Increasing technification of educational process is a characteristic feature of contemporary stage of development of higher professional institutions. Nowadays various educational technologies – modular, problem, concentrate, context, etc. – are widely used at the institutions of higher engineering education. For several years the department of engineering education and psychology at the Kazan National Research Technological University has been researched and developed principals of designing and implementing university educational technologies, their functional laws and conditions according to up-to-date requirements to contemporary chemical process engineer [1]. As exemplified by the course “General chemical engineering and fundamentals of industrial ecology”, included into the chemical process-engineering curriculum, implementation of modular and context educational technology is described. Traditional way of teaching this course results mainly in reproductive level of acquisition of educational material; it does not give sufficiently correct picture of professional specifics of a process control engineer. Pragmatist approach that forms the basis for educational technologies helps to eradicate these defects, because students assimilate new information, acquire skills and habit patterns in case-study, solving problems that simulate real professional situations. The subject matter of modular educational technology is that a student is more or fully independent in his work according to suggested to him/her individual educational program (a target-oriented program of activities, data bank and tutorial guidance for achieving the set didactic goals). Module approach aims at creating special programs that would have clearly specified goals and good methodical ware. This allows improving the educational process according to a definite set of standards [2]. Context education is characterized by simulating thematic and social content of future professional activity by means of the whole system of didactic forms, methods and techniques; and abstract knowledge is learned on the basis of this professional activity. It should be mentioned that in a given thematic context (system of thematic acts) not only technological aspect of professional activity is simulated, but also its social side – interlocutory relations, communicational acts in various problem situations (social context). The basic content unit suggested for students is a problem situation with all its subjective social ambiguousness and contrariety, and not an “information portion” or a task. The main task of the course “General chemical engineering” (ПСУ) is acquisition of profound and solid theoretical knowledge concerning design and improvement of chemical-engineering systems. During the training students must acquire not just theoretical knowledge, but also skills to use this knowledge solving particular engineering tasks. In accordance with modular and context educational technologies a theoretical model of the academic discipline “General chemical engineering and fundamentals of industrial ecology” was created. In such conditions professional training includes problem-interlocutory lectures, and informational lectures giving the basic notions and definitions. It also makes sense to hold engineering simulation exercises that promote not only theoretical and practical thinking, but also social personal qualities: team commitment, initiative, responsibility, self-discipline, etc. [3]. Process design skills and habit patterns are effectively developed during independent solving educational tasks by students, taking into account educational level, method, and individual speed, under the supervision and control of teaching stuff. Besides problems solving always contributes to a more profound and systemic acquisition of theoretical material, develops intuition and creative activity of learners, and makes it possible for a teacher and a student himself to set a level of knowledge acquisition in every specific topic of a course and for the course as a whole. To improve the effectiveness of educational process an idea to create problem book appeared. It allows solving problems synchronously with lecture course delivered at the chair. The main peculiarity problem book is that it is aimed at encouraging students to work independently under the supervision of the teacher. Its structure and content must allow the learner acquisition of the necessary amount of knowledge and skills and habits of making engineering simulation required by the State Educational Standard in the individually specific rate, mode and level of learning. To solve the given task problem-modular educational technology was chosen. The curriculum includes 12 modules. The first module describes the goal and structure of the program. Modules 2-10 include theory and educational problems concerning separate units of the course “General chemical engineering”. The module “Summary” contains generalized material of the whole modular problem. The module “Final test” has generalized problem on designing chemical-engineering systems to evaluate the knowledge of standard computation methods and students’ ability for generalization, systemization and creativity. Modules 2 – 10 consist of invariant and variative parts, including several units of academic elements. Invariant part of the module contains four units, and the main unit is “Problems”. It includes five academic elements, and each of them has specific didactic purpose and structure. The unit “Problems” includes: educational element “Theory” with all the necessary information to solve problems that students have already covered at the lectures; educational element “Routine tasks” where students can see how to solve typical problems with examples and comments; educational element “Self-control” with problems to solve independently, answers and rating of complexity of problems in points; educational element “Intermediate control” where problems referring to the given module are presented with complexity rating in points. Besides the unit “Problems” invariant part contains the unit “Incoming test” for actualizing control of basic knowledge of students, and the unit “Final test” to check the acquisition level of educational material presented in the module. Variative part of the module has the units “Updating supporting knowledge”, “Mistakes and comments” and “Challenges”. Several units present variative part of the module. The unit “Maintenance of reference information” is for weak students who failed the unit “Entrance control”. The unit “Mistakes and comments” is used in case if a student could not solve problems from the unit “Self-control” and needs additional comments and additional problems to internalize the material of an educational element. The unit “Challenges” is destined for the advanced students. The units “Generalization” and “Problem” function as systemic representation of the module structure, its purpose and task that the module solves. We think that the suggested structure and content of the problem book will allow a teacher solving a variety of tasks: to teach students to calculate engineering parameters of chemical technology processes; provide individual approach to the rate and ways of achieving goals; promote development of students’ self-guided work skills; control the level of educational material acquisition more intrinsically. Basing on the context educational technology some changes were made in fulfilling term project. Term paper, aimed at providing a more profound comprehension of theory and its practical implementation in computation and development technological production flow diagrams, has also undergone changes. Some recommendations concerning optimal organizational forms and methods of making term paper were suggested. Suggested didactic materials for the lessons include approximate themes for term papers, functions of workflow participants, questionnaires, reporting forms, final evaluation criteria, etc. Making the course paper students obtain experience of individual and teamwork, therefore social context is given. Thematic context is created as follows: 1 stage – Getting tasks and dividing into sub-groups. The task for course paper is given to the whole group and not to one student. The group is divided into sub-groups according to the task subject and based on the specialty profile. For example, if the topic of the course paper is “Sulphuric acid from flotation pyrite production using contact method”, sub-groups may be divided in accordance to production stages: “Derivatization of sulphurous-acid anhydride”, “Derivatization of sulphur trioxide”, “Derivatization of sulphuric acid from sulphur trioxide and water”. After dividing into sub-groups and defining all the functions the teacher gives sub-group leaders suggested readings. 2 stage – Independent work of students, literature review. On this stage students independently study flow diagram of production according to the task given; physics and chemistry of a particular production stage and its flow chart. Than they discuss in sub-groups and make a drawing of flowchart of the particular production stage and one of the leaders prepare a report and presentation on the subject. Thus the self-guided work of students results in preliminary selection of optimal technological production scheme of a particular phase, and developing the idea of composition and structure and production process in general, necessary for discussion after the presentation. 3 stage – Seminar-discussion about the results of independent work. Lesson plan on this stage: · Presentation of one of the sub-group leaders about the flowchart of the particular production according to the subject of course paper; · Reports of sub-group members on the topics: physics and chemistry of a particular production phase; process scheme of of a particular production phase. Seminar-discussion is carried out under the supervision of the teacher who moderates the discussion without interfering or obtruding his opinions. Even if students have chosen a wrong process operation they find this out on the next stages of course work, find their mistakes and then correct them. Based on the seminar-discussion results the teacher gives the sub-group the task to make engineering simulation of the particular phase, and then a task to each student to make engineering simulation of a particular device. 4 stage – Independent work in student subgroups aimed at making computations. On this stage students work independently according to the following plan: · Every sub-group member makes process design and description of a particular device or reactor of the given phase independently; · Sub-group members gather together and discuss the results of each student's work; · Making the flow chart of the particular phase and calculation of all phases taking into account each student's part of work (they may use computers), description of the flow chart of the particular phase. Each student independently makes an activity report according to regulatory requirements. These reports are later included into the general concept note. 5 stage Seminar-discussion about the results of independent work. Lesson plan on this stage: · Activity reports of sub-group leaders concerning engineering simulation of a particular production stage; · Discussions of reports; · The teacher gives each sub-group tasks to make the graphical part of course work. The teacher supervises seminar-discussion. Discussion may be organized using one the active teaching method – "Brainstorming". It makes sense to give the sub-group that worked under the given process phase the role of critics, and make the rest of the group idea hamsters. Thus each student will be able to be both a critic and an idea hamster. 6 stage Independent work in student subgroups aimed at making graphics and diagrams. On this stage students work independently according to the following plan: · Every sub-group member makes a general view drawing of the device or reactor of the particular phase independently according to the given task; · Sub-group leader corrects calculations and description of process diagram if it is necessary after the stage 5, and makes a view drawing of the process flow diagram; · Sub-group members gather together and discuss the results of each student's work. Each student independently makes an activity report according to regulatory requirements. Thus, in case if students worked well and tidily at all the stages creating the term project, they have computations in the form of explanatory note; and graphical part with process flow diagram of a definite production stage, made by the team-leader, and general view drawings of reactors and devices made by each member of the sub-group. 7 stage – Defense of term project where active teaching methods are used. A sub-group that defenses its part of technological flow diagram sits in the center of a circle and makes discussion about the given technological production stage, and configuration of definite devices and reactors, while other sub-groups sit around them, hang upon their words and keep track of the discussion. It should be noted that each student from the outer circle follows one or two participant of the discussion. Activity in discussion, quality of suggestions, and criticism of other suggestions are taking into account. After that joint discussion starts, when "external" observers comment on the project, and the subgroup under analysis also air view about the course of discussion, its effectiveness, and behavior of fellow participants. In the inner circle the discussion is led and facilitated by the team leader, and in the outer circle – by professor. The procedure is repeated several with every sub-group. When all the sub-groups have presented their projects, general discussion begins concerning the work results and effectiveness. Professor concludes about the course of the discussion, about the work of each sub-group and every student. Therefore, introducing educational technologies in the process of special training of chemical process-engineers provides not just implementation of theoretical knowledge in computations and developing technological production flow diagram, but also dynamism, integrity and good organization, simulating thematic and social context of real engineering performance, motivation for additional knowledge. All this facilitates development of engineering thinking of the future professional.