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

Machines and devices of chemical and oil refining industries

DEEP PROCESSING OF HIGH MOLECULAR COMPOUND

Working program of the academic discipline (Syllabus)

Details of the academic discipline	
Level of higher education	***Second (master's)***
Branch of knowledge	*13 Mechanical engineering*
Specialty	*133 Industrial engineering*
Educational program	*Engineering and computer-integrated design technologies of innovative industry equipment*
Discipline status	*Selective*
Form of education	*Daytime*
Year of training, semester	*1st year, spring semester*
Scope of the discipline	*4 credits*
Semester control/ control measures	*Exam*
Lessons schedule	*http://rozklad.kpi.ua/Schedules/ScheduleGroupSelection.aspx*
Language of teaching	*Ukrainian*
Information about head of the course / teachers	*Lecturer/Practical/ Practical: associate professor of the Department MAHNP, Associate Professor M.P. Shved, < npchved46@gmail.com >*
Placement of the course	https://ci.kpi.ua/uk/syllabuses-bac-disciplines/#place

Program of study discipline

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

- *the ability to carry out calculation and design, modernization and operation along the entire life cycle of equipment, and disposal of waste from deep processing of organic raw materials.*

1.2. The main tasks of the academic discipline.

***knowledge**:*

- *modern approaches, methods and techniques, solving problems in design, maintenance, modernization and operation along the entire life cycle of equipment, and disposal of waste from deep processing of organic raw materials*

skill:

- *using scientific and technical information, regulatory documents, professional knowledge, perform calculation and design, modernization and operation along the entire life cycle of equipment, and disposal of waste from deep processing of organic raw materials*

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

The list of disciplines, the mastery of which is necessary for the student (requirements for the level of preparation) for successful mastering of the discipline:

- *Processes and equipment of chemical technologies*

the list of disciplines that are based on the results of training in this discipline.:

- *Pre-diploma practice*
- *Diploma design*

2. Content of the academic discipline

Chapter 1. Theoretical foundations of polymer production processes.

Topic 1.1. Properties of polymers as high molecular weight compounds.

Information is given on the structure, main properties and raw materials for the production of polymers, the composition of plastics. Types of deformations, stress tensor and deformation rates are considered and their physical meaning is revealed. The main thermophysical properties of polymers, simple shear, Hooke's law, dissipation energy are considered. The classification of non-Newtonian fluids is given. The spherical tensor and deviator, properties of polymer melts, power equation are considered. Flow curves are processed. Rheological equations of Newtonian and non-Newtonian fluids, invariants of the strain rate tensor are considered.

Topic 1.2. Typical technological schemes of polymer synthesis.

The general characteristics of polymer synthesis processes are given. The mechanism of polymerization and polycondensation reactions is considered. The main technological schemes of polymer synthesis processes are presented. The method of synthesis of polymers in mass, emulsion, suspension, solution is considered. The types of polymer materials, their main characteristics, areas of application, and labeling are given. A general classification of fusion reactors is given. Advantages and disadvantages of polymer synthesis methods (in mass, solution, emulsion and suspension) are considered.

Topic 1.3. Kinetics of chemical transformations during the synthesis of polymers.

The physical content of reaction speed and conversion speed is considered. Methods of controlling the conversion rate are considered. Peculiarities of the kinetics of homogeneous transformations are considered using the example of a simple and complex (reversible) chemical reaction. The equations for determining the rate of a chemical reaction, the main factors that affect the rate of a chemical reaction, the Arrhenius equation are given. The peculiarities of the kinetics of heterogeneous transformations in liquid-liquid systems, the physical meaning of the diffusion coefficient are considered. The peculiarities of the kinetics of heterogeneous transformations in liquid-solid systems, the physical meaning of the mass transfer coefficient are considered.

Chapter 2. Basics of modeling polymer synthesis processes

Topic 2.1. General mathematical model of synthesis processes.

The equations of conservation of mass and energy for batch reactors (capacitive type), their physical essence and partial cases are considered. The equations of conservation of mass, energy and amount of movement in general form are considered. The equation of conservation of mass and energy for continuous reactors (tubular and column types), their physical essence and partial cases are considered. The main laws of mass and energy transfer, the concept of a solid environment are considered. The physical meaning of the concept of "ideal mixing and ideal displacement reactors" is considered. The principle of formulating mathematical models of batch and continuous reactors is given. The system of conservation equations in a general form and the principles of its solution are given. Hydrodynamics in tank and tubular reactors are considered. The method of calculating the number of revolutions of mixing devices is presented. The classification of mixing devices is given. Heat exchange processes in reactors are analyzed. Heat balance and heat transfer in reactors are considered. The conditions of stable operation of reactors are determined. The physical content of the heat of dissipation and its influence on the course of polymer synthesis processes are considered.

Topic 2.2. Modeling of periodic devices.

The mathematical model, calculation algorithm, thermal and material balances of batch reactors are considered.

Topic 2.3. Modeling of devices of continuous action.

The mathematical model, calculation algorithm, thermal and material balances of continuous reactors are considered.

Chapter 3. Basic methods of polymer processing.

Topic 3.1. Classification of methods and their implementation in technological schemes.

The main properties of polymers are considered and the classification of the main methods of their processing (extrusion, injection molding, blow molding, pneumatic and vacuum forming, pressing, calendering), as well as technological schemes of these methods are given.

Chapter 4. Extrusion processing methods.

Topic 4.1. Equipment for the preparation of melt.

The principle of operation and design features of extruders, the physical model of extrusion, the principle of calculation using the stepwise approximation method are considered.

Topic 4.2. Modeling of melt preparation processes.

Mathematical models of the processes taking place in separate zones of the extruder (feeding, melting, homogenization), algorithms for their calculation are considered. Gives the principle of building a general algorithm for calculating worm extruders, choosing the geometry of working bodies and modes of polymer processing.

Topic 4.3. Processes and equipment for forming products.

The peculiarities of product formation and the design of forming heads, the generalized algorithm of their calculation, the functional connection of the extruder and the forming head, operating characteristics and operating points are considered.

Topic 4.4. Processes and equipment for heat treatment of products.

The principles of modeling heat treatment processes and the design features of the equipment are considered. The algorithm for calculating heat treatment processes is considered using the example of a polymer pipe cooling scheme.

Chapter 5. Modeling of thermal processes of deep oil refining.

Topic 5.1

their columns The method of sizing the elements of the fractionating rectification column is given.

3. Educational materials and resources

3.1 Basic

1. *Synopsis of lectures. Access from the screen:http://login.kpi.ua.*
2. *Radchenko L.B. Processing of thermoplastics by the extrusion method: Science. manual. - K.: IZMN, 1999. - 220c.*
3. *Radchenko L.B. Sivetsky V.I. Basics of modeling and designing worm extruders: Science. manual. - K.: Polytechnic, 2002. - 152c.*
4. *Piven O.N., Grechana N.A., Chornobylskyi I.I. Thermophysical properties of polymeric materials. Directory. - K.: Higher School, 1975. - 317 p.*
5. *Thermophysical and rheological characteristics and friction coefficients of filled thermoplastics. Handbook / Under the editorship of Yu.S. Lipatova - K.: Science. dumka, 1977. - 244 p.*
6. *Study of rheological properties of polymer solutions. Methodical instructions for the performance of laboratory work by students of the specialty: 133 Industrial mechanical engineering, specialization: Engineering, equipment and technologies of chemical and oil refining industries, educational and qualification level specialist in the discipline "Equipment for the synthesis and processing of polymeric materials": [Electronic resource] / "KPI im. . Igor Sikorsky"; structure. M. P. Shved, A. R. Stepaniuk. - Kyiv: "KPI named after Igor Sikorsky", 2017. 17p. Access from the screen:http://si.kpi.ua.*
7. *Research of the line for the production of sleeve polymer film. Methodical instructions for laboratory work / Radchenko L.B., Ruzhynska L.I., Shved M.P., Stepaniuk A.R. - K.: NTUU "KPI", 1998. - 44 p.*

3.2. Auxiliary

1. *Trokhin Y.Y., Bebko V.V. Processes and equipment for the production of polymeric materials. - K.: KPI, 1985. - 11 p.*

Educational content

4. Methods of mastering an educational discipline (educational component)

Lecture classes

Lectures are aimed at:

- *provision of modern, comprehensive in-depth knowledge of the discipline, the level of which is determined by the target attitude to each specific topic;*
- *provision of critical creative work together with the teacher in the process of work;*
- *education of acquirers of professional qualities and development of their independent creative thinking;*
- *awareness of global trends in the development of science in the field of processes and technology of primary gas and oil processing;*
- *awareness of the methods of processing information resources and determining the main directions for solving specific scientific and technical problems;*
- *teaching research materials in a clear and high-quality language in compliance with structural and logical connections, clarification of all given terms and concepts available for perception by the audience.*

No s/p	***The name of the topic of the lecture and a list of the main questions (a list of didactic tools, references to the literature and tasks on the SRS)***	***Number hours***
	Chapter 1. Theoretical foundations of polymer production processes.	
	Topic 1.1. Properties of polymers as high molecular weight compounds.	
1-1	*Structure, main properties and raw materials for the production of polymers. Composition of plastics. Types of deformations.* *Literature: 1-5.* *Task on SRS: Thermophysical properties of polymers. A simple shift. Hooke's law. Energy dissipation.*	*1*
1-2	*Properties of polymer melts. Classification of non-Newtonian fluids. Power equation. Processing of current curves.* *Literature: 3-8, 18.* *Tasks on SRS: Types of polymer materials and their labeling. Main characteristics and areas of application.*	*1*
Topic 1.2. Typical technological schemes of polymer synthesis. ***Topic 1.3. Kinetics of chemical transformations during the synthesis of polymers.***		
2-1	*General characteristics of polymer synthesis processes. Polymerization and polycondensation reactions, mechanism of flow. Examples of technological schemes of synthesis processes. Bulk synthesis of polymers.* *Literature: 1, 2, 11-14.* *Task on SRS: General classification of fusion reactors. Reaction speed and conversion speed. Controlling the conversion rate.*	*1*
2-2	*Examples of technological schemes of synthesis processes. Synthesis of polymers in solution.* *Literature: 1, 2, 11-14.* *Task on SRS: Kinetics of homogeneous transformations. Simple and complex (reversible) chemical reactions.*	*1*
3-1	*Examples of technological schemes of synthesis processes. Synthesis of polymers in emulsion and suspension. Advantages and disadvantages of polymer synthesis methods (mass, solution, emulsion and suspension).* *Literature: 1, 2, 11-14.*	*1*

	Task on SRS: Kinetics of heterogeneous transformations in liquid-liquid, liquid-solid systems.	
	Chapter 2. Basics of modeling polymer synthesis processes	
	Topic 2.1. General mathematical model of synthesis processes.	
3-2	*Basic laws of mass and energy transfer. The concept of a continuous environment. Mass and energy conservation equation for batch reactors (capacitive type). Physical essence and partial cases.* *Literature: 7, 8.* *Task on SRS: Equation of conservation of mass and energy for reactors of continuous action (tubular and column types). Physical essence and partial cases.*	*1*
4-1	*Hydrodynamics in tank and tubular reactors. Types of mixing devices. Calculation of the number of revolutions of mixing devices.* *Literature: 14.* *Tasks on SRS: Reactors of ideal mixing and ideal displacement. Formulation of mathematical models of batch and continuous reactors.* *Literature: 7-13.*	*1*
4-2	*Heat exchange in reactors. Heat balance, heat transfer.* *Literature: 15.* *Tasks at SRS: Conditions for stable operation of reactors.*	*1*
Topic 2.2. Modeling of periodic devices.		
5-1	*Mathematical model of the batch reactor of the capacitive type.* *Literature: 11, 16, 17.* *Task on SRS: Algorithm for calculation of a reactor of periodic action of the capacitive type.*	*1*
Topic 2.3. Modeling of devices of continuous action.		
5-2	*Mathematical model of a continuous reactor.* *Literature: 11, 16, 17.* *Task on SRS: Algorithm for calculating a continuous reactor.*	*1*
	Chapter 3. Basic methods of polymer processing	
	Topic 3.1. Classification of methods and their implementation in technological schemes	
6-1	*Properties of polymers. Classification of the main methods of processing them into products (extrusion, injection molding, blow molding, pneumatic and vacuum molding, pressing, calendering).* *Literature: 1, 5, 6.* *Tasks at SRS: Technological diagrams illustrating the main methods of processing (extrusion, injection molding, blow molding, pneumatic and vacuum forming, pressing, calendering), and equipment for their implementation.* *Literature: 2-10.*	*1*
	Chapter 4. Extrusion methods of polymer processing	
	Topic 4.1. Equipment for the preparation of melt	
7-1	*Characteristics of melt preparation equipment. Extruders. Principle of action, classification, design features.* *Literature: 5-10.* *Tasks on SRS: Design features of extruders.* *Literature: 5-10.*	*1*
7-2	*A physical model of the processes in the worm channel (feeding, melting, homogenization). The principles of constructing algorithms for calculating extruders as a whole as a sequence of algorithms for calculating individual processes.* *Literature: 5-6.* *Task on SRS: Generalized algorithm for calculating extruders.* *Literature: 5-10.*	*1*

	Topic 4.2. Modeling of melt preparation processes	
	Mathematical model of the feeding process in the worm channel and its analysis. *Literature: 5-10.* *Task on SRS: Algorithm for calculating the feeding process in the worm channel.* *Literature: 5-6.*	
8-1	*Mathematical model of the melting process in the worm channel and its analysis.* *Literature: 5-10.* *Task on SRS: Algorithm for calculating the melting process in the worm channel.* *Literature: 5-6.*	*1*
8-2	*Mathematical model of the process of homogenization in the worm channel and its analysis. Selection of dimensions and construction of the geometry of the working organs of the worm extruder.* *Literature: 2-10.* *Task on SRS: Algorithm for calculating the homogenization process. Algorithm of the design calculation of the worm extruder.* *Literature: 5-6.*	*1*
	Topic 4.3. Processes and equipment for forming products	
9-1	*Design features of molding heads and principles of their calculation.* *Literature: 2-10.* *Task on SRS: Generalized algorithm for calculating forming heads.* *Literature: 5-6.*	*1*
9-2	*Functional connection of the extruder and the forming head. Operating characteristics and operating points.* *Literature: 5-6.* *Task on SRS: Optimizing the geometry of the working bodies of extruders.* *Literature: 2-10.*	*1*

Practical training

Applicants should be helped to develop creative thinking, a creative approach to the scientific substantiation of the research direction and methodology. The main tasks of the cycle of practical classes:

- *to help applicants deepen their theoretical knowledge in the field of processes and technology of primary gas and oil refining;*
- *to promote the training of miners in the methodology of determining the properties of oils and the peculiarities of their processing;*
- *form criteria for evaluating the efficiency of primary gas and oil refining processes.*

No s/p	***The name of the topic of the practical lesson and the list of main questions (list of didactic support, references to the literature and tasks on the SRS)***	***Number hours***
Chapter 1. Theoretical foundations of polymer production processes		
Topic 1.1. Properties of polymers as high molecular weight compounds.		
1-3	*Study of thermophysical and rheological properties of polymer melts.* *Literature: 3-8, 18-24.*	*6*
4-6	*Study of the melt flow rate of polymers.* *Literature: 11, 16, 17.*	*6*
7-9	*Study of thermophysical and rheological properties of polymer melts.*	*6*

	Literature: 3-8, 18-24.	
	Chapter 4. Extrusion methods of polymer processing	
	Topic 4.2. Modeling of melt preparation processes	
10-12	*Research of the process and equipment in the production of polymer pipes by the extrusion method.* *Literature: 5-8.*	*6*
13-16	*Polymer flow modeling*	***6***
	Literature: 5-8.	
17	*Modeling of processes in the forming head*	*2*
	Literature: 5-8.	
18	*MKR*	*2*

5. Independent work of student

Independent work makes up 50% of the study of the credit module, which includes preparation for the credit. The main task of independent workacquirers- this is the deepening of worldview and scientific knowledge in the directions specified in the lectures, by searching for the necessary information, forming perseverance and creative search in the formation of working hypotheses.

No s/p	***Title of the topic, list of didactic support, references to the literature and tasks on the SRS***	***Number hours***
	Chapter 1. Theoretical foundations of polymer production processes.	
	Topic 1.1. Properties of polymers as high molecular weight compounds.	
1	*Thermophysical properties of polymers. A simple shift. Hooke's law. Energy dissipation.* *Literature:*	*4*
2	*Types of polymer materials and their marking. Main characteristics and areas of application.* *Literature:*	*4*
	Topic 1.2. Typical technological schemes of polymer synthesis. *Topic 1.3. Kinetics of chemical transformations during the synthesis of polymers.*	
3	*General classification of fusion reactors. Reaction speed and conversion speed. Controlling the conversion rate.* *Literature:*	*4*
4	*Kinetics of homogeneous transformations. Simple and complex (reversible) chemical reactions.* *Literature:*	*4*
5	*Kinetics of heterogeneous transformations in liquid-liquid, liquid-solid systems.* *Literature:*	*4*
	Chapter 2. Basics of modeling polymer synthesis processes	
	Topic 2.1. General mathematical model of synthesis processes.	
6	*Equation of conservation of mass and energy for continuous reactors (tubular and column types). Physical essence and partial cases.* *Literature:*	*4*
7	*Ideal mixing and ideal displacement reactors. Formulation of mathematical models of batch and continuous reactors.* *Literature: 7-13.*	*4*
8	*Conditions of stable operation of reactors.* *Literature:*	*4*
	Topic 2.2. Modeling of periodic devices.	
9	*Algorithm of calculation of the reactor of periodic action of the capacitive type.*	*4*

	Literature:	
	Topic 2.3. Modeling of devices of continuous action.	
10	*Algorithm for the calculation of a continuous reactor.* *Literature:*	*4*
	Chapter 3. Basic methods of polymer processing	
	Topic 3.1. Classification of methods and their implementation in technological schemes	
11	*Technological schemes illustrating the main methods of processing (extrusion, injection molding, blow molding, pneumatic and vacuum forming, pressing, calendering), and equipment for their implementation.* *Literature: 2-10.*	*4*
	Chapter 4. Extrusion methods of polymer processing	
	Topic 4.1. Equipment for the preparation of melt	
12	*Design features of extruders.* *Literature: 5-10.*	*4*
13	*A generalized algorithm for calculating extruders.* *Literature: 5-10.*	*4*
	Topic 4.2. Modeling of melt preparation processes	
14	*Algorithm for calculating the feeding process in the worm channel.* *Literature: 5-6.*	*5*
15	*The algorithm for calculating the melting process in the worm channel.* *Literature: 5-6.*	*5*
16	*Algorithm for calculating the homogenization process. Algorithm for the design calculation of a worm extruder.* *Literature: 5-6.*	*5*
	Topic 4.3. Processes and equipment for forming products	
17	*A generalized algorithm for calculating forming heads.* *Literature: 2-10.*	*5*
18	*Optimization of the geometry of the working bodies of extruders.* *Literature: 2-10.*	*5*

Policy and control

6. Policy of academic discipline (educational component)

Rules of attending classes and behavior in classes

Attending classes is mandatory.Gettersare obliged to take an active part in the educational process, not to be late for classes and not to miss them without valid reasons, not to interfere with the teacher conducting classes and not to be distracted by activities unrelated to the educational process.

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,acquirersshould contact the teacher to coordinate the algorithm of actions related to solving existing problems.

Policy of academic integrity

Plagiarism and other forms of dishonest work are unacceptable. Plagiarism refers to 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

Gettersmust 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

7. 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
2	4	120	18	36	–	66	1	–	test

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

The rating of the applicant from the credit module consists of the points he receives for work in practical classes, lectures and MKR.

Semester control is an exam.

System of rating (weighted) points and evaluation criteria

A weighted point for questions in lectures is 1 point

The weighted score for practical classes is 2 points each;

Weighted score for the exam is 41 points

Criteria for evaluating the performance of a practical task

Completeness and signs of task completion	***Points***
The task is fully completed	*2*
Minor defects according to point 1	*1.5*
Untimely completion of the task	*1.0*
Untimely completion of the task, deficiencies under clause 1	*1.0*
Poor performance of the task	*1.0*
Failure to complete the task	*0*

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

$$R = 9\ 1 + 2\ 17 + 1 + 20 + 1\ 40 = 9 + 34 + 16 + 41 = 100 \text{ points}$$

According to the results of educational work in the first 7 weeks, the "ideal achiever" should score 20 points. At the first attestation (8th week), the applicant receives "credited" if his current rating is at least 20 points.

According to the results of the educational work in 13 weeks of training, the "ideal achiever" should score 400 points. At the second attestation (14th week), the applicant receives "credited" if his current rating is at least 40 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.

Getters, 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*

8. Additional information on the discipline (educational component)

An approximate list of questions submitted for semester control

The ticket consists of three questions

Part 1

- *Justify the purpose of worm machines.*
- *What are the main working organs of a worm extruder?*
- *Give the types of classification of high molecular weight substances.*
- *Give the classification of high molecular weight substances according to the origin of high molecular weight compounds (MHC).*
- *Give the classification of high molecular weight substances according to the nature of the Navy. are divided into:*
- *Give the classification of high-molecular substances according to the type of reaction of obtaining IMS*
- *Give the classification of high-molecular substances in relation to the action of elevated temperatures of the Navy.*
- *Give the classification of high molecular weight substances depending on the composition of the main (main) chain of the Navy*
- *Analyze the structure of polymer macromolecules*
- *Analyze the concepts of thermoplastics and thermoplastics.*
- *Analyze the concept of mechanical hysteresis.*
- *Analyze the concept of polyolefins and their properties.*
- *Analyze the concepts of polystyrene and its copolymers and their properties.*
- *Analyze the concept of polyvinyl chloride and its copolymers and their properties.*
- *Analyze the concept of polyvinyl acetate plastics and their properties.*

- *Analyze the concept of polymethyl methacrylate and their properties.*
- *Analyze the concept of polyamides and their properties.*
- *Analyze the concept of polyethylene terephthalate and their properties.*
- *Analyze the concept of fillers and composite materials based on polymers and their properties.*
- *Analyze the concept of polyolefins and their properties.*
- *Analyze the concept of polyolefins and their properties.*
- *Analyze the concept of polyolefins and their properties.*
- *Analyze the stages of chemical and technological processes.*
- *To analyze the following most used features of the classification of chemical reactors.*
- *Analyze the concept of hydrodynamic conditions in the reactor.*
- *Analyze the concept of heat exchange conditions in the reactor,*
- *Analyze the concept of the phase composition of the reaction mixture in the reactor.*
- *To analyze the concept of the method of organization of the process in the reactor.*
- *Analyze the concept of the nature of changes in process parameters over time in the reactor.*
- *Analyze the concept of structural characteristics of reactors.*
- *To analyze the technological process parameters in a batch reactor.*
- *Analyze the parameters of the technological process in a continuous reactor.*
- *To analyze the features of the tank reactor design.*
- *Analyze the design features of a column reactor.*
- *Analyze the design features of a tubular reactor.*
- *Analyze the basics of the theory of chemical reactors. reactors for homogeneous processes*
- *To analyze the mathematical model of the ideal mixing batch reactor*
- *To analyze the mathematical model of the ideal displacement reactor of continuous operation*
- *To analyze the mathematical model of the ideal mixing reactor of continuous action*
- *Analyze methods of manufacturing plastic products.*
- *Analyze the classification of methods of manufacturing plastic products.*
- *To analyze the physical and chemical bases of plastic processing*
- *Analyze conceptsfluidityand its use during polymer processing*
- *Analyze the areas of use of the melt flow index.*
- *Analyze the concept of rheological properties of polymer melts*
- *Analyze the determination of the viscosity of polymer melts on a capillary viscometer*
- *To analyze the operation of viscometers with coaxial cylinders ("cylinder-cylinder") and "cone-plane" type.*
- *Analyze the principle of operation and structural schemes of extruders.*
- *Analyze the use of worm extruders.*
- *To analyze the principle of action and the design scheme of a single-worm extruder of single-worm extruders.*
- *Analyze the scheme of the melting process of polymer material in a standard screw.*
- *Analyze the designs of screws with one-way threading.*
- *To justify the use of dispersive mixing elements.*
- *To analyze the principle of operation and structural schemes of multistage extruders.*
- *To analyze the principle of action and the necessity of using gear pumps in cascade disk-gear extrusion.*
- *Analyze the principle of action and the general structure and principle of action of a worm extruder.*
- *Analyze the principles of modeling extruders.*

Working program of the academic discipline (syllabus):

Compiled by associate professor of the MAHNV department, candidate of technical sciences, associate professor Mykola Shved

Approved by the Department of the MAHNV (protocol No. 20 of June 20, 2024)

Agreed by the Methodical Commission of the faculty (protocol No. 11 dated 28.06.2024)