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

Machines and devices of chemical and oil refining industries

Pre-diploma practice

Working program of the academic discipline (Syllabus)

Details of the academic discipline	
Level of higher education	***First (undergraduate)***
Branch of knowledge	*13 Mechanical engineering*
Specialty	*133 Industrial engineering*
Educational program	*Computer-integrated technologies of chemical engineering equipment design*
Discipline status	*Mandatory*
Form of education	*daytime*
Year of training, semester	*4th year, spring semester*
Scope of the discipline	*6 credits*
Semester control/ control measures	*Test*
Lessons schedule	*http://rozklad.kpi.ua/Schedules/ScheduleGroupSelection.aspx*
Language of teaching	*Ukrainian*
Information about head of the course / teachers	*Heads of bachelor's degrees*
Placement of the course	https://ci.kpi.ua/uk/syllabuses-bac-disciplines/#place

Program of educational discipline

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

The purpose of the educational discipline is to form students' competence:

- *Ability to generate new ideas (creativity).*
- *Ability to think systematically.*
- *Ability to achieve set goals.*
- *Abilityapply professional knowledge to conceptualize engineering solutions;*
- *Abilityprepare raw data for the selection and justification of scientific, technical and organizational decisions;*
- *Abilityuse knowledge to analyze engineering products, processes and methods; the ability to choose and apply appropriate analytical methods and mathematical modeling methods;*
- *Abilityprovide modeling of technical objects and technological processes using standard packages and means of automation of engineering calculations, conduct experiments according to specified methods with processing and analysis of results;*

1.2. The main tasks of the academic discipline.
After mastering the academic discipline, students must demonstrate the following learning outcomes:

- *knowledge of the structure and production programs of the workshop, KB, department, laboratory; peculiarities of the technological process, design and construction or scientific research works, regularities of calculation, design, operation, repair of the main technological equipment; technical and economic indicators of work of the shop, department, KB of the laboratory; measures for safety, labor protection, fire-fighting equipment, production ecology.*

1. **Pre-requisites and post-requisites of the discipline (place in the structural and logical scheme of training according to the relevant educational program)**

A list of disciplines that a student needs to master (requirements for the level of training) for successful mastery of the discipline:

- *Mathematics - 1. Analytical geometry. Differential and integral calculus.*
- *Mathematics - 2. Functions of many variables. Rows Probability theory.*
- *Engineering and computer graphics - 1. Engineering graphics.*
- *Engineering and computer graphics - 2. Computer graphics.*
- *Processes and devices of chemical industries.*
- *Calculation and design of apparatus for chemical production.*

2. **Content of the academic discipline**

Section 1. Safety techniques and labor protection

Topic 1.1. Safety equipment and occupational health and safety at the practice facility

Topic 1.2. Safety equipment and labor protection in the unit

Topic 1.3. Safety techniques and occupational health and safety at workplaces

Topic 1.4. Study of the ecological foundations of environmental protection

Section 2. General information about the object of practice

Topic 2.1. Study of the work of the main structural divisions, the organization of their production and research activities

Topic 2.2. Studying the specifics of work and the range of production, scientific and research tasks, the solution of which is being worked on by a separate structural unit

Topic 2.3.Study of technical and economic indicators of the unit's work efficiency

Chapter 3. Work on an individual task

Topic 3.1. Preparation and study of materials for an individual task

Topic 3.2. Carrying out clarifying laboratory studies

Topic 3.3. Processing and generalization of experimental research results

Topic 3.4. Checking the provisions of mathematical and physical modeling and the scientific novelty of the proposed solutions

Topic 3.5. Conclusions and recommendations regarding the method of calculating processes and equipment of the chosen scientific field

Section 1.Usingnumerical methods.

Topic 1.1 Numerical solution of equations.

Introduction. The purpose and tasks of the course are given. The main principles of using numerical methods for solving equations are considered. Basic numerical methods of solution are presented. A solution using programming environments is considered.

Chapter 2. Combined problems.

Topic 2.1 Basic principles of working with one-dimensional arrays.

Work with records, cartels and the specifics of algorithms for this work are considered.

Topic 2.2 Basic principles of working with two-dimensional arrays.

The work with multi-level records, cartels and the specifics of the algorithms of this work are considered.

Chapter 3. Numerical integration.

Topic 3.1 Calculation of definite integrals.

The basic principles of using numerical integration are presented.A solution using programming environments is considered.

Chapter 4. Approximation of functions.

Topic 4.1 Interpolation formulas.

The purpose of interpolation and its use for scientific and engineering purposes is considered. Different methods of interpolation and extrapolation, how to solve them, the specifics of using different computer programs.

Topic 4.2 Approximation of functions.

The purpose of approximation and its use in scientific and engineering purposes is considered. Different methods of approximation, how to solve them, the specifics of using different computer programs.

3. Educational materials and resources

3.1 Basic

1. *Methodological instructions for the execution of the report on production practice of the educational and qualification level "Bachelor" for students studying in the field of training 6.050503 Mechanical engineering: [Electronic resource]: / NTUU "KPI"; structure. A. R. Stepaniuk. - Kyiv: NTUU "KPI", 2014. - 24 p.(Full text, pdf, 0.5 Mb)*
2. *Methodological instructions for the completion of the report on pre-diploma practice of the educational and qualification level "Bachelor" for students studying in the field of training 6.050503 Mechanical engineering: [Electronic resource]: / NTUU "KPI"; structure. A.R. Stepaniuk - Kyiv: NTUU "KPI", 2014. - 24 p.*
   (Full text, pdf, 0.65 Mb)
3. *Methodological instructions for the completion of the report on pre-diploma practice of the educational and qualification level "MASTER" for students studying in the field of training 6.050503 Mechanical engineering, specialty 8.05050315 "Equipment of chemical production and construction materials enterprises": [Electronic resource]: / NTUU "KPI"; structure. A.R. Stepaniuk - Kyiv: NTUU "KPI", 2014. - 21 p.(Full text, pdf, 0.65 Mb)*
4. *Altshuller H.S. Find an idea. Introduction to the theory of solving inventive problems. - Novosibirsk: Nauka, 1986. - 209 p.*
5. *Akhnazarova S.L., Kafarov V.V. Experiment optimization in chemistry and chemical technology: Uchebn. allowance for chemical and technological universities. - M.: Higher. school, 1978. - 319 p.*
6. *Batuner L.M., Pozin M.E. Mathematical methods in chemical engineering. - L.: Goshimizdat, 1960. - p.*
7. *Butuzov A.I., Minakovsky V.M. Generalized variable transfer theories. - K.: Higher School, 1970. - 100 p.*
8. *V.V. Kovalchuk, L.M. Moiseev. Basics of scientific research: Education. manual. – K.: VD "Professional", 2007. – 240 p.*
9. *V.K. Sydorenko, P.V. Dmytrenko. Basics of scientific research: Education. manual. – K.: RNNC "DINIT", 2000. – 259 p.*
10. *Vasylyuk A., Pakhotsynskyi R., Yakovets N. Modern educational systems: Education. manual. - Nizhin: NDPU, 2002. - 139 p.*
11. *Voznesensky V.A. Statistical methods of experiment planning in technical and economic studies. - M.: Statistics, 1974. - 192 p.*
12. *Gelperin N.I. Basic processes and apparatuses of chemical technology. Part 1, 2. - M.: Khimiya, 1981. - 811p.*
13. *Guhman A.A. Application of the similarity theory to the study of heat-mass exchange processes. - M.: Higher. school, 1974. - 328 p.*
14. *Draper N., Smith H. Applied regression analysis: Trans. with English - M.: Statistics, 1973. - 392 p.*
15. *DSTU 2777–94 Heat exchange during boiling and condensation. Terms and definitions.*
16. *Ioffe I.L. Designing processes and apparatuses of chemical technology. - L.: Khimiya, 1991. - 352 p.*
17. *Kasatkin A.H. Basic processes and apparatuses of chemical technology. - M.: Khimiya, 1971. - 784 p.*

18. *Kafarov V.V. Fundamentals of mass transfer: Gas-liquid, vapor-liquid, liquid-liquid systems. - M.: Higher School, 1962. - 656 p.*
19. *Kirillyn V.A., Sychev V.V., Sheindlin A.E. Technical thermodynamics. - Moscow: Energy, 1974. - 448 p.*
20. *Kirpychev M.V., Konakov P.K. Mathematical foundations of the theory of similarity. - M.-L.: Izd. Academy of Sciences of the USSR, 1949. - 103 p.*
21. *Kogan V.B., Fridman V.M., Kafarov V.V. Equilibrium between liquid and vapor. - M.-L.: Nauka, 1966. - Book. 1-2.*
22. *Krasilnikova G., Samsonov V., Tarelkin S. Automation of engineering and graphic works. - St. Petersburg: Peter, 2001. - 256p.*
23. *Kraskevich V. E., Zelensky K. Kh., Grechko V. I. Numerical methods in engineering research. - K.: Higher School, 1986. - 263 p.*
24. *Kuznetsov N.D., Chistyakov V.S. Collection of problems and questions on heat-technical measurements and devices: Textbook. allowance for universities. - M.: Energoatomizdat, 1985. - 328 p.*
25. *Lashchinsky A.A. Construction of welded chemical apparatus: Reference book. - L.: Khimiya, 1981. - 382 p.*
26. *Lectures in higher school: Method. instructions for young teachers / State A.I. Astakhov, A.A. Odintsov. - K.: KPI, 1983. - 48 p.*
27. *Lvovsky E.N. Statistical methods of constructing empirical formulas. - M.: Higher. school, 1982. - 224 p.*
28. *Lvovsky E.N. Statistical methods of constructing empirical formulas: Textbook. allowance for university students. - M.: Higher. school, 1988. - 239 p.*
29. *Ludmirskaya G.S., Barsukova T.A., Bogomolny A.M. Liquid-vapor equilibrium. - L.: Khimiya, 1987. - 336 p.*
30. *Sverdan M.M., Sverdan M.R. Basics of scientific research: Education. manual. – Chernivtsi: Ruta, 2006. – 352 p.*
31. *Mathematical modeling/ V.I. Skurikhin, V.B. Shifrin, V.V. Dubrovsky. - K.: Technika, 1983. - 270 p.*
32. *Kushnarenko N.M., Udalov V.K. Scientific processing of documents: Textbook. - K.: Znannia, 2006. - 331 p.*
33. *Nalymov V.V. The theory of the experiment. - M.: Nauka, 1971. - 208 p.*
34. *Basic processes and apparatuses of chemical technology: Handbook on design / Ed. Yu.I. Ditnersky - M.: Khimiya, 1991. - 496 p.*
35. *Ostrovsky H.M., Volyn Y.M. Modeling of complex chemical and technological systems. - M.: Khimiya, 1975. - 311 p.*
36. *Shcherban P.M. Applied pedagogy: Teaching method. manual. - K.: Vyshcha Shk., 2002. -215 p.*
37. *Pedagogical mastery of a higher school teacher: Method. instructions for young teachers / State A.I. Astakhov. - K.: KPI, 1982. - 42 p.*
38. *Experiment planning/Ed. H.K. Krug. - M.: Nauka, 19661. - 424 p.*
39. *Planovsky A.N., Nikolaev P.I. Processes and devices of chemical and petrochemical technology. - M.: Khimiya, 1987. - 490 p.*
40. *Planovsky A.N., Ramm V.M., Kagan S.Z. Processes and devices of chemical technology. - M.: Khimiya, 1968. - 848 p.*
41. *Construction of mathematical models of chemical and technological objects/ Dudnikov E.G., Balakyrev V.S., Kryvsunov V.N. and others - L.: Khimiya, 1970. - 312 p.*
42. *Workshop on heat transfer: Tutorial. aid for universities / Solodov A.P., Tsvetkov F.F., Eliseev A.V. etc.; Ed. A.P. Solodova. - M.: Energoatomizdat, 1986. - 296 p.*
43. *Industrial heat and mass exchange processes and installations / Ed. A.M. Baklastov. - M.: Energoatomizdat, 1986. - 328 p.*
44. *Rakhmilevych Z.Z., Radzyn I.M., Faramazov S.A. Handbook of chemical and petrochemical production mechanics. - M.: Khimiya, 1985. - 592 p.*
45. *Rego K.G. Mathematical processing of the results of technical measurements: Ref. allowance - K.: Technika, 1987. - 128 p.*

46. *Romankov P.G., Noskov A.A. A collection of calculation charts for the course of chemical technology processes and apparatus. - L.: Chemistry, 1977. - 24 p.*
47. *Ruzynov L.P. Statistical methods of optimization of chemical processes. - M.: Khimiya, 19725. - 200 p.*
48. *Properties of organic compounds: Handbook / Ed. A.A. Fun - L.: Khimiya, 1984. - 520 p.*
49. *Skoblo A.I., Tregubova I.A., Molokanov Yu.K. Processes and devices of the oil refining and petrochemical industry. - L.: Khimiya, 1982. - 363 p.*
50. *Chemist's Handbook. Vol. 1.– M.-L.: Goshimizdat, 1963. – 1071 p.*
51. *Statistical methods in engineering studies (laboratory workshop): Textbook. manual/ Borodyuk V.P., Voshchynin A.P., Ivanov V.Z. etc.; Ed. H.K. Kruga. - M.: Vysshaya Shk., 1983. - 216 p.*
52. *Tananayko Yu.M., Vorontsov E.G. Methods of calculation and research of film processes. - K.: Tehnika, 1975. - 312 p.*
53. *Heat engineering reference book. Vol. 2. - M.: Energia, 1976. - 896 p.*
54. *Faramazov S.A. Labor protection during operation and repair of equipment of chemical and oil refining enterprises. - M.: Khimiya, 1985. - 224 p.*
55. *Fitsula M.M. Higher school pedagogy: Education. manual. - K.: Akademvydav, 2006. - 352 p.*
56. *Shenk H. Theory of engineering experiment: Trans. with English / Ed. N.P. Buslenko. - M.: Mir, 1972. - 381 p.*

Educational content

4. Independent work of student

Independent work is 100% study of the credit module, which includes preparation for the credit. The main task of the independent work of students is to deepen worldview and scientific knowledge in the directions by searching for the necessary information, forming perseverance and creative search in the formation of working hypotheses for the intensification of transfer processes.

Policy and control

5. Policy of academic discipline (educational component)

Rules for assigning incentive and penalty points

- *incentive points can be awarded by the teacher exclusively for the performance of creative works and working hypotheses.*
  But their sum cannot exceed 25% of the rating scale.
- *Penalty points are not provided within the academic discipline.*

Policy of deadlines and rescheduling

In case of academic debts arising from the academic discipline or any force majeure circumstances, graduate students should contact the teacher to coordinate the algorithm of actions related to the solution of existing problems.

Policy of academic integrity

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. Inadmissible tips and write-offs during writing tests, conducting classes.
The policy and principles of academic integrity are defined in Chapter 3 of the Code of Honor of the National Technical University of Ukraine "Ihor Sikorsky Kyiv Polytechnic Institute". More details:https://kpi.ua/code

Policy of academic behavior and ethics

Graduate students must be tolerant, respect the opinion of others, formulate objections in the correct form, adequately support feedback during classes.

Standards of ethical behavior of students and employees are defined in Chapter 2 of the Code of Honor of the National Technical University of Ukraine "Ihor Sikorskyi Kyiv Polytechnic Institute". More details:https://kpi.ua/code

6. Types of control and rating system for evaluating learning outcomes (RSO)

Distribution of study time by types of classes and tasks in the discipline according to the working study plan:

Semester	Training time		Distribution of study hours				Control measures		
	Credits	Acad. hours	Lectures	Practical	Lab. do	SRS	MKR	RR	Semester control
12	6	270	-	-	–	270	-	–	test

The student's rating in the discipline consists of the points he receives for:
Work on the report and assessment.

Semester control is credit.

System of rating (weighted) points and evaluation criteria

The system of rating points and evaluation criteria:

Report execution and report protection

R =20+80 = 100 points

The maximum number of points is 100. To receive credit from the credit module "automatically" you need to have a rating of at least 60 points.

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

Students who scored a rating of less than 0.6 R during the semester, as well as those who want to improve the overall rating, complete a credit test. At the same time, all the points they received during the semester are cancelled. Test tasks contain questions that refer to different sections of the credit module. The list of assessment questions is given in Chapter 9.

To obtain a passing grade, the sum of all rating points R received during the semester is converted 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 not met	*not allowed*

Working program of the academic discipline (syllabus):
Compiled by Roman Sachko, senior lecturer of the Department of the National Academy of Sciences of the Russian Academy of Sciences, candidate of technical sciences
Approved by the Department of the Academy of Medical Sciences (protocol No. 20 dated June 20, 2022)
Agreed by the Methodical Commission of the faculty (protocol No. 10 dated 24.06.2022)