al-Farabi Kazakh National University
Faculty of Chemistry and Chemical Technology
Department of Physical Chemistry, Catalysis and Petrochemistry
5B072100 – Chemical technology of organic substances
Syllabus
Autumn semester
2020-2021 Academic year

Academic course information

Discipline's code	Discipline's title	Number of hours				ECTS	IWST
		IWS	Lect.	Pract.	Lab.		
TTPOR4507	Technology of Thermal Processes in Oil Refinery	68	15	0	60	5	7
Lecturer	Kudaibergenov Nurbolat Zharylkasynuly PhD			Office hours		Scheduled	
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Telephone number	8 701 381 52 91			Auditory		306	

Academic presentation of the course	**Type of course** «Technology of Thermal Processes in Oil Refinery» is a basic component in the bachelor educational program for specialty "5B072100 – Chemical technology of organic substances". **Aim of course:** to form a system of competences in the context of qualification requirements: ***Cognitive:*** be able to - determine the properties of raw materials and processed products; - describe the most important typical technological schemes of thermal processes in oil refining; ***Functional:*** be able to - explain the mechanism, kinetics and thermodynamics of the of thermal processes in oil refining; - use knowledge about the course of reactions underlying the thermal processes of deep processing of hydrocarbon raw materials, as well as factors that affect the flow of technological processes, while performing laboratory work, solving practical problems, performing technological and thermal calculations in the graduation design; ***Systemic:*** be able to - draw up diagrams of installations the of thermal processes in oil refining; - choose specific techniques and methods for solving technological problems. ***Social:*** be able to - engage in dialogue; - defend their point of view; - work in a team; ***Metacompetences***: be able to evaluate the significance of the results in their own professional development.
Prerequisites	Organic Chemistry, General Chemical Technology, Basic Processes and Devices of Chemical Technologies, Oil refining, Gas and Coal Technology
Post requisites	Profile and special disciplines.
References and Resources	1. Суербаев, Х.А. Термические процессы переработки нефти. Алматы : Казак университеті, 2005. - 78 с.

	2. Корзун Н.В., Магарил Р.З. Термические процессы переработки нефти. М.: КДУ, 2008. — 96 с. 3. Гуреев А.А., Чернышева Е.А., Коновалов А.А., Кожевникова Ю.В. Производство нефтяных битумов. М.: Изд. Нефть и газ, 2007. - 102 с. 4. Суербаев, Х. А. Термические и каталитические процессы переработки нефти и газа: учебное пособие - Алматы : Казак университеті, 2008. - 178 с. 5. Солодова Н.Л., Абдуллин А.И. Пиролиз углеводородного сырья. Учебное пособие. - Казань, КГТУ, 2007. - 239 с. 6. Raseev S.D. Thermal and Catalytic Processes in Petroleum Refining. Marcel Dekker, Inc., 2003. - 920 p. 7. Словарь нефтяных терминов. Ссылка: http://www.npukk.ru/?q=node/188
Academic policy of the course in the context of university moral and ethical values	**Academic Behaviour Rules:** Compulsory attendance in the classroom, the impermissibility of late attendance. Without advance notice of absence and undue tardiness to the teacher is estimated at 0 points. Submission of assignments (Independent work of students, midterm control, laboratory tasks, projects and etc.) prior to the deadlines. The violation of submission deadlines leads to the deduction of penalty points. The students who not handed over the next task or have got for its performance less than 50% of points, have opportunity to fulfill the specified task according to the additional schedule. The students who have skipped laboratory classes for a good reason, fulfill them in an extra time in the presence of the laboratory assistant, after the admission of the teacher. The students who haven't performed everything types of works, aren't allowed to examination. Besides, at an assessment activity and attendance of students is considered during occupations. **Academic values:** Academic honesty and integrity: independent performance of assignments; inadmissibility of plagiarism, forgery, cheating at all stages of the knowledge control, and disrespectful attitude towards teachers. (The code of KazNU Student's honor) Be tolerant, respect foreign opinion. Objections formulate in a correct form. Plagiarism and other forms of dishonest work are unacceptable. The help and writing off are inadmissible during delivery of IWS, intermediate control and final examination, copying of the solved tasks by other persons, passing an examination for other student. The student convicted of falsification of any information of a course, unauthorized access to the Intranet, using cribs, will receive a total assessment of «F».
Evaluation and attestation policy	**Criteria-based evaluation:** assessment of learning outcomes in correlation with descriptors (verification of competence formation during midterm control and examinations). **Summative evaluation:** evaluation of the presence and activity of the work in the classroom; assessment of the assignment, independent work of students, The formula for calculating the final grade: Your total assessment will be calculated by a formula: $Total - assessment - on - discipline = (\text{BC1} + ME + \text{BC2}) * 0{,}6 + FE * 0{,}4$ Minimum estimates as a percentage are given below: 95% - 100%: A 90% - 94%: A- 85% - 89%: B+ 80% - 84%: B 75% - 79%: B- 70% - 74%: C+ 65% - 69%: C 60% - 64%: C- 55% - 59%: D+ 50% - 54%: D- 0% -49%: F

Calendar (schedule) the implementation of the course content:

Week / date	Topic title (lectures, practical classes, Independent work of students)	Number of hours	Max. score
1	**Lecture 1.** The history of the emergence and development of thermal processes of oil refining.	1	
	Laboratory 1: Introduction to safety in the laboratory and distribution of the work: «Thermal cracking petroleum» and «Obtaining of bitumen».	2	15
2	**Lecture 2.** Thermodynamics and kinetics of thermal reactions of petroleum hydrocarbons.	1	
	Independent work of student with teacher (IWST): Consultation on the implementation of the IWS 1	1	
	Laboratory 2: Letting the theory and techniques of laboratory work 1. Calculation of reactors of a thermal cracking coil under pressure.	2	15
3	**Lecture 3.** Thermal processes of oil refining in the gas phase. Fundamentals of the theory of gas-phase thermal reactions of hydrocarbons.	1	
	Laboratory 3: Calculation of the reactors of the thermal cracking chamber under pressure. Performing laboratory work: Determination of the relative density of the thermal cracking feedstock. Collecting the thermal cracking unit.	2	15
4	**Lecture 4.** Influence of operating conditions	1	
	Laboratory 4: Calculation of coke chambers on the delayed coking unit. Performing laboratory work: Thermal cracking. Analysis of gaseous products of cracking.	2	15
	IWST: Submission and defence of IWS 1. Calculation of the reaction coil and chambers of thermal cracking under pressure	1	25
5	**Lecture 5.** Thermal cracking at high pressures and moderate temperature. Visbreaking.	1	
	Laboratory 5: Distillation of liquid products of thermal cracking. Determination of the relative density of gasoline and cracking residues. Making a material balance by experience 1.	2	15
	BC1		100
6	**Lecture 6.** The thermal cracking of Straight Run Residue.	1	
	Laboratory 6: Thermal cracking. Analysis of gaseous products of cracking.	2	13
	IWST: Consultation on the implementation of the IWS 2	1	
7	**Lecture 7.** Cracking of Straight Run Residue. Thermal gasoil.	1	
	Laboratory 7: Distillation of liquid products of thermal cracking. Determination of the relative density of gasoline and cracking residues. Making a material balance by experience 2.	2	13
8	**Lecture 8.** Hydrovisbreaking and categories of visbreaking processes.	1	
	Laboratory 8. Calculations for laboratory work 1: determination of the heat of reaction, determination of the yield of gasoline.	2	13
	IWST: Submission and defence of IWS 2. Calculation of reaction devices coker oil residues.	1	23
9	**Lecture 9.** Coking. Delayed coking.	1	
	Laboratory 9: Letting the theory and techniques of laboratory work 1. Calculation of the reactor at coking plants in the fluidized bed of coke coolant.	2	13
	Lecture 10. Modern pyrolysis unit. The technological scheme of the	1	

10	process.		
	Laboratory 10: Collecting unit for production of bitumen. Performing laboratory work 2.	**2**	**25**
	IWST: Consultation on the implementation of the IWS 3	**1**	
	ME		**100**
11	**Lecture 11.** Fluid coking. The equipment for the fluid coking process.	**1**	
	Laboratory 11: Analysis of the bitumen.	**2**	**13**
12	**Lecture 12.** Flexicoking.	**1**	
	Laboratory 12: Letting calculations for laboratory work 2.	**2**	**13**
	IWST: Consultation on the implementation of the IWS 3	**1**	
13	**Lecture 13.** Pyrolysis. General issues of commercial pyrolysis.	**1**	
	Laboratory 13: Calculation of the furnace tube pyrolysis.	**2**	**13**
14	**Lecture 14.** Technological scheme and operation mode of delayed coking units.	**1**	
	Laboratory 14: Calculation of pyrolysis installations with moving layer of solid coolant.	**2**	**13**
	IWST: Submission and defence of IWS 3. Calculation of reaction devices coker oil residues	**1**	**23**
15	**Lecture 15.** Production of petroleum bitumen	**1**	
	Laboratory 15: A final report on laboratory work.	**2**	**25**
	BC2		**100**

Dean Tassibekov H.S.

Chairman of the Faculty Methodical Council Mangazbayeva R.A.

Head of the Department Aubakirov E.A.

Lecturer Kudaibergenov N.Zh.