



Project INNOCHEM

**Innovating Education of Talents in Chemistry for Business Success in SMEs'
Innovations**

2014-1-SK01-KA203-000507

ACTION PLAN – Slovakia

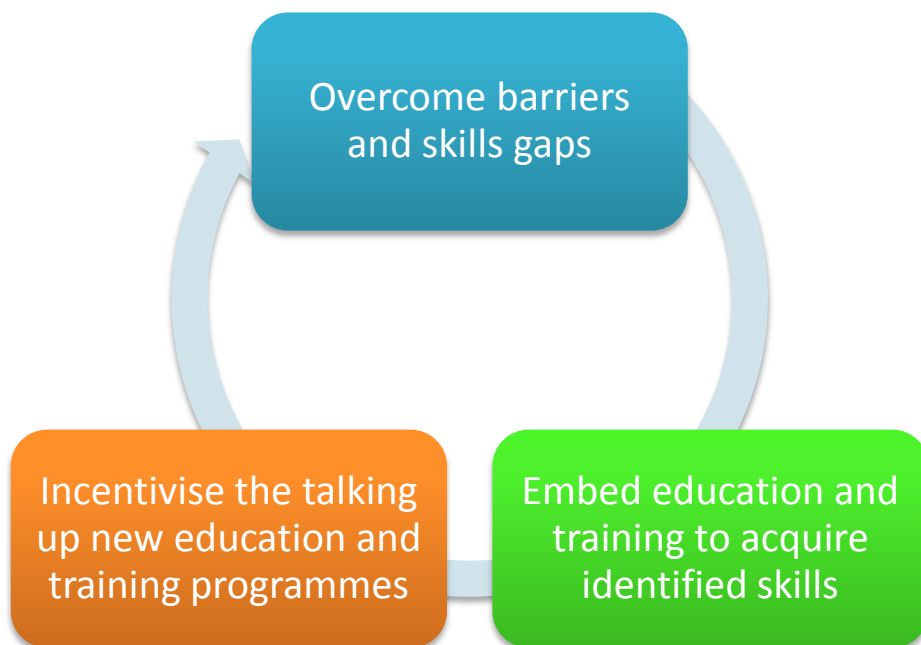
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1. Foreword

The InnoChem Roadmap, **endorsed** by the Faculty of Chemical and Food technology of the Slovak University of Technology and the Association of Chemical and Pharmaceutical Industry of the Slovak Republic, has been focused on:

- Identifying measures to overcome barriers and skills gaps in the middle and senior level professionals in the chemical industry to meet the needs of the sector for future innovations;
- Embed education and professional training to develop the identified skills in new generation of professionals for the chemical industry;
- Suggest the necessary measures to ensure that the added value of more qualified professionals is recognised and the professional ecosystem is motivating for middle and senior level professionals to acquire the targeted innovation skills.



The Action Plan outlines implementation of the Roadmap and:

- Presents the **general strategy** for delivering the education and training to bridge the identified skills gaps;
- Points out the **key/priority measures** for the educators and employers to implement this strategy;
- Maps out the **actions**, a set of recommendations for the actions, focusing on the specific targeted skills and other structural and promotional actions.

2. Strategy overview

The idea for overcoming the identified barriers of adequacy, costs, age and uncertainty at economic and technology level, stands on the promotion of educational programmes at the tertiary level of

education as an added value for the chemical sector and the targeted professionals themselves, specifically by:

- **Flexibility:** modular approach to tailor the education and professional training to the specific needs of the sector and the targeted professionals;
- **Industry/Employers involvement:** cooperation on developing innovations in educating the targeted professionals, including in-company stages improving the practical component and reducing costs;
- **Cross-cutting training:** the status quo analysis has shown that the skills are missing in both vertical axis (relevant to the sector innovation needs) and horizontal level (people skills, negotiating skills, entrepreneurial skills);
- **Requalification:** specific programmes should be implemented, particularly targeted at mid-career professionals to promote their inclusion in the continuously innovative sector.



The action plan includes three layers of action according to its operation:

- **Structural:** actions focusing on system intervention into tertiary level education and training programmes (e.g. new qualifications, curricula revisions, innovations of the pedagogical concept);
- **Operational:** actions focusing on delivering education and training to the target groups;
- **Supporting:** actions, which support both structural and operational actions, involving broader group of stakeholders (e.g. ZCHFP, member companies, independent innovators, research capacities, FCHPT STU).

3. Structural Actions

3.1 Developing education and practical professional preparation of master students and PhD. students within the existing courses based on the results of the survey conducted among SMEs

FCHPT STU will implement new knowledge and information within the existing subjects in line with the results of SMEs survey, e. g. organic chemistry, analytical chemistry, spectral methods, safety and environment, process control, innovation management. Moreover, in the further accreditation to the study plans of the study programs the larger range of subjects in which students acquire various *soft skills*, including entrepreneurial skills and knowledge of the financial market and enterprise finance, personal skills, as well as scientific and technical skills, will be included. Within personal skills as financial literacy, presentation and communication skills, managerial skills and knowledge of legislation will be considered. Another way is to increase the promotion of subjects developing *soft skills* in complementary subjects. To the development of financial literacy contributes the cooperation with Junior Achievement Slovakia, n.o. Students of the bachelor study program Automation, Information Engineering and Management in Chemistry and Food Industry have the opportunity within the subject Fundamentals of Business to involve in the young entrepreneurs' competition. In the future, we expect better promotion of this subject, which is elective course for the students of other study programs. Within the scope of the course Financial Market and Corporate Finance, which is a compulsory course of master degree studies, students have the option to obtaining the financial literacy certificate for passing the More Than Money program.

3.2 Involvement of practitioners in lectures

Currently, the education at FCHPT STU is primarily provided by FCHPT STU teachers. Within the individual courses, especially in the master degree study, the practitioners are also involved in the education by lecturing selected chapters within their expertise. FCHPT STU will continue in this trend. The requirement to provide lectures by practitioners also appears in student polls made by FCHPT STU every year.

3.3 Review the study program: "Process control technology in the chemical and food industries".

The FCHPT STU in Bratislava offers an accredited master degree program Control of Technological Processes in Chemical and Food Industries.

Characteristics of the study program

The master degree study provides the full-value technical and economic education aimed at the control, management and economy of production processes, especially in the chemical and food-processing industry. It is the unique study program in the Slovak Republic integrating the knowledge of all areas of chemistry, processing, chemical and food technologies related to the economic and managerial education. Specifically, it provides knowledge in enterprise economy, human resources management, corporate finances, marketing, management of the production and logistical processes, strategic control in technologies, mathematical models in decision-making, information technologies, labour and industrial law. From technological aspects, it enlarges the education about inorganic and organic technologies, bio electrochemistry, technology of modern materials. For

graduates it provides complete expert, technologic, economic and managerial knowledge in correlative relationships which the industry expects and demands on the present day.

Key learning outcomes

The graduate of master degree program is an engineer with large technological ground, which knows the methods and technologies of inorganic, organic chemistry, separation processes, technology of modern materials and alternative energy sources. The graduate is competent to design the conception of production process, to manage production of technological units and devices taking into account ecological aspects. The theoretical knowledge qualifies him to manage economics and managerial processes, technological and production processes as well. The knowledge from areas of marketing, human resources management, financial management, production management and investment development makes him possible the interactive thinking which means to regard not only the technological and economic relationships but its legal, environmental and social aspects, too. The graduate is competent to IT application and in-plant information system for correct decision-making and control. The graduate obtained the business and financial planning know-how per quod he gained the knowledge and skills for his business activities starting.

Graduates application

The graduate of master degree program is universal technologically and economic oriented with the wide ability application in many areas of production management, technologic processes, human resource management, the marketing and in other economy spheres. The versatility of education makes possible for the graduate to work as a leader alternatively as an individual worker in the business management, as a controller, project manager etc. Obtained knowledge makes him possible to be of use in the public administration (in tax a financial institutions), in the engineering-investor and consultant organizations as well. He may work as a leader or as an individual worker in the creative teams for the control and production innovation, processes, business managerial systems etc. Theoretical knowledge qualifies him for the advanced form of education and makes him possible to be of use in the educational institutions also. By selection from the optional and compulsory elective subjects, especially from the simulation managerial programs, the graduate obtains the knowledge and know-how, which permit him to be of use as a businessman too.

Study plan for the re-accréditation

Study program	Control of Technological Processes in Chemical and Food Industries				
Field of study	5.2.18 chemical technologies				
Guarantor	prof. Ing. Ján Híveš, PhD.				
Level of study	2 nd				
Form	Full-time				
Standard length	2				
Study plan					
Course code	Course title	Type of educational activities	Range and methods of educational activities	Assessment method	Credits
1st term					
Compulsory courses					
N412A2_4I	Advanced Inorganic Technology	lecture	2 h, on-site method	exam	2
	Chemical Engineering Calculations for Engineers	lecture, seminar	1/2 h, on-site method	exam	2
N424P0_4I	Enterprise Economy	lecture, seminar	2/2 h, on-site method	exam	4
N424M1_4I	Marketing in Industrial Enterprises	lecture, seminar	2/2 h, on-site method	exam	5
Optional courses, the student chooses the courses in the range of 11 credits					
N412T1_4I	Technology of Modern Materials	lecture, seminar	2/1 h, on-site method	exam	3
N412A1_4I	Applied Thermodynamics	lecture, seminar	2/1 h, on-site method	exam	3
N424R0_4I	Budgeting in Technologies	lecture, seminar	2/2 h, on-site method	exam	4
N424S0_4I	Strategic Control in Technologies	lecture, seminar	2/2 h, on-site method	exam	4
	Information Technology I	laboratory practise	2 h, on-site method	classified credit	2
	Electrochemical engineering	lecture	2 h, on-site method	exam	2
	Metallic Materials Protection	lecture	2 h, on-site method	exam	2
	Operational Management in Chemical Industry	lecture	2 h, on-site method	exam	2
	Technology Processes and Devices of Silicate Industry	lecture	2 h, on-site method	exam	2
Elective courses					
N424K0_4I	Communicative Skills	lecture, seminar	2/1 h, on-site method	exam	3
N424F2_4I	Financial Literacy	lecture, seminar	2/1 h, on-site	exam	3

			method		
N412K1_4I	Corrosion and Materials Protection	lecture	2 h, on-site method	exam	2
N434T0_4I	Physical Education	seminar	2 h, on-site method	credit	1
	Electric and Electronic Waste Treatment	lecture	2 h, on-site method	exam	2
	Gas Industry	lecture	2 h, on-site method	exam	2
2nd term					
<i>Compulsory courses</i>					
N423S0_4I	Separation Processes	lecture, seminar	2/3 h, on-site method	exam	5
N423L0_4I	Laboratory Practice in Separation Processes	laboratory practise	1 h, on-site method	classified credit	1
N424U0_4I	Accounting in Industrial Enterprises	lecture, seminar	2/2 h, on-site method	exam	5
N400O0_4I	Professional Training	professional training	120 h per term, on-site method	credit	3
Optional courses, the student chooses the courses in the range of 10 credits					
N424I0_4I	Investment Development	lecture, seminar	1/1 h, on-site method	exam	2
N424F3_4I	Financial Market	lecture, seminar	2/1 h, on-site method	exam	4
N424R1_4I	Management of the Production and Logistical Processes	lecture, seminar	2/1 h, on-site method	exam	4
N412A3_4I	Alternative Energy Sources	lecture	2 h, on-site method	exam	2
	Technical Electrochemistry	lecture, seminar	2/2 h, on-site method	exam	5
	Nanomaterials in Chemical Technology	lecture, seminar	2/2 h, on-site method	exam	5
Elective courses					
N424P1_4I	Corporate Finances	lecture, seminar	2/2 h, on-site method	exam	3
N424N0_4I	Costs and Prices in Industry	lecture, seminar	2/2 h, on-site method	exam	3
N424M2_4I	Quality Management	lecture, seminar	2/1 h, on-site method	exam	3
N424R2_4I	Innovation and Change Management	lecture, seminar	2/1 h, on-site method	exam	3
N424E0_4I	Environmental management	lecture, seminar	2/1 h, on-site method	exam	3
N434T1_4I	Physical Education	seminar	2 h, on-site method	credit	1
	Corrosion Engineering	lecture	2 h, on-site method	exam	2
	Technology of Fuels and Lubricants	lecture, seminar	2/2 h, on-site method	exam	5
	Kinetics and Reactors	lecture, seminar	2/1 h, on-site method	exam	3
3rd term					
<i>Compulsory courses</i>					
N413O3_4I	Advanced Organic Technology	lecture	2 h, on-site method	exam	3
424M4_4I	Mathematical Models in Decision-making	lecture, seminar	2/2 h, on-site method	exam	5
	Technology of special	lecture	3 h, on-site method	exam	4

	inorganic materials				
N424R3_4I	Human Resources Management	lecture	2 h, on-site method	exam	3
N424S1_4I	Simulation Training in Management Activities	lecture, seminar	2/2 h, on-site method	exam	5
N424L1_4I	Laboratory of Technological Processes Management	laboratory practise	4 h, on-site method	classified credit	4
Optional courses, the student chooses the courses in the range of 8 credits					
N424F4_4I	Financial and economic analysis of the technology	lecture, seminar	3/2 h, on-site method	exam	5
N424F5_4I	Financial management	lecture, seminar	3/2 h, on-site method	exam	5
N424D1_4I	Tax system	lecture, seminar	2/1 h, on-site method	exam	3
N412B1_4I	Bio electrochemistry	lecture	2 h, on-site method	exam	3
N422I3_4I	Information Technology II	laboratory practise	2 h, on-site method	classified credit	2
	Alternative fuels	lecture	2 h, on-site method	exam	3
4th term					
<i>Compulsory courses</i>					
N400D0_4I	Diploma Thesis	final thesis, state exam	20 h a week /1 h a semester, on-site method	exam	24
Optional courses, the student chooses the courses in the range of 6 credits					
N424E1_4I	Ethics and Etiquette in Managerial Activity	lecture, seminar	2/1 h, on-site method	exam	2
N424R4_4I	Management of Small and Medium-sized Enterprises	lecture, seminar	2/2 h, on-site method	exam	2
N424P2_4I	Labour and Industrial Law	lecture, seminar	2/1 h, on-site method	exam	2
	Electric and Electronic Waste Treatment	lecture	2 h, on-site method	exam	2
	Industrial Materials Degradation	lecture	2 h, on-site method	exam	2

Schedule of re-accreditation preparation

Task	Date
Preparation or resp. up-date of study plans, update of guarantors of subjects in study plans	6.9.2017
Up-date of guarantor or co-guarantor	6.9.2017
Up-date of the minimum personal guarantee condition	6.9.2017
Submission of the proposal, resp. up-date of guarantors and co-guarantor, minimum conditions for personal guarantee, study plans, including guarantors of subjects for negotiation in FCHPT	12.9.2017
Submission of the proposal, resp. up-date of guarantors and co-guarantors, minimum conditions for personal guarantee, study plans, including guarantors of subjects for negotiation in Dean's College of FCHPT STU	12.9.2017
Up-date of the <i>Scientific and Pedagogical Characteristics</i> of professors and associate professors on the document server of STU	15.9.2017
Elaboration of a list of all persons who provide compulsory and optional courses of study programs	10.9.2017
Elaboration of documents <i>Scientific and Pedagogical Characteristics</i> of professors and associate professors participating in the study program	30.9.2017
Elaboration of the application for accreditation, resp. reaccreditation	30.9.2017
Elaboration of documents: list of supervisors of final thesis and final thesis topics	30.9.2017
Elaboration of the document: list of the members of examination committees	30.9.2017
Academic Senate FCHPT –discussion of the design of accreditation and re-accreditation study programs	3.10.2017
Scientific Council FCHPT –approval of study programs for accreditation and re-accreditation	10.10.2017
Completing the accreditation documents	20.10.2017
Sending an accreditation application to the Accreditation Commission	31.10.2017

4. Operational Actions

4.1 Motivating students by awarding the best theses and works in the students' scientific and professional activities by enterprises from the chemical and the pharmaceutical industries

The FCHPT STU long-standing tradition is to award the best master theses, where the best master theses from different areas are chosen each year and the students obtain prize (financial or material); the prize being usually awarded by the company that proposed the prize. Prizes are usually suggested and known at the end of the summer term, and students for individual awards are nominated by members of the Examination Committees. In the next years, FCHPT STU plans to publish the awards - financial or material rewards - after the agreement with the companies, at the beginning of the summer term to motivate students within work on their master thesis. Students have the opportunity during their study to participate on work in student scientific activity. Many students participate in this activity during undergraduate studies and continue in chosen topic also during their master studies. Here also the opportunity for the SMEs opens to offer the themes for

students in a bachelor degree under the guidance of a practice expert, so student can work in this area for several years, and SMEs can educate a worker according to their specifications and needs. Results – partial or complete – students can present at student conferences or competitions. The FCHPT STU organizes every year the Student Scientific Conference in the field of Chemistry and Chemical and Food Technology, named Chemistry and Technology for Life and invites to it the students with related study fields in Slovakia and the Czech Republic. The conference runs in November, and students of all three degrees can take part in competitive and non-competitive contributions in different sections. For the next year, FCHPT STU would like to address, in cooperation with the ZCHFP, the practitioners to join as members of expert committees.

4.2 Increasing international mobility of students

Students of the FCHPT STU will increase mobility using Erasmus+, National Scholarship Program, CEEPUS, IAESTE and others, where they can take undergraduate and graduate courses from their study program or take a research fellowship. During this stay, students are acquiring valuable knowledge and language experience that they can then apply in their next study or employment. In the coming years, FCHPT plans to involve more students into these mobility stays.

4.3 Reinforcing talented students through student club Sokrates

The student club Sokrates has been working at the FCHPT STU for several years with active involvement of students and teachers. At present, the club is transformed to a civic association and the organizing committee is formed by students. Within the program the scientific lectures, excursions of various enterprises focused on chemical, pharmaceutical and food industry, experimental labour in laboratories and other social activities are offered. The greatest interest is in lectures and excursions. One of the priorities is to provide excursions directly in SMEs, where students will be able to see activity directly in the business, helping them to make decisions in their next professional life.

The crucial point for effective collaboration with ZCHFP and SMEs is the communication and the opportunities for presentations of SMEs at universities. The dean of the FCHPT STU regularly convenes the Industry Council, members of which are representatives of selected chemical, pharmaceutical and food industries, where is the occasion to discuss during the meeting the themes as professional training, topics of the final works and work within the students scientific activity, excursions and , awards.

FCHPT STU annually organizes the projects as Open Week in February and CHEMSHOW - The Chemist Fair in June, which are focused to secondary school students who decide on further studies. Throughout the program, they obtain information about their prospective studies and opportunities, as well as they can participate in interesting lectures and laboratory visits and demonstrations of experiments. Within the scope of application information, the SMEs have possibility to gain the direct contact with secondary school students about and they can inform the students about their future work after study.

For the first time at the FCHPT STU, in cooperation with the Student Parliament under the auspices of FCHPT STU, the CHEMDAY will take place on November 14, 2017. CHEMDAY is like the so-called Career days running at other faculties or universities. Approximately 30 enterprises in the chemical, food and pharmaceutical industries are given the opportunity to inform students about their

companies and the opportunity to work in their company. Representatives of companies will be able to present their production programs, offer bachelor and master theses and professional experience.

5. Support Actions

5.1 Extending offers for professional affiliation and stage in SMEs not only during summer but also during the autumn and spring semesters, in close cooperation with the ZCHPF SR

Students of all study programs within the master degree study at FCHPT STU are required to pass the *Professional Training* with a range of 120 hours per semester with 3 credits. The aim of this subject is acquirement of knowledge of the basic operation principles of the production, development or research departments, familiarization with the specific tasks, the treatment of which the student will participate, carrying out professional activities related to assigned tasks within the production, development or research under the supervision of a responsible employee and presentation and defence of reached results and obtained experiences. The result of the Professional Training is that the students can apply in practice their theoretical and methodological knowledge obtained during studies. They have validated their knowledge and professional orientation. Students know possibilities of their work in practice. Every year the FCHPT STU discussed with members of the Industry Council, which acts as the advisory body of the dean, on the possibilities of providing training in companies that are members of the council. Simultaneously, the STU provides information on the possibilities of passing Professional Training in companies operating in the chemical, pharmaceutical and food industry in the Slovak Republic based on a request from specific companies or personal contacts of STU staff. On the faculty web site http://www.fchpt.stuba.sk/en/information-for-students/working-services-and-shipping.html?page_id=2516 are listed current job offers, the possibilities of Professional Training or master thesis in enterprises. FCHPT STU students complete their professional experience in enterprises, e. g. Slovnaft a.s., Evonik Fermas, s.r.o., Fortischem, a.s., Duslo, a.s., Rona, a.s., Chemosvit, a.s., ProCS, s.r.o., Slovenské cukrovary, s.r.o., VÚTCH-Chemitex, s.r.o., MONDI SCP, a.s., BUKOZA HOLDING, Považské cementárne, a.s., DETOX, Heineken Slovensko, a.s., Continental Matador Rubber, s.r.o., Slovalco, a.s., Slovenská Grafia, a.s., Grafobal, a.s. and in many others. In the forthcoming academic year, FCHPT STU plans to expand the offer of professional training in SMEs in cooperation with the ZCHFP. Presently, students pass the Professional Training on summer holidays during July and August. Since numerous enterprises during the summer are in summer working mode or operations are shut down in the summer, FCHPT STU allows students to pass the training during winter or summer term by adjusting their timetable so that they can attend classes without leaving hours. FCHPT STU will inform about this opportunity the students, as well as the companies that provide the Professional Training for students.

5.2 Support for solving thesis themes from practice

Within each level of study at FCHPT STU students must elaborate the final thesis in which students apply the knowledge and skills gained within the research of selected topics within their study program. At the master degree program, students elaborate their master theses during the summer term in the last year of study (range 20 hours a week.) Topics of master theses in master degree

program are selected by students and topics are offered by STU teachers and practitioners as external collaborators. Topics presented at FCHPT are always focused on actual problems of applied or basic research within the scientific research grants or industry needs. The number of topics offered exceeds the number of students in the given year, so students have possibility to choose a topic. In the next academic years, FCHPT STU wants to spread the offer with a larger number of problem-solving topics directly in enterprises. In cooperation with ZCHFP, we want to offer SMEs the opportunity to combine professional training and master thesis within the same theme, so students and SMEs would have more time to solve the given problem.

6. Timetable

Action	Time-frame
Developing education and practical professional preparation of undergraduate students and PhD. students within the existing courses based on the results of the survey conducted among SMEs	Continuous
Involvement of practitioners in lectures	By December 2017 and continuous
Review the study program: "Process control technology in the chemical and food industries"	Academic years 2017/2018 – 2018/2019
Motivating students by awarding the best theses and works in the students' scientific and professional activities by enterprises from the chemical and the pharmaceutical industries	By August 2018 and continuous
Increasing international mobility of students	By December 2018 and continuous
Reinforcing talented students through student club Sokrates	By November 2017 and continuous
Extending offers for professional affiliation and stage in SMEs not only during summer but also during the autumn and spring semesters, in close cooperation with the ZCHPF SR	By August 2018 and continuous
Support for solving thesis themes from practice	By December 2017 and continuous
Reviewing the implementation of the Action Plan and adopting new measures as needed	By December 2019