

Identification	Subject	CHEM I Experimental Processes in Polymer Technology, 4 ECTS		
	Department	Chemistry and Chemical Engineering		
	Program	Postgraduate		
	Term	Fall 2026		
	Instructor	Ruslan Hajiyeu		
	E-mail:	ruslan.hajiyeu@khazar.org		
	Phone			
	Classroom/hours	TBC		
	Office hours			
Prerequisites				
Language	English			
Compulsory/Elective	Compulsory			
Required textbooks and course materials	• [1] Osswald, T. A. and Hernández-Ortiz, J. P., Polymer Processing: Modeling and Simulation, 2nd Edition, Hanser, 2021.. • [2] Tadmor, Z. and Gogos, C. G., Principles of Polymer Processing — Modern Perspectives, Elsevier, 2022. • [3] Rosato, D. V., Rosato, D. V., Injection Molding Handbook — Recent Advances and Process Optimization, 4th Edition, Springer, 2020.			
Website of course	This course is based on traditional face-to-face classes.			
Teaching methods	Lecture	X		
	Group discussion	X		
	Workshops	X		
Evaluation	Methods	Date/deadlines		Percentage (%)
	Midterm exam	TBC		30
	Assignment	TBC		20
	Quiz	2nd week of each month		10
	Final exam	TBC		40
	Total			100
Course outline	This course examines the principles and practice of polymer processing from a hands-on, application-driven perspective using published datasets, and case studies. Students will study polymer structure–property relationships, rheology, melt flow and viscosity behavior, and the theory behind extrusion, injection molding, film processing and compounding.Assessment combines quizzes, simulation reports, a midterm, a group process-design project, and a final exam.			
Course objectives	The course aims to develop students’ practical competence in selecting and applying appropriate polymer processing methods for different materials and applications. It introduces the principles of experimental design for polymer processes, enabling students to plan virtual experiments, collect and interpret data, evaluate process performance, and quantify experimental uncertainty. Emphasis is placed on integrating safety and sustainability into process-related decisions through the application of HAZOP principles and life-cycle considerations when evaluating processing routes. The course also prepares students for independent research by engaging them in a group project that integrates process design, Design of Experiments (DoE), optimization, data analysis, and technical reporting			

Learning outcomes	By the end of this course, students will be able to: • Explain how polymer microstructure and morphology influence processing behavior and final properties. • Apply rheological concepts and viscosity models to predict melt behavior under processing conditions. • Model and troubleshoot extrusion and injection molding operations using simulation outputs and published datasets to diagnose defects. • Use DoE methods to optimize processing parameters and demonstrate measurable improvements in target properties. • Produce a professional technical report and presentation that includes process flow diagrams, mass/energy estimates, safety assessment, and a sustainability appraisal.
Policy	• Participation For a variety of reasons, participation in a classroom context is essential. It is essential to the learning process, promotes teamwork, and aids in the general success of both the individual students and the class. • Quiz A consistent method of gauging your understanding of the content covered in class is through quizzes. They assist you and your teacher in evaluating your comprehension of important ideas and identifying any areas that can benefit from more explanation. Each quiz will consist of 5-8 questions, and each question will be marked according to its difficulty. There will be two quizzes. • Withdrawal (pass/fail) The School Science and Engineering grading guidelines are carefully adhered to throughout this course. To pass, a student must typically receive a mark of at least 60%. • Assignment An individual research assignment worth 20 points will ask each student to investigate a specific polymer processing problem (for example, optimizing an extrusion run, diagnosing an injection-molding defect from published data, or performing a virtual DoE on a processing parameter). Deliverables: a concise technical report (max 2,000 words) that states the problem, summarizes relevant literature, describes methods or simulations used, presents results with clear figures/tables, and draws practical conclusions; include a one-page executive summary and a short recorded oral summary (5–7 minutes). • Activity Students are expected to actively participate in all course related activities, including lectures, case studies, and problem-solving sessions. Active participation is considered an essential part of the learning process, as the course relies on discussion, analysis of practical examples, and the application of theoretical concepts to engineering problems. • Cheating/plagiarism Any form of plagiarism or cheating on a test, quiz, or project will result in the cancellation of the assignment. In this scenario, the student will receive a score of zero (zero) without any further consideration. • Illness Students with an illness may miss a quiz or presentation. This might be because students need to go to the hospital, recover at home, or attend regular medical appointments. In this case, the student must inform the instructor in advance about the illness and must present a document from their doctor. After considering the situation, the instructor may set a new date for the quiz or project presentation. Only one opportunity will be given to the student. The students who don't inform the instructor in advance will not be given a chance to retake the quiz or give a presentation. • Professional behavior guidelines During class hours, students are expected to conduct themselves in a way that fosters a positive academic and professional atmosphere. Discussions without

	permission, side conversations and unethical conduct are absolutely forbidden. • Ethics In class, students must not be late. During class, mobile phones must be put away and turned off.
Use of Artificial Intelligence Tools	The use of Generative Artificial Intelligence (GAI) tools within this course is permitted solely for educational, research, and individual learning purposes and must remain consistent with the University's principles of academic integrity. GAI tools may be used as supplementary resources to support learning and research; however, all submitted work must reflect the student's own understanding, critical thinking, and academic contribution. Any use of GAI must be appropriately disclosed in the relevant assignment, project, presentation, or other academic material. Students are fully responsible for evaluating and verifying the accuracy, reliability, and appropriateness of all AI-generated content included in their work.

Tentative Schedule		
Weeks	Topics	Reference books
1	Introduction to polymer processing principles	[2] Ch. 1, pp. 1–24
2	Polymer structure, morphology and their influence on processing	[2] Ch. 2, pp. 25–64.
3	Rheology fundamentals for polymer processing	[1] Ch. 3, pp. 101–150
4	Melt flow behavior, viscosity models and temperature dependence	[1] Ch. 4, pp. 151–200
5	Extrusion theory: single-screw and twin-screw fundamentals	[2] Ch. 6, pp. 145–190
6	Extrusion process variables, scale-up and troubleshooting (virtual case studies)	[1] Ch. 7, pp. 191–240
7	Midterm Exam	
8	Injection molding fundamentals: filling, packing, cooling, and warpage	[3] Ch. 2, pp. 45–100
9	Injection molding process optimization and defect analysis	[3] Ch. 4, pp. 145–200
10	Blow molding and thermoforming: process principles and simulation	[2] Ch. 9, pp. 261–300
11	Film and sheet processing: cast and blown film, orientation effects	[2] Ch. 10, pp. 301–340
12	Compounding, additives, and mixing: twin-screw compounding theory	[1] Ch. 7, pp. 321–370
13	Processing-property relationships: crystallinity, orientation, and mechanical performance	[2] Ch. 3, pp. 65–104
14	Process safety, HAZOP for polymer processing lines, and sustainability considerations	[2] Ch. 12, pp. 401–440
15	Polymer 3D printing processes: FDM/FFF, SLA, SLS, material extrusion, and process-property links	[3] Ch. 1–3, pp. 1–80
	Final Exam	

