

**THE UNDERGRADUATE PROGRAMME FOR THE BACHELOR OF
CHEMISTRY EDUCATION**

Decision No 3807/ QĐ-ĐT dated on 10/10/2016 by the Rector of Thai Nguyen University of Education.

1. General information

Name of programme	Bachelor of Chemistry Education
Code number	D140212
Awarding institution	Thai Nguyen University of Education
Type of diploma	Bachelor of Chemistry Education
Level of training	Undergraduate
Number of required credits	135
Type of study	Full-time
Training duration:	4 years
Enrollment object	High school graduates
Assessment scale	10
Graduation requirement	• The accumulated number of credits and volume of the training programme : 135 • The cumulative average score of the entire programme meets the minimum of 2.00 or higher. • Having a Physical Education and Defense Education Certificate. • Have achieved required foreign language learning outcomes. • Have achieved the required level of information technology learning outcomes.
Job position	• To be a chemistry teacher at schools, international schools, colleges, and universities. • To be a researcher in a research center or institute of chemistry and institute of educational science. • To be an expert, an officer, or a manager at schools, universities, and Departments of Education and Training.

	To work in companies or in a field of work related to chemistry.
Higher education after graduation	Graduates may continue on to studying masters and doctoral qualifications in this country or abroad.
Reference program	Bachelor of Chemistry Education of Hanoi National University of Education
Last revision	10/2016

2. Program Objectives (PO)

The objective of this training programme is to train a Bachelor of Chemical Education (BCE) with good political and moral qualities, with knowledge and expertise and powerful professional skills in chemistry for teaching chemistry in high school, college and university; working in the research institute; to be an expert, an officer, or a manager at schools, universities, and Departments of Education and Training; to work in companies or in a field of work related to chemistry.

3. Program Learning Outcomes (PLOs)

After graduation, students should meet the following expected learning outcomes:

3.1. Knowledge

3.1.1. To understand and apply the basic knowledge of Marxism-Leninism, Ho Chi Minh's Ideology, the Revolutionary Directions of the Vietnamese Communist Party, Vietnamese Law, National Defense and Security in their occupational activities and life.

3.1.2. To apply the knowledge of mathematics and natural sciences (Science, Biology, Earth Science, ...) to fulfill the requirements for teaching Natural Science in high schools.

3.1.3. To understand and analyze the basic knowledge systems of modern chemistry: chemical elements, chemical substances, chemical reactions, concepts, laws, basic theories in chemistry, condensation and dispersing system in chemistry, ... To applying the above scientific knowledge to real work and life.

3.1.4. To apply the knowledge of educational psychology, education, pedagogical skills, ... to solve as well the tasks of the teacher.

3.1.5. To understand and analyze the scientific knowledge system of theory and teaching methodology of chemistry. Applying that knowledge to perform as well the task of teaching Chemistry and teaching Natural Science in high schools, the requirements for renovation of general education.

3.1.6. Ability to use English in simple communication and reading comprehension in the field of chemistry, to obtain a certificate in English at level to A2 of CEFR (Common European Framework of Reference for Languages).

3.1.7. Having knowledge and computer skills meeting the standards of basic information technology skills according to the Circular No. 03/2014 / TT-BTTTT dated March 11, 2014 of the Ministry of Information and Communications or obtaining a computer certificate IC3, or ICDL.

3.2. Occupational skill requirements

3.2.1. Main skills

3.2.1.1. Professional skill

- To present an issue of chemistry.
- To proficient in chemical language.
- To perform chemical experiments.
- To proficient in chemical calculation.
- To apply chemical knowledge to solving practical problems, applying the achievements of modern chemistry to serve production, life and scientific research activities.

3.2.1.2. Professional practice skills

- Analyzing the content of the teaching program
- Prepare a teaching plan
- Design and organize teaching activities.
- Applying the typical teaching methods, means and forms of teaching of the subject.
- Deploying integrated teaching and individual teaching in chemistry teaching in high schools.

3.2.2. Soft skills

3.2.2.1. Career self-development skills Ability to self-study, self-study and apply knowledge into practice.

3.2.2.2 Communication skills

- Communicate with learners and colleagues at work;
- Handling pedagogical situations;
- Communicate with educational forces outside the school;
- Reasonable combination of verbal and non-verbal communication means to attract students; determine the aspirations and interests of students to control and adjust the educational process.

3.2.2.3. Teamwork skill

- To know how to consult with group members
- Can persuade, work cooperatively with team members to complete work individually and collectively
- To know to share information with members of the group
- To know how to help team members

- To know how to learn in groups to complete tasks
- To knowing how to touch and persuade group members for the purpose of student education.

- To know how to coordinate group activities

3.2.2.4. Foreign language skills

- To use English in simple communication.
- To read professional documents in English.

3.2.2.5. Computer skills Proficient in office computing at work.

3.3. Requirements for ethical qualities

3.3.1. Political quality, civic responsibility

- To strictly comply with the Party's lines and undertakings, the policies and laws of the State of Vietnam.
- Patriotic, have a sense of civic responsibility towards social and national issues, actively participate in community development, comply with laws and regulations of all levels of education management.

3.3.2. Ethical qualities and professional manners

- Respect learners, accept professional ethical standards, have a spirit of cooperation with colleagues and build a friendly, positive working environment, have a sense of professional self-esteem, pedagogical style ink.
- Honesty in career and in life.

3.3.3. Ability to update knowledge and creativity at work Having a sense of regularly updating scientific knowledge of Chemistry and innovating teaching methods in the subject.

4. The amount of knowledge students need to accumulate: 135 credits, no including Physical Education and Defense Education.

5. Target admissions: Students graduating from high school

6. Training process, grading scale and graduation conditions: The training process, grading scale and graduation conditions are in accordance with the regulations on university and college training according to the credit system, issued according to the Decision 1838 / QĐ-ĐHSP..... of the Rector of University.

7. Courses List

Entry	Code	Name	Credit	Credit kinds					Compulsory Courses	Before Courses	Semester
				Theory	Exercise	Experiment	Seminar	Professional practise			
1.	General knowledge		24								
1.1. Compulsory Courses			22								
1	MLP151N	Principles of Marxism - Leninism	5	40	30	20	20				2
2	HCM121N	Ho Chi Minh’s Thoughts	2	15	10	10	10				6
3	VCP131N	Principles of the Vietnam Communist Party	3	22,5	15	15	15			HCM 121N	7
4	EDL121N	General law	2	20	5	5	10		MLP151N		6
5	ENG131N	English 1	3	15	15	30	15				1
6	ENG132N	English 2	3	15	15	30	15		ENG131N		2
7	ENG143N	English 3	4	20	20	40	20			ENG132N	3
1.2. Selective courses (select to 2 credits)			2								
8	GME121M	Public and educational administratio n	2	15	10	12	8				1
9	GIF121N	Basic informatics	2	20		20					1

Entry	Code	Name	Credit	Credit kinds					Compulsory Courses	Before Courses	Semester
				Theory	Exercise	Experiment	Seminar	Professional practise			
10	EDE121N	Environment and development	2	20	8		12				1
11	VIU121N	Vietnamese in use	2	15	15	15					1
12	VCF121N	Vietnamese culture's foundation	2	21	4	6	8				1
13	LOG121N	Basic logic	2	20	10	5	5				1
14	CDE121N	Culture and development	2	21		6	12				1
1.3	Physical education										
15	PHE111N	Physical education 1									1
16	PHE112N	Physical education 2								PHE111N	2
17	PHE113N	Physical education 3								PHE112N	3
1.4	Defense education										
18	MIE131N	Defense education		05 weeks							4
2. Professional education knowledge			65								
2.1. Fundamental knowledge			15								
19	MAT221M	Advanced mathematics for chemistry	4	45	20	10					1
20	NSC231N	Natural Science I	3	35	20						2

Entry	Code	Name	Credit	Credit kinds					Compulsory Courses	Before Courses	Semester
				Theory	Exercise	Experiment	Seminar	Professional practise			
21	NSC232N	Natural Science II	3	23	14	30					3
22	SCI253N	Natural Science III	5	63			24				4
2.2. Professional knowledge			50								
Compulsory Courses			44								
23	CMS341M	Chemistry of material structure	3	30	9	15	6				1
24	TCP331N	Fundamental theory of chemistry process	4	33	15	30	9			CMS331M	2
25	CNE331N	Chemistry of non-metallic elements	4	33	15	30	9			TCP341N	3
26	CME341N	Chemistry of metallic elements	5	42	21	30	15			TCP341N	4
27	THC331N	Thermodynamic chemistry	3	30	15		15			CMS331N	3
28	KCH321M	Kinetic chemistry	2	18	12		12			THC331N	4
29	ELE331N	Electrochemical and physicochemical experiment	3	18	12	30	12			KCC321N	5

Entry	Code	Name	Credit	Credit kinds					Compulsory Courses	Before Courses	Semester
				Theory	Exercise	Experiment	Seminar	Professional practise			
30	OCH331N	Theoretical principle of organic chemistry and hydrocarbon	3	30	15		15			TCP341N	4
31	DHE341N	Derivatives of hydrocarbon excess	4	33	15	30	9			OCH331N	5
32	CCH321N	Complex organic molecular and polymer	2	21	9		9			DHE341N	6
33	TAC331N	Basis theory analytical chemistry	3	18	15	30	9			TCP341N	4
34	QAC341N	Quantitative analytical chemistry	4	30	20	30	10			TCA331N	5
35	CFL321N	Chemistry for life 1	2	21	9		9			CFL321N	7
36	CFL322N	Chemistry for life 2	2	15	6	15	9				
Selective courses			6								
37	CCC321N	Chemistry of coordination compounds	2	21	12		6			TCP341N	7
38	SUC321N	Application spectrometry method on chemistry	2	18	12		12			ELE331N	7

Entry	Code	Name	Credit	Credit kinds					Compulsory Courses	Before Courses	Semester
				Theory	Exercise	Experiment	Seminar	Professional practise			
39	ECS321N	Statistical data handling of experimental chemistry	2	21	12		6			TCA331N	7
40	CHM321N	Material chemistry	2	21	12		6			CNE341N CME351N	7
41	SOC321N	Synthesis organic chemistry	2	21	9		9			CCH321N	7
42	TNC321N	Thuật ngữ và danh pháp hoá học	2	15	16		14			DHE341N	7
43	QCH321M	Quantum chemistry	2	18	12		12			CMS331M	7
3. Educative knowledge			39								
Compulsory Courses			35								
44	EPS331M	Educational psychology	3	30		15	15				1
45	PEP341M	Pedagogics	4	42	8	12	16			EPS331M	2
46	COS321M	Pedagogical communication	2	15	8	18	4				6
47	TTC441N	Theory of teaching chemistry	4	36	27		9	12		MLP151N PEP341M	4
48	TMC441N	Chemical teaching methods in high school	4	30		30	18	12		TTC441N CNE341N CME351N	5

Entry	Code	Name	Credit	Credit kinds					Compulsory Courses	Before Courses	Semester
				Theory	Exercise	Experiment	Seminar	Professional practise			
49	ECT421N	Chemical experiments in high school	2			60				CNE341N CME351ND HE341N	6
50	ESC421M	Chemical exercises in high school	2	12	18		18			CNE341N CME351N DHE341N	6
51	ECA421M	Extracurricular Activities in Teaching Chemistry	2	12	18		12	6		TMC441N	5
52	TNS431M	Natural scientific teaching in high school.	3	15		30	21	9		TMC441N	6
53	PTT421N	Pedagogical practice 1	2			60				PEP341M	3
54	PTT422N	Pedagogical practice 2	2			60				TMC441N ECT421N	7
55	TRA421N	Pedagogical training in teaching chemistry 1	2	3 weeks in school							5
56	TRA432N	Pedagogical training in teaching chemistry 2	3	7 weeks in school							8
Selective courses			4								
57	HOC421N	History of Chemistry	2	15	12		18			TMC441N	6

Entry	Code	Name	Credit	Credit kinds					Compulsory Courses	Before Courses	Semester
				Theory	Exercise	Experiment	Seminar	Professional practise			
58	TDC421M	Differentiated teaching in chemistry teaching at high school.	2	15	24		6			TMC441N	6
59	ETC421M	Equipment teaching chemistry	2	15		30				TMC441N	6
60	IAT421N	Informatics application in chemistry teaching	2	12		30	6			TMC441N	6
61	PMC421M	Problem-solving method in chemical teaching in high school	2	15	12		18			TMC441N	6
62	NSC421N	Natural scientific topics of chemistry in high school.	2	15	9		21			TMC441N	6
63	TOE421M	Teaching in the Online Environment	2	15	21		9			TMC441N	6
64	UEC421M	Using English in chemical teaching	2	15	15		15			TMC441N	6
4. Thesis, module replacements for the graduation thesis			7								

Entry	Code	Name	Credit	Credit kinds					Compulsory Courses	Before Courses	Semester
				Theory	Exercise	Experiment	Seminar	Professional practise			
Thesis											
65	CTE971N	Thesis	7								
Modules for thesis replacement			7								
66	TPD931N	Chemical teaching in school under the positive direction	3	30	15		15			TMC441N	7
67	TAT931M	Measurement and assessment in chemistry teaching	3	30	15		15			TMC441N	7
68	CCN921N	Natural Product	2	21	9		9			CCH321N	8
69	CPM921N	Corrosion and protection of metal	2	18	12		12			ELE331N	8
70	CCH921M	Colloidal chemistry	2	20	8		12			ELE331N	8
71	PTE921N	General techniques for environmental treatment	2	21	12		6			QAC341N	8
Total			135								

8. Training plan

Ent ry	Code	Name	Cr edi t	Semester							
				I		II		III		IV	
				1	2	3	4	5	6	7	8
1.1. Compulsory Courses			22								
1	MLP151 N	Principles of Marxism - Leninism	5		x						
2	HCM121 N	Ho Chi Minh’s Thoughts	2						x		
3	VCP131N	Principles of the Vietnam Communist Party	3							x	
4	EDL121N	General law	2						x		
5	ENG131 N	English 1	3	x							
6	ENG132 N	English 2	3		x						
7	ENG143 N	English 3	4			x					
1.2. Selective courses (select to 2 credits)			2								
8	GME121 M	Public and educational administratio n	2	x							
9	GIF121N	Basic informatics	2	x							
10	EDE121N	Environment and development	2	x							

Ent ry	Code	Name	Cr edi t	Semester							
				I		II		III		IV	
				1	2	3	4	5	6	7	8
11	VIU121N	Vietnamese in use	2	x							
12	VCF121N	Vietnamese culture's foundation	2	x							
13	LOG121 N	Basic logic	2	x							
14	CDE121N	Culture and development	2	x							
1.3	Physical education										
15	PHE111N	Physical education 1		x							
16	PHE112N	Physical education 2			x						
17	PHE113N	Physical education 3				x					
1.4	Defense education										
18	MIE131 N	Defense education									
2. Professional education knowledge			65								
2.1. Fundamental knowledge			15						x		
19	MAT221 M	Advanced mathematics for chemistry	4	x							
20	NSC231N	Natural Science I	3		x						
21	NSC232N	Natural Science II	3			x					

Ent ry	Code	Name	Cr edi t	Semester							
				I		II		III		IV	
				1	2	3	4	5	6	7	8
22	SCI253N	Natural Science III	5				x				
2.2. Professional knowledge			50								
Compulsory Courses			44								
23	CMS341 M	Chemistry of material structure	3	x							
24	TCP331N	Fundamental theory of chemistry process	4		x						
25	CNE331N	Chemistry of non-metallic elements	4			x					
26	CME341 N	Chemistry of metallic elements	5				x				
27	THC331N	Thermodynamic chemistry	3			x					
28	KCH321 M	Kinetic chemistry	2				x				
29	ELE331N	Electrochemical and physicochemical experiment	3					x			

Ent ry	Code	Name	Cr edi t	Semester							
				I		II		III		IV	
				1	2	3	4	5	6	7	8
30	OCH331 N	Theoretical principle of organic chemistry and hydrocarbon	3				x				
31	DHE341 N	Derivatives of hydrocarbon excess	4					x			
32	CCH321 N	Complex organic molecular and polymer	2						x		
33	TAC331N	Basis theory analytical chemistry	3				x				
34	QAC341 N	Quantitative analytical chemistry	4					x			
35	CFL321N	Chemistry for life 1	2					x			
36	CFL322N	Chemistry for life 1	2							x	
Selective courses			6								
37	CCC321N	Chemistry of coordination compounds	2							x	
38	SUC321N	Application spectrometry method on chemistry	2							x	

Ent ry	Code	Name	Cr edi t	Semester							
				I		II		III		IV	
				1	2	3	4	5	6	7	8
39	ECS321N	Statistical data handling of experimental chemistry	2							x	
40	CHM321N	Material chemistry	2							x	
41	SOC321N	Synthesis organic chemistry	2							x	
42	TNC321N	Thuật ngữ và danh pháp hoá học	2							x	
43	QCH321M	Quantum chemistry	2							x	
3. Educative knowledge			39								
Compulsory Courses			35								
44	EPS331M	Educational psychology	3	x							
45	PEP341M	Pedagogics	4		x						
46	COS321M	Pedagogical communication	2						x		
47	TTC441N	Theory of teaching chemistry	4				x				
48	TMC441N	Chemical teaching methods in high school	4					x			

Ent ry	Code	Name	Cr edi t	Semester							
				I		II		III		IV	
				1	2	3	4	5	6	7	8
49	ECT421N	Chemical experiments in high school	2						x		
50	ESC421M	Chemical exercises in high school	2						x		
51	ECA421M	Extracurricular Activities in Teaching Chemistry	2					x			
52	TNS431M	Natural scientific teaching in high school.	3						x		
53	PTT421N	Pedagogical practice 1	2			x					
54	PTT422N	Pedagogical practice 2	2							x	
55	TRA421N	Pedagogical training in teaching chemistry 1	2					x			
56	TRA432N	Pedagogical training in teaching chemistry 2	3								x
Selective courses			4								
57	HOC421N	History of Chemistry	2						x		

Ent ry	Code	Name	Cr edi t	Semester							
				I		II		III		IV	
				1	2	3	4	5	6	7	8
58	TDC421 M	Differentiate d teaching in chemistry teaching at high school.	2						x		
59	ETC421 M	Equipment teaching chemistry	2						x		
60	IAT421N	Informatics application in chemistry teaching	2						x		
61	PMC421 M	Problem- solving method in chemical teaching in high school	2						x		
62	NSC421N	Natural scientific topics of chemistry in high school.	2						x		
63	TOE421 M	Teaching in the Online Environmen t	2						x		
64	UEC421 M	Using English in chemical teaching	2						x		
4. Thesis, module replacements for the graduation thesis			7								
Thesis											

Ent ry	Code	Name	Cr edi t	Semester							
				I		II		III		IV	
				1	2	3	4	5	6	7	8
65	CTE971 N	Thesis	7								
Modules for thesis replacement			7								
66	TPD931N	Chemical teaching in school under the positive direction	3							x	
67	TAT931M	Measurement and assessment in chemistry teaching	3							x	
68	CCN921N	Natural Product	2								x
69	CPM921N	Corrosion and protection of metal	2								x
70	CCH921M	Colloidal chemistry	2								x
71	PTE921N	General techniques for environmental treatment	2								x
Total			135	15	19	16	22	21	19	16	07

9. Course abstracts

9.1. MLP151N, Principles of Marxism - Leninism (5 credits):

This subject is designed to equip students with the basic knowledge about the basic principles of Marxism-Leninism including: the world view and the philosophical principles of Marxism-Leninism, the doctrine of Marxism-Leninism on the mode of

capitalist production and the theory of Marxism-Leninism on socialism. In studying this module, students will be equipped with knowledge of the world view and scientific methodology. This subject is directly linked to the Ho Chi Minh Thoughts module (HCM121N) and the Principles of Vietnam Communist Party (VCP131N) in the subjects of political theory, natural sciences, social sciences and humanities.

9.2. HCM121N, Ho Chi Minh's Thoughts (2 credits):

Ho Chi Minh Thoughts is compulsory a module belonging to the general education knowledge category. The objective of study is to relate the system of theoretical views of Ho Chi Minh on the basis of Vietnam's revolution.

Specifically, this subject provides basic knowledge about Ho Chi Minh's ideology as the basis, formation and development of Ho Chi Minh thoughts.

At the same time, this module provides basic thematic ideas of Ho Chi Minh as: Thoughts about the issue of ethnic and national liberation revolution, thoughts about socialism and the path of transition to socialism in Vietnam, thoughts about the Communist Party of Vietnam, thoughts about socialism and the path of transition to socialism in Vietnam, thoughts about the Communist Party national unity and international unity, thoughts about the state of the people, by the people, for the people; thoughts about culture, ethics and building new humanity.

This module has a direct relationship with the module "The basic tenet of Marxism - Leninism, Revolutionary way of Communist Party of Vietnam and the scientific disciplines of political theory, social sciences - Humanities."

9.3. VCP131N, Principles of Vietnam Communist Party (3 credits):

This module is about the "Revolutionary way of Communist Party of Vietnam" and basically researching about the revolutionary way made by the Party during the process of leading Vietnam's revolution from 1930 to present.

The module includes 8 chapters. In chapters 1, 2 and 3 students will study the revolutionary way of the Party in the national, democratic and popular revolution (1930-1975); In chapters 4, 5, 6, 7 and 8, it researches on the revolution way of the Party in the restoration period, such as the way of industrialization, building up the socialist-oriented market economy, building the political system, building and developing the culture, social problem-solving and foreign policy.

By studying this module, students will gain the basic knowledge about the establishment of the Communist Party of Vietnam, understanding of the process of formation, complement, development of the revolutionary way of the Party and judge results of the implementation of the Party's revolutionary way on some fundamental aspects of the restoration period.

9.4. EDL121N, General of law (2 credits):

This subject provides basic knowledge about the state and the law, such as the origin of the state and the law, the essence of the state and the law, formation of the state and many other aspects. Alongside this, the module provides basic knowledge on some of the important laws within the legal system of Vietnam, such as constitutional law, administrative law, criminal law, civil law and others.

9.5. ENG131N, English 1 (3 credits):

The English 1 module provides students with basic grammar such as present simple tense, continuous present tense, simple past tense, past continuous tense, comparative tense verbs, and basic vocabulary about topics such as health, sports, transportation and provides the experience to be able to develop language skills at Level 2 "advanced". At the same time, this subject also trains students their skills to use English in everyday forms of communication such as listening and reading information from interviews on the radio, conversations, reading articles on familiar topics, expressing opinions and interpret them in everyday communication situations, writing grammatically correct sentences on topics such as health, sports, traffic, and adventures.

Through classroom lessons and exercises on the MyELT self-study software, students can consolidate their knowledge while developing self-study and self-training skills.

9.6. ENG132N, English 2 (3 credits):

The English 2 module is the next stage on from English 1, it builds students vocabulary about environmental topics, life events, careers, and science/technology. Besides this, the module provides students with knowledge of basic grammatical phenomena, such as countable and uncountable nouns, consistent number nouns, articles, large verbs, future forms, prepositions, present tenses, components, defining relative clauses and conditionals type 1 and type 0. The subject knowledge is not only academic but also includes information and practical knowledge about places, people and event in several countries around the world.

This module continues to train the learners of English communication skills at Level 3 at intermediate level, including listening, speaking, reading and writing, divided between 4 main topics as mentioned above. At the end of this module, within the learned topics, students can talk, listen to ideas and get information, read ideas and read information, and be able to write short paragraphs of 35-45 words.

9.7. ENG143N, English3 (4 credits):

The English 3 module continues on to complement students vocabulary on Language and learning topics, travel and vacation, history, naturally with grammatical topics about passive sentences in the present and the past, past perfect tense, questions for the subject and the object, the adjectives –ing and tailed, structure used to, indirect sentences; conditional type 2, the pronouns, will, might. In addition, through this subject, students continue to practice communication skills in English such as: listening to conversations,

interviews, articles; reading and understanding articles on topics learned, presenting personal views, planning or interviewing and practicing intimate letter writing skills and writing a personal resume of about 100-120 words.

Together with the English modules 1 and 2, this subject continues to develop English language skills for students to achieve English level 3 according to the 6-level Foreign Language Competency Framework of Vietnam and is usable in communication operations.

9.8. GME121M, Public and educational administration (2 credits):

This module has particularly important implications for training programmes bachelor pedagogy. It provides students with the basic knowledge of the state administration (the main characteristics of the state administration, content, processes, tools, forms, methods of management within the state administration, civil servants, law officers), state management of education and training (the nature, characteristics, principles, the content management apparatus of state for education and training, views of the Party and the State on education and training) and the legal documents on education and training. Thus, students are aware of their own responsibilities in the implementation of legal documents on education and the obligation of citizens to the country. The subject has a close relationship with the general law module, the subject of general education, professional organizations and the management school.

9.9. GIF121N, Basic informatics (2 credits):

This module teaches the basic concepts of information processing and computing, taking advantage of Internet services for learning, research and teaching; skills in using operating systems for computer system management, using application software, word-processing and saving documents for official work, using spreadsheets such as Excel for science and technical tasks, using presentation tools such as PowerPoint for creating attractive, informative and effective presentations.

9.10. EDE121N, Environment and development (2 credits):

This module consists of 5 chapters which deliver the subject matter relating to the environment and development. The module provides students with basic knowledge about the environment, population, human needs and the activities to satisfy human needs, the condition of natural resources, environmental pollution issues and environmental protection policies for sustainable development. The content covers global scale and in-depth analysis from Vietnam itself.

In addition to this, the module provides knowledge about the relationship between humans and the environment, the consequences of population explosions, the impact of population growth on the environment, the influence of modern society on the natural

environment, the current condition of the natural environment regarding pollution, the relationship of population, social-economic development and natural resources. Subjects related to natural and social fields such as geography, earth science, meteorology, economics, and demographics are also touched upon.

9.11. VIU121N, Vietnamese in use (2 credits):

This module is a part of the specialized knowledge block, equipping students with the basic knowledge of how to spell, pronounce, use words and make sentences, how to receive and create some common types of documents.

This module has 2 chapters. Chapter 1: Practice skills of spelling, pronouncing, using words and making sentences. Chapter 2: Practice the skills to receive and create documents.

Thanks to these skills, learners can enhance their communicative ability in reading, writing, listening and speaking activities. At the same time, learners can apply the knowledge gained from the subject to do scientific research, to improve the efficiency of administrative communication, to improve the effectiveness of teaching Vietnamese lessons at high schools, to improve self-study abilities, cooperation skills and computer skills.

9.12 VCF121N, Vietnamese Culture's Foundation (2 credits):

This module equips students with basic, important and specific characteristics of Vietnamese culture. The subject consists of 3 chapters which provide the general knowledge to students with an overview of culture and general culture. The content mainly pays attention to most of the basics of Vietnamese culture such as: Vietnamese cultural positioning, Vietnamese cultural progress, basic cultural components, Vietnamese cultural regions and Vietnamese culture from traditional to modern day.

9.13. LOG121N, Basic Logic (2 credits):

This formal logic module is part of the general education knowledge block. This module equips learners with basic knowledge about the forms and laws of thinking. It helps learners to think independently and know how to solve problems related to thinking. Formal logic is closely related to theoretical sciences such as philosophy, computational sciences such as mathematics and humanities such as linguistics and psychology.

9.14. CDE121N, Culture and development (2 credits):

This module belongs to the basic knowledge block, group of elective modules. The module presents basic knowledge of culture-related specialties, analyzes the relationship between culture and development, the role, influence and impact of culture on economic development, social development and vice versa. The module is also relates to Vietnamese culture, identifying and analyzing the basic characteristics of Vietnamese culture, its role in the

development of the Vietnamese economy and society in the contemporary context, and the impact of economics on cultural development.

9.15. Physical education 1

The Physical education 1 module is a compulsory subject for non-specialized sports students of Thai Nguyen University of Education. This subject includes two sports: athletics and gymnastics. These are the two sports with the oldest history, occupying an important position in the competition programmes of the International Olympic Games and in the cultural and sports life of mankind. This subject provides students with the knowledge of health care and hygiene, and includes the basic skills such as short-distance running, long-distance jumping, team formation exercises and hand exercises. Moreover, this subject also helps students to improve their health, contributes to training their ethical qualities, will, agility, collective spirit and creating favourable conditions for training in other sports.

9.16. Physical education 2

In the physical education 2 module, students can choose to study one of the following five sports: Football, Volleyball, Basketball, Aerobics or Martial Arts. This subject provides the students with the benefits and effects of practicing their sport of choice, the basic technical principles, tactics, competition rules, organization and refereeing. This module forms the basic skills and techniques in those sports, helps students in improving their health, contributes to the training of moral qualities, will, agility and collective spirit. This creates favourable conditions for training in other sports.

9.17. Physical education 3

In the physical education 3 module, students can choose to study one of the following five sports: Sports Dance, Handball, Shuttlecock, Badminton or Chess. This subject provides students with the benefits and effects of practicing the sport which they have chosen, the basic technical principles, tactics, competition rules, organization, and refereeing. This subject forms the basic skills and techniques in those sports, helps students in improving their health, contributes to the training of moral qualities, will, agility and collective spirit which creates the favourable conditions for training in other sports.

9.18. Defense education: According to additional documentation.

9.19. MAT221M, Advanced mathematics for chemistry (2 credits):

This subject provides students with the basic knowledge of set theory, mapping, matrices, determinants, linear equations, real numbers and functions of real variables,

theoretical limits, continuous functions, calculus functions for one variable, primitive and indefinite integrals, definite integrals and generalized integrals.

9.20. NSC231N, Natural Science 1 (Physic) (3 credits):

This course includes the most general and basic theoretical knowledge of matter structure, the matter properties, the existence of material phase and the phase transition process, the natural forms of movement, from the motion of the atoms, charges to the motion of the planets, orb, four forms of interaction and forces in nature, the general knowledge about astronomy, space science and applications for common astronomical phenomena. The course content also includes basic knowledge about the current in different environments such as: solid, liquid, gas; natural phenomena and applications such as electrical discharges in gases (lighting), electrolysis phenomena and its applications in molding, electroplating, painting, the knowledge about using electricity safety, economical and efficiency.

9.21. NSC232N, Natural Science 2 (3 credits):

This course includes the basic and the most general theoretical knowledge about wave propagation process, the applications of mechanical waves and electromagnetic waves in life such as instruments manufacturing, ultrasound, media...; energy, kinds of energy and energy sources in nature such as fossil fuels, solar energy, wind energy..., using energy economical, efficiency.

Basic experiment train students for physical experimental skills, consolidate the theoretical knowledge learned. Practical part includes some typical experiments to investigate phenomena, physical processes, determine the physical quantities such as free-fall motion, Archimedes force, charge, electric field, current in different environments...

9.22. NSC233N, Natural Science 3 (5 credits):

This subject provides basic knowledge about the origin of life, the emergence of life on Earth, the distribution system biota; structure and function of cells, cell cycle, general introduction to the process and energy metabolism in cells, the growth and reproduction of cells, the process of sexual reproduction of the cell; the basic knowledge of the genetic phenomena; Introduction classical and modern evolution. In addition, this subject also provides an overview of the contents of the flora and fauna including the plant body composition, the process of acquisition and exchange of substances in the plant body; structure and operations of the agencies in the bodies of animals and humans. The module also provides

basic content of ecology, the biosphere, the relationship and the interaction between inorganic and organic in nature world, the role of humans in such activities. From that show the essence, the impact and effects of climate change on the lives of humans and other species in the world to have a sense born to preserve and protect nature.

9.23. CMS331M, Chemistry of material structure (3 credits):

This module provides students with knowledge of the chemistry of material structure which is the basis for more specialised subjects. It enables students to be able to go on to study subjects such as inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry as well as many others. The chemistry of the material structure is a basic part of the knowledge of substances and their structure. This module makes use of a basic knowledge of advanced mathematics to study atomic structures, the periodic table of elements, molecular structure, chemical bonds in substances and the crystalline state of materials. From this basis, students we be able to build their skills so they can apply their knowledge to solve problems, problems in teaching, in science and in the rest of life.

9.24. TCP341N, Fundamental theory of chemistry process (4 credits):

The fundamental theory of chemistry process module forms part of the basis of specialized knowledge to enable the students to be able to study other subjects such as inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry and many others.

The fundamental theory of chemistry process is a part of the basic knowledge of the theory of chemical processes and the conditions necessary for the chemical processes to occur. This subject uses a basic amount of advanced mathematics and general physics to study various conditions such as temperatures, pressures, entropy, and the thermodynamic qualities of reactions occurring within, any system, the balance system, solutions and electro-chemical systems. Thus, the module contributes to skills on how to apply this knowledge into solving matters in teaching, science, and life.

9.25. CNE341N, Chemistry of non-metallic elements (4 credits):

The "Chemistry of Non-metallic Elements" module provides basic and up-to-date scientific knowledge of non-metallic elements and their compounds. The basic contents of the subject include the location, structural characteristics, properties, natural state, methods of preparation and applications of nonmetals and their compounds.

9.26. CME351N, Chemistry of metallic elements (5 credits):

The "Chemistry of metal elements " module provides basic and up-to-date scientific knowledge of metal elements and their compounds. The basic content of the course

includes the location, structural characteristics, properties, natural state, methods of preparation and applications of metals and their compounds from group IA to group IVA and from group IB to group VIIIB. Thus equipping students with knowledge, and homeworking skills related to the knowledge of metal elements in real life.

9.27. THC331N, Thermodynamic chemistry (3 credits):

Chemical thermodynamics is the most important part of physical chemistry. This module applies and develops the principles, the laws of thermodynamics, chemical processes and physical chemistry, to equip students with necessary knowledge of basic thermodynamics, heating effects on chemical processes and physical chemistry, the properties and the basic rules of solutions and their application in practice. Also the balanced conditions and processes of chemical reactions, and the factors affecting that balance. Also conditions, properties of phase balance, rules of phase transition in heterogeneous systems, Surface phenomena and adsorption.

9.28. KCH321M, Kinetic chemistry (2 credits):

This module helps students better understand the knowledge related to the rate of reaction, and the reaction rate constants, that are part of the fundamental theory of chemistry processes. This module provides students with the knowledge of reaction rates, the reaction rate constants, the kinetic rules of simple and complex reactions, the number of factors affecting the reaction rate as the concentration of reaction substances, temperature, catalyst concentration, reaction mechanisms, the basics of catalytic phenomena, catalytic reaction classifications and the influence of catalyst to the rate of reaction.

9.29. ELE331N, Electrochemical and physicochemical experiment (3 credits):

In this module, the rules of interchange between the chemical potential and electrical power is studied. This provides students with the basic knowledge about the theory of dissociation of solutions, the equilibrium between electrodes and the solutions and the irreversible electrochemical processes. There is also content about the application of electrochemical reactions in life and production. In the practical part of the module, students will learn how to conduct physical and chemical experiments to explain, prove and consolidate the knowledge they have learned.

9.30. OCH331N, Theoretical principle of organic chemistry and hydrocarbon (3 credits):

This module provides the student with the fundamental knowledge of organic chemistry, including the research methods of organic chemistry, chemical bonding in organic

molecules, hybridization, isomerism, nomenclature, configuration, stereochemistry, electron effects, spatial effects, organic reactions and mechanisms of organic reactions. This subject consists of 5 chapters, as below:

- Chapter 1. Introduction to Organic Chemistry
- Chapter 2. Spatial structure of molecules
- Chapter 3. Chemical bonding and electron effects of organic compounds
- Chapter 4. Organic Reactions
- Chapter 5. Organic Reaction Mechanisms

9.31. DHE341N, Derivatives of hydrocarbon excess (4 credits):

Knowledge of hydrocarbon derivatives is considered as an important part of basic scientific knowledge, current, and always ties into real life production and in teaching in high school. This subject provides the knowledge of the structure, chemical properties, applications and preparation of hydrocarbon derivative compounds and organic chemistry experiments. In addition, it will contribute towards the skills to solve the problems in science and life for the student.

9.32. CCH321N, Complex organic molecular and polymer (2 credits):

Complex compounds and polymers function as part of basic scientific knowledge, are current, and are always tied to real life production. This module provides knowledge of the structure, chemical properties, applications and preparation of nitrogen-containing compounds, complex compounds and high molecular functions. Thus forming the skills students will need to solve problems, problems in science and in the rest of life.

9.33. TAC331N, Basis theory analytical chemistry (3 credits):

This subject gives learner the understanding of the basic theories of analytical chemistry, and helps learner to understand clearly the configuration of equilibriums, processes that happen in solutions, the factors that influence those processes, and how to predict and explain phenomena occurring in electrolyte solutions based on qualitative, semi-quantitative and quantitative assessments etc. The equilibrium calculation is deployed by using approximately continuous methods and ignores ionic force effects.

9.34. QAC331N, Quantitative analytical chemistry (3 credits):

This subject aims to provide students the basic knowledge of quantitative analysis methods which are commonly used in chemistry and its related fields. After completing this subject, the students will be able to apply a suitable quantitative analytical method for determining the concentration of one element, or one substance in an any sample.

9.35. CFL321N, Chemistry for life 1 (2 credits):

Chemistry for life 1 is a module that provides students with knowledge about chemical products in relation with everyday life. It prepares a significant amount of knowledge about the processing of production, application, the environmental problem in production, impacts to environment and health of human beings. The knowledge in this module relates to the interconnection with inorganic, organic and environmental subjects. Preparing students with knowledge of these sciences will help them connecting and using them to other areas of their life, as well as for their teaching.

6.36. CFL322N, Chemistry for life 2 (2 credits):

The chemistry for life 2 module provides student with knowledge about fertilizers, chemicals for plant protection (for example, pesticides, herbicides...), safety for food and the polluted environment in agriculture. Generally, students will be able to understand the disadvantageous effects on the environment and will be able to propose solutions to solve pollution effects.

9.37. CCC321N, Chemistry of coordination compounds (2 credits):

This module presents the basic knowledge about the compounds, components, structures, isomerism and their nomenclature. This module uses 3 modern theories (Valence bond theory, Crystal field theory, Molecular orbital theory) to explain chemical bonds in the compounds and their characteristic properties. Furthermore, this module presents the characteristic reactions of compounds. Thus, the students will have skills on applying knowledge about compounds into solving matters of science, teaching processes and life.

9.38. SUC321N, Application spectrometry method on chemistry (2 credits):

This module provides students with the following knowledge: The theoretical basis for the formation of infrared spectra (IR), visible ultraviolet (UV-Vis) and mass spectrometry (MS). Some characteristics, principles of spectroscopy and application of infrared spectra, visible ultraviolet and mass are also included.

9.39. ECS321N, Statistical data handling of experimental chemistry (2 credits):

This module provides the student with concepts of mathematical statistics and empirical data processing such as: deviations (bias), random variables, precision, repeatability, variance, standard deviation, common distributions, reliable boundary (ϵ) and reliable accuracy. It also covers the statistical processing of data obtained in experimental chemistry including: the calculation of the quantities that characterize the concentration and dispersion of the dataset, the errors in indirect measurements, using the standard t, Q to check the systemic errors of the dataset and the crude errors of a certain values,

compare variance and compare the mean of two or more measurements, using standard F to compare the repeatability of two test series, test a statistical hypothesis, to define meaningful digits, the rules for rounding numbers and how to present data in chemistry.

9.40. CHM321N, Material chemistry (2 credits):

This module provides the basic knowledge about materials, such as concepts, classification, structure, types of bonding in materials and properties of materials. In addition, some common materials such as ceramics, composite materials, inorganic polymer materials, and advanced materials (nanomaterials) have also been mentioned. In each type of material, specific properties are studied and hence outline their main uses. Moreover, students can develop skills in applying knowledge in materials chemistry to solve problems in science and in life.

9.41. SOC321N, Synthesis organic chemistry (2 credits):

This module is comprised of 6 chapters which provide students with some basic knowledge of organic synthesis and synthetic methods for producing organic compounds. The chapters are as follows:

- Chapter 1: The attachment of functional groups to organic compound molecules and the transformation between functional groups.
- Chapter 2: Methods of carbon – carbon combination creation in organic compounds.
- Chapter 3: Methods of carbon – hetero-atom creation
- Chapter 4: Methods of cyclization in organic chemistry.
- Chapter 5: Synthesis of organic compounds based on reduction reactions.
- Chapter 6: Synthesis of organic compounds based on oxidization reactions.

9.42. TNC321N, Terminology and Chemical Nomenclature (2 credits)

The system of chemical concepts in high school programs are almost terms or symbols related to Chemical terminology. Chemistry program in schools utilize a large number of Chemical terminology - words that contain Chemical concepts, as well as tools for Chemical scientific thinking. Scientific concepts (in general), and Chemical concepts (in particular) result from the process of generalization and abstraction of human mind, so the symbols expressing those are also abstract and highly generalized. On the other hand, most of the chemical terms are constructed from borrowing scientific terminology in a foreign language, not necessarily related to common words and phrases. It is a specialized system, we, therefore cannot know and use it if we do not study Chemistry.

Establishing and developing linguistic competence and capacity of using Chemical language are the target and main content of the module.

This module will equip students with nomenclature concept system, Chemical terminology, the regulation of their use, the content and form of Chemical concept expression concept through Chemical terminology and nomenclature system. The course will also enable students' capacity of using the chemical language as a means of effective research and Chemistry teaching. The integrated teaching capacity in teaching Chemistry at high schools is, thereby, promoted.

9.43. QCH321M, Quantum chemistry (2 credits):

Quantum chemistry is a subject of the specialized knowledge block. This module is equipped with in-depth knowledge so that students can understand the basic knowledge gained in the chemistry of material structures.

This subject introduces the fundamental knowledge of quantum mechanics as applied to chemistry, to fundamental concepts of quantum mechanics such as wave functions, to complex numbers, operators, private functions, private values, the basic axioms of quantum mechanics and the important consequences of the axioms of quantum mechanics. This module also helps students with understanding the knowledge of how to explain the structure of hydrogen atoms and the same hydrogen generation by quantum mechanics, and many electron atoms. Basically, it provides the knowledge of VB, MO, HMO methods in the research into the structure of chemical compounds.

9.44. EPS331M, Educational psychology (3 credits):

This module equips students with the concepts, rules and common methods of educational psychology, the theoretical issues of the psychological development of high school and junior high school students, mechanisms, rules and psychological development stage individuals, the psychological basis for teaching activities and education, relationships between learning and perception, learning and education, psychological theories and models of learning and the psychological basis of moral education. Special subjects within the module also give students knowledge of theoretical issues about the ethical and psychological support skills in basic schools. From there, it is possible to apply the knowledge learned in teaching, research and human psychology, formation and personality development of students, school support and higher solving difficulties in psychology. At the same time, the subject is also the basis for studying other subjects in the curriculum, such as school education and psychology.

9.45. PEP341M, Pedagogics (4 credits):

This module is about:

- Knowledge of education as a science: human education science, factors that affect personality development, the aims of education systems and the education mission.
- Knowledge of teaching theory: the definition of the teaching process, the factors that contribute to the teaching process, the rules, methods, and form of teaching.
- Knowledge of education theory: the definition of the education process, the essence of the process of education, the logic in the processing of education, education rules and education methods of organizing educational activities in schools.
- The requirements for teachers' personality, pedagogical labour characteristics, role and content of classroom teachers in multicultural and revolutionary environment 4.0.

9.46. *Communication Pedagogy (2 credits)*

Subject bloc professional knowledge in training programs Pedagogical Psychology - Education aims to equip learners with basic knowledge about communication, pedagogical communication: concepts, position, role and stages of pedagogical communication; principles, styles and pedagogical skills. Thereby, help learners practice skills some basic pedagogy in teaching and education, such as interpersonal skills communication environment; Skills to learn object communication; Skills initial impression in communication; Listening skills ... At the same time, said the choice of communication style suit pedagogical subjects and social situations; confident, proactive communication.

This course has relationships with many other subjects in the curriculum, such as: psychological consultation, education and life skills, communication with marginalized groups ...

9.47. TTC441N, Theory of teaching chemistry (4 credits):

This module instructs the students on the theory of teaching chemistry in high schools, as it is a general problem, with issues about the nature of teaching high school chemistry. The module content consists of:

- The theory of taught chemistry in high school (The rationale of the process of teaching high school chemistry), including teaching duties, content and curriculum structure, methods and formats of the organization of teaching chemistry in high school.
- Research on the process of teaching high school chemistry, including basic concepts, the scientific method (in general) and scientific research and education on teaching chemistry (in particular).

After completing the module, outside the system of basic knowledge, the module also helps students to gain the skill of using the knowledge of psychology and education in teaching chemistry, and in scientific research for teaching chemical processes at high school. It helps students initially form the qualities required for future chemistry teachers.

9.48. TMC441N, Chemical teaching methods in high school (4 credits):

Methods of teaching high school chemistry is a compulsory module in the curriculum of the pedagogical chemical industry. This subject provides students with knowledge of:

- The system of chemical knowledge content in the programme for studying chemistry in high school, the structure of the teaching plans and development-oriented programmes for chemistry in high school.
- The scientific basis of the selection, selection skills, and ability to apply the teaching methods, means, and formats of organization for the type of teaching the lesson required in high school chemistry.
- Skills content analysis for chemistry lessons, designing lessons and planned teaching methods for each type of lesson, identify the requirements of the study to be achieved. The specifics of teaching methods in teaching chemistry, deployment of different types of chemistry lessons: theory of chemistry, chemical laws, elements and the chemicals (inorganic and organic), revision lessons and training.

9.49. ECT421N, Chemical experiments in high school (2 credits):

The module content includes chemistry in high school, the experiments performed by teachers and practical experiments performed by the students. On completion of the module, students should be proficient in pedagogical skills in using teaching experiments in high school chemistry, including the following tasks:

- Proficiency in preparation for a lesson to enhance the student's practical skills.
- Proficiency in technique and conduct in the experiments performed in the programme.
- Select the content and methods for teachers to allow students to perform experiments to consolidate the learning content.

9.50. ESC421M, Chemical exercises in high school (2 credits):

This module includes the presentation of theory as the classification, formats and types of exercises from mainstream chemistry in popular programmes, and analyze the role of chemistry homework tasks in teaching chemistry in high school.

The practical part consists of exercises, discussions to help students locate exercises in the chemistry education curriculum, provides guidance for the students to the types of

exercises, using exercises in specific types of lessons, improving computational chemistry and chemical language usage content for students. The module is organized into 6 chapters:

- Chapter 1: Some common problems about high school chemistry
- Chapter 2: General methods to solve a chemical problem
- Chapter 3: Generalized exercises
- Chapter 4: Inorganic chemistry exercises
- Chapter 5: Organic chemistry exercises
- Chapter 6: Using exercises in the process of teaching chemistry

9.51. ECA421M , Extracurricular Activities in Teaching Chemistry

EA are diverse in contents, integrated, and a collection of knowledge, skills of different subjects and educational fields such as moral education, intellectual education, life skills education, life values education, art education, aesthetics, physical education, labor education, etc. The educational contents of EA are very practical and close to real life, meeting the needs of students, helping them to apply their knowledge in real life in an easy and convenient way. EA can be organized in different scales: by group, by grade, in one school or among different schools in various forms such as club activities, game shows, forums, sightseeing excursions, competitions, exchange, voluntary, and community activities, etc. Every form carries certain educational meanings.

In the new secondary programs, in the period of vocational orientation (at high school), the extracurricular activities are organized in association with the future career, mostly in the form of professional clubs. Students will be assessed for competence, excitement, etc. and advised for their career orientation and selection. In this period, the educational program is highly differentiated and elective. Students get experience with various occupations in different forms.

Chemistry is a subject with advantageous conditions to organize extracurricular activities for students. Extracurricular activities are designed to be specific, outside classroom in which the organizing and guiding relevant contents in practical teaching contexts must be paid more attention to.

9.52. TNS431M, Natural scientific teaching in high school (3 credits)

This course is a knowledge modules with duration of 3 credits, in which the theory presents and analyzes the nature of the integration of teaching, analyzing trends teaching that integrates the received the necessity of integrating the teaching of science in schools; the method and form of integrated teaching; requirements, the ability to integrate the teaching of chemistry; the principle of the thorough development program integrated DH; the conditions for integrated

learning, content analysis, and teaching chemistry towards integration, and applying integrated teaching perspective in teaching natural science in schools.

Practical part of the course will guide students to practice the techniques taught in the classroom teaching deployment of natural science in schools.

9.53. TRA421N, Pedagogical practice 1

Pedagogical Practices course Chemistry 1 is subject to help students practice teaching skills such as: Presentation skills; panel presentation skills and organizational skills of collective activities (classes, team, ...). Through the course, students are initially formed the basic teaching capacity, especially the ability to use language, the language of chemistry, initially have some understanding of the work of teachers

understanding of the capacity of the teachers, but those powers needed to meet the requirements of general education innovation.

9.54. TRA432N, Pedagogical practice 2

This course includes 2 credits (2 units of study), course content is the process of practice teaching skills, those skills necessary for the chemistry teacher in high school. After completing the course, students will have mastered the learning skills to prepare, skills to conduct lessons in teaching high school chemistry, that apply in the general knowledge of psychology, education on the deployment of teaching, know to apply theoretical knowledge in practice teaching, are trained to master the practical skill of teaching chemistry in high school.

9.55. PTT421N, Pedagogical training in teaching chemistry 1 (2 credits):

This module is to help students practice their teaching skills such as presentation skills, panel presentation skills and organizational skills for collective activities (classes, teams etc.). Throughout the module, students are shown the basic teaching skills, especially the ability to use language, chemical language, and to initially have some understanding of the work of teachers, understanding the skills of teachers and especially those skills that are needed to meet the requirements of general education innovation.

9.56. PTT422N, Pedagogical training in teaching chemistry 2 (2 credits):

This module includes the process of practical teaching skills, particularly those skills necessary for the chemistry teacher in high school. After completing the module, students will have mastered the skills to prepare and deliver lessons in teaching high school chemistry, whilst applying the general knowledge of psychology, education on the deployment of teaching, and know how to apply theoretical knowledge in practical

teaching, and are trained to master the practical skills of teaching chemistry at high school.

9.57. HOC421N, History of chemistry (2 credits):

This module studies and presents the study of the history of chemistry and how this has helped in accumulating chemical knowledge over the course of time. This includes the evolution of chemical ideas and the great successes and achievements in the field of chemistry. While studying this module, the students will find that their chemical knowledge is complimentary and deeply systematized in both breadth and depth. Also student will learn of the experience of the successes and failures of thinking, in the way of learning and the way of scientific research. The module content also exemplifies the famous chemists and the serious labour in chemical research. The module also helps students to gain a broad knowledge of and to appreciate the many issues, characteristics and realise that chemistry and sciences in general, rely on continuous research from generation to generation for continued development and progress.

9.58. TDC421M, Differentiated teaching in chemistry teaching at high school. (2 credits):

This module covers some of the most important concepts and methods of organizing differentiated teaching (DT) in teaching chemistry. Due to specific properties, DT has its own principles in which the most remarkable idea of teaching is that teachers must consider students as distinguished individuals, to value quality above quantity, focus on learners, learning should be relevant and interesting, utilizing teaching methods for whole-class, groups and individuals.

9.59. ETC421M, Equipment teaching chemistry (2 credits):

Teaching facilities are material objects to be used by teachers as a means of organization, and to control the cognitive activities of learners to achieve learning objectives. The content of this module consists of two parts: The theory part includes a basic knowledge of general teaching facilities, teaching with traditional media, the means to teach chemistry, multimedia in teaching and the application of multimedia in teaching high school chemistry. The practical part helps students to use general teaching facilities and specific teaching facilities for the teaching of chemistry in particular.

9.60. IAT421N, Informatics application in chemistry teaching (2 credits):

This module helps enhance a student's imagination and creativeness in order to improve the effectiveness of teaching chemistry. The subject studies how to integrate the applications of information and communications technology (ICT) into the teaching methods of Chemistry, examines the teaching and learning of chemistry in ICT environments so that it can enhance a student's activity and independent study in chemistry. The module provides students with the necessary skills in ICT, which partly contributes to the national education improvements of today. This module also provides students with important knowledge for the utilization of different software in teaching

and learning chemistry. It is even helpful with teaching integrated and relevant subjects later on.

9.61. PMC421M, Problem-solving method in chemical teaching in high school. (2 credits):

This module introduces general issues about problems and methods of problem solving in teaching in general, and methods of creating problems in teaching chemistry in particular, in which it deals with the contents of 2 types of methods: The methods are problem-solving teaching and problem-based teaching. The module equips students with the knowledge of these positive teaching methods. It also trains and develops basic teaching skills of a chemistry teacher at high school. Completing the course, students will master the skills to prepare and conduct lessons in teaching high school chemistry in the direction of capacity development and integrated teaching. They can apply comprehensive knowledge of the psychology of education in the implementation of integrated teaching. Students are trained to master the practical skills of teaching chemistry in high schools using the problem-solving teaching methodology and problem-based teaching too.

9.62. NSC421N, Natural scientific topics of chemistry in high school (2 credits):

This module equips students with the knowledge of chemistry related to practical issues, reflecting the deep interdisciplinary relationships with other subjects, and becoming the basis for designing interdisciplinary themes to ensure the requirements of integrated teaching in chemistry at high schools. The contents of the subject including such issues as The state of substance, acids and bases, metals, inorganic carbon, energy, atmospheric chemistry, oceans, organic synthesis technologies, etc. Also this module will help the student link chemical knowledge with practical life, improving their capacity of problem-solving and creativeness for students.

9.63. TOE421M, Teaching in the on-line environment (2 credits):

This module equips students with the theoretical knowledge about the environment and popular supporting tools for on-line teaching today. Students also have chance to learn about the skills to design, organize, and manage on-line subjects for their department. Students will apply teaching methodologies into designing on-line subjects on Moodle - a new Learning Management System (LMS), which focuses on improving their Information technology (IT) skills, and enhancing their active interaction with learners in the on-line learning environment.

9.64. UEC421M, Using English in chemical teaching (2 credits):

The contents of this module include reading passages about universal scientific knowledge, common chemical knowledge from specialized English documents and how to access the requirements of IGCSE certification exam. The contents are compiled to suit the knowledge of chemistry as well as other natural sciences at secondary school, and includes the following topics: science, the elements and chemicals (Periodic Table

of chemical elements), foreign educational programmes, etc. with some organizational models for specific teaching activities.

9.65. CTE971N, Thesis (7 credits)

9.66. TPD931N, Chemical teaching in schools under the positive direction (3 credits):

The module content consists of two parts:

- Theory: an overview of the most common definition of innovation-oriented teaching methods (general) and methods of teaching chemistry in high school (in particular), which focus on the point of research in teaching: "Teaching a learner-centered" orientation is the chosen implementation for active teaching.
- Practice: providing the students with basic skills to develop a positive chemistry lesson, the teaching methods used should allow the learning of basic techniques taught, teaching techniques, the evaluation of tests, in a positive way in order to improve the efficiency of the process of teaching high school chemistry.

9.67. TAT931N, Measurement and assessment in chemical teaching (3 credits):

The basic contents of the module include general issues of testing and evaluating learning outcomes, teaching objectives, methods and formats of assessment, assessment tools, procedure for organizing an examination, etc. These contents will equip students with the methods and techniques for evaluating, designing questions, building test types, organizing an exam, how to collect and process the data obtained after each exam, evaluating the learning outcomes of chemistry in schools in order to meet the requirements of the new education reform programs. In addition to this, the module provides a number of techniques in dealing with exam questions in order to generate the best questions.

9.68. CCN921N, Natural compound (2 credits):

Natural compounds are an important part of organic chemistry. The module provides students with a systematic advanced base of knowledge and methods for studying natural compounds such as extraction methods, physicochemical properties, identification of structural methods, biological activities, the application of natural compounds in plants, animals and micro-organisms which exhibit biological effects such as terpene, terpenoid, steroid, alkaloid and polyphenols.

9.69. CPM921N, Corrosion and protection of metal (2 credits):

This module helps students to know how to solve the problem of metal corrosion encountered in real life. The module provides students with the knowledge of metal corrosion and the economic importance of the problem. Students will find out about the mechanism behind metal corrosion and the electrochemical measures that can be used against the corrosion of metals and look at ways of determining the rate of metal corrosion.

9.70. CCH921M, Colloidal chemistry (2 credits):

This module will introduce students to some basic knowledge about this highly distributed system, the role and importance of this system in production and life and in biology and materials technology. They will also learn about the composition and method of preparation and purification of glue including: surface phenomena, adsorption of the colloidal, optical properties, kinetic properties, electrical properties, flocculation of colloidal systems and about the distributed system of the sale of colloidal substances.

9.71. PTE921N, General techniques for environmental treatment (2 credits):

This module contains knowledge of the techniques for environmental treatment and provides knowledge about the analysis and impact evaluation of polluted environments – this acquired knowledge will then be used by the students to propose treatment solutions for these environments. In particular, students will be given systematic content which relates to the general techniques for treating polluted soil, water and air. This will be extremely advantageous for applying them in real life, and to aid in teaching this subject as part of science teaching in high schools.