speciality	*161 Chemical technology and engineering*
Educational program	*Industrial ecology and resource-efficient clean technologies*
Status of discipline	*Optional*
Form of training	*full-time/remote/mixed*
Year of preparation, semester	*1 course, autumn semester*
Volume of discipline	*4 credits (120 hours)*
Semester control/ control measures	*Exam*
Schedule of classes	*3 hours per week (2 hours of lectures and 1 hour of practical classes)*
Language of instruction	*Ukrainian*
Information about thecourse /teachers	Lecturer: *https://eco-paper.kpi.ua/pro-kafedru/vykladachi/vizytky/galish-vita-vasilivna.html* Practical /Seminary: *https://eco-paper.kpi.ua/pro-kafedru/vykladachi/vizytky/galish-vita-vasilivna.html*
Course placement	*https://do.ipo.kpi.ua/*

Program of discipline

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

Scientific research is an integral part of the development of science and are aimed at studying certain processes or phenomena, analyzing the impact of various factors on them, summarizing results, establishing patterns and applying them in practical activities. The development of science and technology is certainly closely connected with the development of science and is called by means of information systems and technologies in the search, systematization, processing and storage of scientific information.

The ability to search, process and analyze information using various information sources, the ability to apply modern information systems, databases, specialized lost support in scientific work is necessary for a scientist and will allow to initiate, justify, develop and implement innovative scientific projects.

***The subject of the discipline "Information systems in scientific research"** is the study of modern information systems and technologies, software and technical means for working with scientific information, processing the results of research, transformation, transmission and presentation of information.*

The purpose of the discipline "Information systems in scientific research"

The purpose of studying the discipline is the professional training and formation of a complex of knowledge at the masters about the possibilities and prospects of using information systems in research

activities, as well as the use of information products during scientific research, processing of research results and their design, on the operation of modern search engines, scientometric databases. In accordance with the purpose of training masters in this specialty requires the acquisition of appropriate competencies:

- *fromdate to search, processing and analysis of information from different sources;*
- *withdate to investigate, classify and analyze indicators of quality of chemical products, technological processes and equipment of chemical production;*
- *withthe date to use the results of scientific research and development to improve existing and / or development of new technologies and equipment of chemical industries.*

*In accordance with the requirements of the program of the discipline "**Information systems in scientific research**", students after its assimilation must demonstrate the following programmatic learning results:*

- *to organize work and the work of the team in the conditions of industrial production, design units, research laboratories, determine the goals and effective ways to achieve them, motivate and train staff;*
- *to carry out in the scientific and technical literature, patents, databases, other sources of search for the necessary information on chemical technology, processes and equipment for the production of chemicals and materials based on them, systematize, and analyze and evaluate relevant information;*
- *be able to use modern information technology.*

2. Prerequisit and requisition disciplines (place in the structural and logical scheme of training according to the relevant educational program)

*The study of the discipline "**Information Systems in Scientific Research**" is based on the principles of integration of various knowledge gained by masters during the bachelor's degree in the study of the disciplines of natural and engineering-technical direction. The discipline "**Information Systems in Scientific Research**" should help students in performing scientific work on the topic of a master's thesis.*

3. Contents of the discipline

Section 1. Information systems in scientific activity

Topic 1. Information systems and their role in scientific activities.
Topic 2. Classification and application of information systems.
Topic 3. Information systems and efficiency of research activities.

Section 2. Databases in scientific activity.

Topic 4. Look at the scientific information.
Topic 5. Information and search engines.
Topic 6. Scientometric, abstract, bibliographic databases.

Section 3. Network information systems and technologies in scientific activities

Topic 7. Methods for creating cloud-oriented environments.

Section 4. Fundamentals of practical application of information systems in scientific activity

Topic 8. Application of software products in scientific activities
Topic 9. Processing and publication of the results of scientific research.

4. Educational materials and resources

Basic literature

1. *Gaidarzhy V.I., Izvarin I.V. Databases in information systems. – K.: University "Ukraine", 2018. - 418 cc.*
2. *Gurevych P.C. Kademia M.Y. Information and telecommunication technologies in the educational process and scientific research: Textbook for students of pedagogical universities and students of institutes of postgraduate pedagogical education / P.C.Gurevich, M.Y. Kademia - Vinnytsia: Glider, 2015. - 366 cc*

3. *Romanchykov V.I. Fundamentals of scientific research: teaching. manual. Kyiv, 2017. - 254 cc*
4. *Shvachych G.G. Modern information and communication technologies: Textbook. / G.G.Shvachych, V.V.Tolstoy, L.M.Petrechuk, Y.S.Ivashchenko, O.A.Gulyaeva, Sobolenko O.V. – Dnipro: NMetAU, 2017. –230 p.*
5. *Shvets F.D. Methodology and organization of scientific research. Textbook./ SP Shvets - Rivne : NUWGP, 2016. - 151 cc*

Additional literature

6. *Information systems in scientific research: visualization of experimental data using the Package OfriginPro [Text]: teaching. posib. for stud. specialties 161 "Chemical technologies and engineering" / V. V. Galish, I. M. Truss, I. M. Deykun, V. G. Ploskonos, O.V. Glushko; KPI them. Igor Sikorsky Kyiv Polytechnic Institute. – Kyiv: KPI them. Igor Sikorsky Kyiv Polytechnic Institute, 2021. – 43 p.*
7. *Kasatkin D.Yu., Blozva A.I., Kasatkina O.M. Informatics and systemsology [textbook] / D.Y. Kasatkin, A.I. Blozva, O.M. Kasatkina / - K.: NUBiP of Ukraine, 2017.- 418 p.*
8. *Voytovych N.V., Naydyonova A.V. Use of Google cloud technologies and web 2.0 services in the educational process. Methodical recommendations. – Dnipro: DPTZ "Dniprovsky PTOTS Center", 2017 – 113 p.*
9. *Vyshnia V.B., Kosychenko O.O. Practicum on the basics of informatics: for students and students of all forms of education. 2nd edition revised and processed. – Dnipropetrovsk: Dnipropetrovsk State University of Internal Affairs, 2014. – 194 P.*
10. *Methodical instructions for laboratory work on the discipline "Packages of applied programs for computer. Part 2" for students of specialty 141 Electric power engineering, electrical engineering and electromechanics / Compiled by: D.V. Nastenko, A.B. Nesterko, G.O. Trunina – Kyiv: NTUU "KPI", 2016.*
11. *Yaskovets I.I., Osipova T.Y., Kasatkin D.Y., Savitskaya Ya.A., Smolii V.V., Gusev B.S., Blozva A.I., Matus Y.V. Software in computational mathematics and modeling [textbook]. - K.: NUBiP of Ukraine, 2017.- 296 p.*
12. *Basics of two-dimensional computer graphics: textbook / O.O. Safronova, K.V. Donets. – K. : KNUTD, 2016. – 175 p.*
13. *Litvinova S.G. Office 365 cloud services: tutorial / S.G. Litvinova, O.M. Spirin, L.P. Anikina. – Kyiv. : Comprinth, 2015. - 170 c.*
14. *Chekotoevsky E.V. Statistical methods based on Microsoft Excel 2016: tutorial/E.V. Chekotowskiy. - K.: Knowledge, 2018. - 407 cc*
15. *Buynytska O.P. Information technologies and technical means of training: teaching. manual for students of higher educational institutions / O.P. Buynytska; Monmsu, Kyiv University. B. Grinchenko. – K. : Center for Educational Literature, 2018. - 240 p.*

Information resources on the Internet

16. *Scientometric database Scopus - Access mode: https://www.scopus.com/home.uri*
17. *Наукометрична база даних Web of Science (WoS) - Режим доступу: https://login.webofknowledge.com/*
18. *Scientometric database Google Scholar - Access mode: https://scholar.google.com/*
19. *Database of dissertations and abstracts - Access mode: http://disser.com.ua/*
20. *Vernadsky National Library of Ukraine database - Access mode: http://www.irbis-nbuv.gov.ua/*
21. *International scientometric databases: types and features - Access mode: https://www.perspektyva.in.ua/naukovvi-prostir/porady- paikouIzui/tigPagobpi-paicoteigus-Iagu-bapuIi/*
22. *Database of patents of Ukraine - Access mode: https://uapatents.com/*
23. *База даних Scimago Journal & Country (SJR) - Режим доступу: https://www.scimagojr.com/*

24. *Database Andndex Copernicus - Access mode: https://indexcopernicus.com/index.php/ru/*
25. *Scientific professional publications of Ukraine - Access mode: https://mon.gov.ua/ua/nauka/nauka/atestaciya-kadriv-vishoyi-kvalifikaciyi/naukovi-fahovi-vidannya*

Educational content

5. Methods of mastering the discipline (educational component)

Lecture classes

Lectures are aimed at:

- *providing modern, holistic, interdependent knowledge in the discipline "Information systems in scientific research";*
- *providing in the process of lecturing the student's* creative work *together with the teacher;*
- *cultivation of professional and business qualities in the student, their development of independent creative thinking;*
- *formation of the student's* interest in *independent scientific duality;*
- *mastering modern trends in the development of the information environment for the development of research activities;*
- *display of results (clear and adequate formulation of results, conclusions, recommendations);*
- *use to demonstrate the results of visual materials;*
- *teaching matterin a clear language in compliance with structural and logical relationsin;*
- *accessibility for audience perception.*

No s/p	The name of the lecture topic and the list of main issues (list of didactic means, references to literature and tasks on the IWS)	Hours
1	***Information systems and their role in scientific activities*** *The stages of development of information systems and technologies.* *Literature: [1 - 2].* *Formation of information culture in research activities. Regulatory framework for the use of information systems and technologies.*	**4**
2	***Classification and application of information systems*** *Modern information systems. Tools of computer systems and technologies to support science research.* *Literature: [1 - 2].* *Tasks on the IWS. Geographic information systems. Artificial intelligence systems. virtual reality systems. hypertext technologies. multimedia technologies.*	4
3	***Information systems and efficiency of research activities*** *Features of evaluation of the effectiveness of research activities. Economic efficiency of research activities.* *Literature: [3].* *Tasks on the IWS. Information systems in the planning of scientific activities.*	4
4	***Look at the scientific information*** *Informatization: impact on the development of science. Basic concepts of scientific information and its processing. Aspects of information management. The role of information in science.* *Literature: [2].* *Tasks on the IWS. Application of information and linguistic systems and technologies in scientific activities.*	**3**

5	***Information and search engines*** *Information and analytical, information and search engines. Database of scientific dissertations and abstracts.* *Literature: [4].* *Tasks on the IWS. Databasesand patents.*	***4***
6	***Scientometric, abstract, bibliographic databases*** *The concept of databases and database management systems is based. Web of Science, Scopus, Google Scholar. Scientific profiles of scientists and researchers. Database of the National Library of Ukraine named after V.I. Vernadsky. Scientific internet communities.* *Literature: [1, 15 - 21].* *Tasks on the IWS. Scimago Journal &country (SJR), Index Copernicus databases. Ukrainian national abstract database "Ukrainian scientific".*	***4***
7	***Methods for creating cloud-oriented environments*** *Possibilities of cloud technologies for informatization of scientific activity. Collective online activities of researchers and exchange of scientific information. Google cloud applications, office applications on the Internet. Засоби Google Docs.* *Literature: [4, 7, 12].* *Tasks on the IWS. Approaches to the organization of scientific work in a computer network. Share your own information resources.*	***3***
8	***Application of software products in scientific activities*** *Types of experimental data, their preparation for processing. Work with text, graphic, tabular information. Application of OpenOffice, MS Office, MATLAB, OriginLab, Coral Draw, Adobe Photoshop in scientific activities. Mathematical processing of experimental data. Accumulation and storage of data. Applied software for visualization, analysis and publication of data.* *Literature: [2, 8 – 11, 13, 14].* *Tasks on the IWS. Forecasting methods in MS Exsel. Operationwith matrices in the MATLAB. Programming in Origin. Creating a graphic abstract in Adobe Photoshop. Specialized packages of statistical processing of scientific data.*	***6***
9	***Processing and publication of the results of scientific research*** *Generalization of the results of scientific activity. Forms of results of scientific activity. Features of the design of scientific results. Methods and means of electronic presentationof the results of scientific research. Web resources of scientific periodicals.* *Literature: [5, 15 – 21].* *Tasks on the IWS. Scientific professional publications of Ukraine.*	***4***
	Total	***36***

Practical classes

In the system of professional training of masters in this discipline, practical classes occupy 50% of the classroom load, 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.

The main tasks of the cycle of practical classes:

- *help students systematize, consolidate and deepen knowledge of a theoretical nature in the field of modern information systems;*
- *teach students techniques for solving practical problems, promote mastering the skills and abilities of using modern information systems to perform scientific activities, processing, analyzing experimental data and presenting scientific results;*
- *teach them to work with information resources, information and scientific databases;*
- *to form the ability to learn independently the method and reception and self-learning, self-development and self-control.*

No s/p	***The name of the topic of practical training and the list of main issues (list of didactic support, reference to literature and tasks on the IWS)***	***Hours***
1	***Working with Google cloud services*** *Literature: [7].* *Tasks on the IWS. Share your own information resources*	***2***
2	***Processing information in a spreadsheet MS Exsel*** *Literature: [8].* *Tasks on the IWS. Forecasting methods in MS Exsel.*	***4***
3	***Visualization of the flow of factors of the experiment in the MATLAB environment*** *Literature: [9].* *Tasks on the IWS. Operation with matrices in matlab workspace*	***2***
4	***Processing and visualization of data in OriginLab*** *Literature: [6].* *Tasks on the IWS. Programming in Origin.*	***4***
5	***Visualize scientific results with Adobe Photoshop software*** *Literature: [11].* *Tasks on the IWS. Create a graphic abstraction in Adobe Photoshop*	***4***
6	***Design presentations in PowerPoint*** *Literature: [7].* *Tasks on the IWS. Ways to output information.*	***2***
	Total	***18***

6. Independent work ofthe student a

Independent work takes 76% of the time to study the credit module, including preparation for modular control work and exam. use modern information systems withato perform scientific research.

No s/p	*Name of the topic submitted for self-study*	*Number of hours of IWS*
	Section 1. Information systems in scientific activity	
1	*Formation of information culture in research activities. Regulatory framework for the use of information systems and technologies.* *Literature: [1 - 2].* *Geographic information systems. Artificial intelligence systems. Virtual reality systems. Hypertext technologies. Multimedia technologies .*	*16*

	Literature: [1 - 2]. *Information systems in the planning of scientific activities.* *Literature: [3].*	
Section 2. Databases in scientific activity		
2	*Application of information and linguistic systems and technologies in scientific activities.* *Literature: [2].* *Databases and patents.* *Literature: [22].* *Бази даних Scimago Journal & Country (SJR), Index Copernicus. Українська загальнодержавна реферативна база даних «Україніка наукова».* *Literature: [22, 23].*	*17*
Section 3. Network information systems and technologies in scientific activities		
3	*Approaches to the organization of scientific work in a computer network. Share your own information resources.* *Literature: [4, 8].*	*9*
Section 4. Fundamentals of practical application of information systems in scientific activity		
4	*Forecasting methods in MS Exsel. Operationwith matrices in the MATLAB. Programming in Origin. Creating a graphic abstract in Adobe Photoshop. Specialized packages of statistical processing of scientific data.* *Literature: [2, 6 - 11].* *Scientific professional publications of Ukraine.* *Literature: [25]*	*16*
5	*Preparation for modular control work*	*2*
6	*Preparation for the exam*	*6*
	Total hours	*66*

7. Modular control work

It is planned to 12 work (MCT), which is performed to assess the knowledge of students.

Politics and control

8. Policy of discipline (educational component)

Rules for attending classes and behavior in classes

Attending classes is a mandatory component of assessment. Students are obliged to take an active part in the educational process, not to be late for classes and not to miss them without a 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

- *encouraging points can be accrued by the teacher solely for active participation in the educational process (practical classes) or additional online specialized courses with obtaining the appropriate certificate:*
- *https://www.coursera.org/learn/latex*
- *https://courses.prometheus.org.ua/courses/course-v1:DNU+PRIN-101+2017_T1/about*
- *https://courses.prometheus.org.ua/courses/course-v1:UKMA+SCDA101+2020_T1/about*

But their amount can not exceed 10 % of the rating scale.

- *penalty points within the discipline are not provided.*

Polika deadlines and re-assemblys

In case of debts in the discipline or any force majeure circumstances, students should contact the teacher through accessible (provided by the teacher) communication channels to solve problematic issues and coordinate the algorithm of actions for working out.

Academic Integrity Policy

Plagiarism and other forms of dishonest work are unacceptable. Plagiarism includes the absence of references when using printed and electronic materials, quotes, opinions of other authors. Invalid hints and write-offs when writing tests, conducting classes; passing the exam for another student; copying materials protected by the copyright system without the permission of the author of the work.

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

Policy of academic behavior and ethics

Students should be tolerant, respect the opinion of others, object to formulate in the correct form, constructively maintain feedback in the classroom.

The 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 "Igor Sikorsky Kyiv Polytechnic Institute". Read more: https://kpi.ua/code

9. Types of control and rating system for assessing learning outcomes (RCOs)

Distribution of educational time by types of classes and tasks in the discipline according to the working curriculum:

Semester	School time		Distribution of training hours				Control measures		
	Credits	acad. year.	Lecture	Practical	Labs	IWS	MCT	IT	Semester control
1	4	120	36	18	–	66	+	–	Exam

The starting pointof the student's ayting in the discipline consists of points that he receives for:

1) *Express control at lectures;*
2) *Implementation and protection of 6 practical works;*
3) *Performing modular control work;*
4) *The answer to the exam.*

Semester control is an exam.

System of rating (weight) points and evaluation criteria

1. *Work in lectures.*

At the lectures , 4 express control is held in order to check the student's assimilation of the material.

Weight BAfor express control – 5 points.

The maximum number of points for express control – 5 points x 4 = 20 points.

2. *Work in practical classes.*

The student must complete 6 practical works. Criteria for evaluating work in practical classes.

Completeness and signs of response	Points
"Excellent": Good preparation in the discussion of issues, the implementation of all tasks	*5*
"Good": The answer does not provide enough factors, examples and conclusions or some inaccuracies	*4*

"Satisfactory": The student is ready to discuss only a part of the issues and / or makesgross mistakes in the answers	*3*
"Unsatisfactory": Active work and preparation for practical training are absent	*0*

Maximum number of points for practical work: 5 points x 6 = 30 points.

3. Modular control work:
MKR consists of three questions.
Weight point for modular control work – 5 points.

Completeness and signs of response	*Points*
"Excellent": Full answer to the question	*5*
"Good": The answer does not provide enough factors, examples and conclusions or some inaccuracies	*4*
"Satisfactory": The answer is superficial, serious mistakes have been made, there is no specific wording of laws and terms	*3*
"Unsatisfactory": The question is not counted or the answer is absent	*0*

The maximum number of points for modular control work is 5 points.

Thus, the maximum amount of points of the starting component that a student can get from the credit module is:

$$Rc = 20 + 30 + 5 = 55 \text{ points.}$$

The examination component is 45% of R:

$$Rекз = 45 \text{ points.}$$

The overall rating scale of the credit module is:

$$R = Rc + Rекз = 55 + 45 = 100 \text{ points.}$$

According to the results of educational work for the first 7 weeks , the "ideal student" should score 15 points.

According to the results of educational work for 13 weeks of study , the "ideal student" must score 35 points.

A prerequisite for admission to the exam is the enrollment of all practical works and modular control work at the general level of the starting rating of at least 35 points.

Each ticket contains three theoretical questions.

Completeness and signs of response	*Points*
"Excellent": Full answer to the question, at least 90% of the necessary information (full, unmistakable solution to the problem)	*15-14*
"Good": A complete answer is enough, at least 75% of the necessary information (complete solution of the problem with minor inaccuracies)	*13-11*
"Satisfactory": Incomplete answer, at least 60% of the necessary information and some errors (the task is performed with certain inaccuracies)	*10-8*
"Unsatisfactory": The message is absent or does not satisfy the conditions	*0*

Themind of all the R rating points received during the semester is translated according to the table:

Score	***Score***
95... 100	*Perfectly*
85... 94	*very good*
75...84	*well*
65... 74	*Satisfactory*
60...64	*enough*
RD 60<	*Disappointing*
Admission conditions not met	*not allowed*

10. Additional information on the discipline (educational component)

Approximate list of questions submitted for semester control

1. *Analyze the advantages and disadvantages of using cloud technologies.*
2. *Name and describe Google services.*
3. *What meta, advantages, properties of data visualization.*
4. *What is a graphic abstraction of a scientific article?*
5. *What is theprocessing of experimental data?*
6. *What databases are used in scientific research?*
7. *Give the structure of information systems.*
8. *Provide technology for visualizing information based on vector and raster graphics7*
9. *Give the types and classification of graphic editors.*
10. *Describe the possibilities, principles and basic techniques of working with spreadsheets.*
11. *Provide information processing technology based on tabular processors.*
12. *Give basic concepts of databases, data structure and database management systems.*
13. *What types of experimental data do you know?*
14. *Describe the educational and scientific resources of the Internet.*
15. *Give the form of presentation of scientific results.*
16. *What is an information system? By what grounds are information systems classified?*
17. *What components does the information system consist of?*
18. *Give the principles of generalization of the results of scientific activity.*
19. *Give the features of the design of scientific results.*
20. *Give web resources of professional scientific periodicals.*
21. *Justify the need for mathematical processing of experimental data.*
22. *Provide ways to accumulate and store scientific information.*
23. *Describe scientometric databases.*
24. *Describe information and search engines.*
25. *Describe the role of information in science.*

Work program of the discipline (syllabus):

Warehouse *Assoc. Prof. Vita Halysh*

Approved *by the Department of E and TRP (Protocol No. 14 of 18.05.2023)*

Approved *by the IHF Methodical Commission (Protocol No. 10 of 26.05.2023)*