

TNU-UNIVERSITY OF EDUCATION



PROGRAMME SPECIFICATION
BACHELOR OF CHEMISTRY EDUCATION

FACULTY OF CHEMISTRY (FC)

20, LUONG NGOC QUYEN ROAD, THAI NGUYEN CITY, VIET NAM

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THAI NGUYEN - 2020

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PROGRAMME SPECIFICATION

FOR BACHELOR OF CHEMISTRY EDUCATION

*Decision No 3473/QĐ-ĐT dated on October 15, 2020 by the Rector
of TNU University of Education.*

I. PROGRAMME DESCRIPTION

1. Programme introduction

Bachelor of Chemistry Education programme revised in 2020 to develop some training industry of educational universities to obtain national standards, to improve the training university quality, adapt to the fundamental and comprehensive renovation requirements of Vietnamese education.

Bachelor of Chemistry Education programme is inherited from the previous Chemistry educational training programme and is supplemented and developed to adapt to the new requirements of general education. The specialized courses of the Bachelor of Chemistry Education programme are taught by lecturers with a Ph.D. degree in the Faculty of Chemistry.

The Faculty of Chemistry continuously improves and develops the facilities as well as educational activity and research to adapt to the different demands in the chemical field. The Faculty of Chemistry provides, creates for learners comprehensive educational environment, both in theory and practice, to encourage the active, initiative, creativity, and cooperative learning of students.

2. 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	133
Type of study	Full-time
Length of study	4 years (maximum is 6 years, can be shorter than 4 years)
Enrollment object, and	- Direct admission is applied to the high-school students, who won national or international prizes.

conditions	- National high school graduation examination results of candidates, which are taken from high to low. - Nationwide admissions.
Assessment scale	10
Graduation requirement	• The accumulated number of credits and volume of the training programme: 133 • The cumulative average score of the entire programme meets the minimum of 2.00 or higher. • Have 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 Vietnam or abroad.
Reference programme	• The Bachelor of Education Chemistry programme at Hanoi National University of Education • The Bachelor of Education Chemistry programme at Ho Chi Minh City University of Education • The Bachelor of Education Chemistry programme at Hanoi Pedagogical University 2

	• The Science Education, Chemistry (9-12) Concentration, Bachelor of Science at The University of North Carolina at Pembroke, USA • The Bachelor of Science in Teacher Education: Chemistry at Drexel University, USA • The Science Education: Chemistry concentration, Bachelor of Science at North Carolina State University, USA
Last revision	10/2020

3. Programme Objectives (PO)

3.1. General objective

The objective of the training programme is to train bachelor of chemical education with good political, good moral qualities, basic knowledge, expertise, and powerful professional skills, and with the good capability to self-study, self-research, and create, adapting to the working environment to serve the cause of education-training, socio-economic development of the whole country, especially the Northern mountain region.

3.2. Specific objectives (POs)

PO1: Have comprehensive knowledge of political theory, educational science and specialized knowledge of chemistry to apply in practical activities of themselves and organizing the chemistry teaching activities in high schools.

PO2: Have skills to practice experiment, practice teaching, research and education in chemistry field; adapt to the working environment, and start up a business.

PO3: Have communication skills, teamwork, exploit and use applications of information technology, English in self-study, scientific research, and chemistry teaching in high schools.

PO4: Have the ability for lifelong learning and continuing to study at higher levels; Ability to work independently, creatively and solve practical problems in high schools related to research and teaching chemistry.

4. Programme Learning Outcomes (PLOs)

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

4.1. Knowledge

* General knowledge

PLO1. Apply basic knowledge about political theory and Vietnamese law in practical activities of themselves and at work.

PLO2. Apply the knowledge of psychology, education, school management to organize teaching and educational activities.

*** Professional knowledge**

PLO3. Apply basic knowledge and specialized knowledge to teach Chemistry, Natural Science in high school, and work in other fields related to Chemistry.

PLO4. Apply the theory and teaching methods of the subject to teaching Chemistry and Natural Science in high schools.

PLO5. Apply knowledge of Chemistry to organize experience activities, and designing STEM education activities for students in high schools.

4.2. Skills

*** General skills**

PLO6. Communicate effectively and implementation of consulting activities in teaching, education, and career guidance.

PLO7. Exploit applications of information technology in self-study, scientific research, teaching, assessment, and student management.

PLO8. Use English equivalent to level 3/6 in communication and professional activities.

***Professional skills**

PLO9. Perform proficiently the teaching methods, teaching forms, testing and evaluation techniques towards developing learners' competencies in professional activities.

PLO10. Perform proficiently the chemistry experiments in professional activities

PLO11. Instruct effectively for high school students in scientific research.

PLO12. Use professional knowledge in assessing the quality of work, making criticism, and proposing solutions to improve the quality of teaching activities and activities related to Chemistry.

4.3. Autonomy and responsibility capacity

PLO13. Perform correctly the teachers' ethics and democracy regulations in high schools.

PLO14. Apply professional knowledge and skills in the process of independent work, group work, and lifelong self-study.

5. Mapping of Programme Objectives (PO) – Programme Learning Outcomes (PLO)

Programme Objectives (POs)	Programme Learning Outcomes													
	General knowledge		Professional knowledge			General skills			Professional skills				Autonomy and responsibility	
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14
PO1	x	x	x	x	x	x			x				x	x
PO2						x				x	x		x	x
PO3						x	x	x	x		x	x	x	x
PO4									x			x	x	x

6. Teaching & learning strategies and assessment method

6.1. Teaching & learning strategies

6.1.1. Teaching methods/strategies

Each course in the programme has used many different teaching methods, such as presentations, seminars, exercises, discussions, experiments, practice, E-learning.

Method of presentation has been used to teach theoretical knowledge. The purpose of this method is to provide students with a deep understanding of the theory content of the course.

The exercise method has been used to teach the exercise. The purpose of this method is to apply course knowledge to solve problems and explain natural phenomena related to the course; practice the skills of using a chemical language to give a presentation on how to solve exercises, Interpersonal skills, writing, and presentation skills; build self-control and responsibility capacity; help student to improve lifelong learning ability.

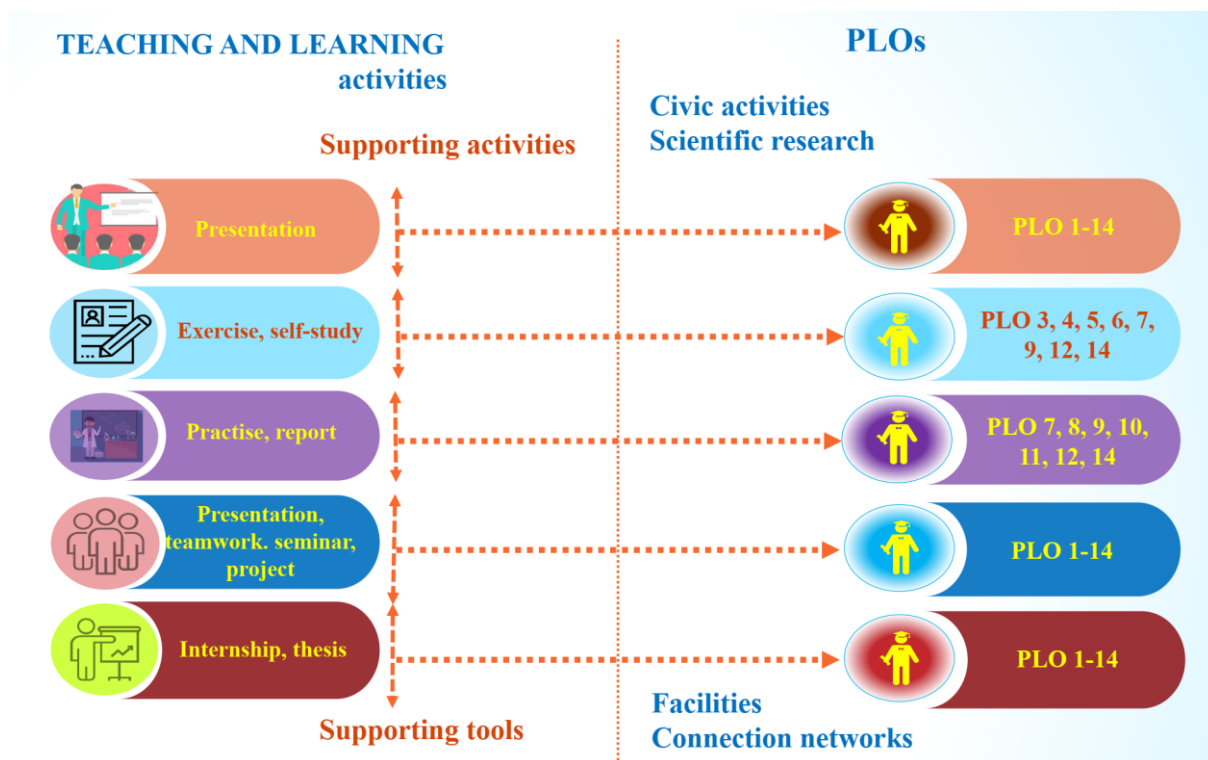
Seminar and discussion methods have been used for seminar knowledge and discussion. The purpose is to train the skills of using a chemical language to present and exchange the subject matter to be discussed; practice reporting, self-study, interacting and teamwork skills, build self-control and responsibility capacity, help students to improve the lifelong learning ability.

Practice methods are used for an independent practice course or integrated into the content course. The purpose of this method is to train experimental skills, practice chemistry for students, help students verify the theoretical content of the course.

Therefore, this method improves the practicing chemical capacity of students in the teaching and researching process.

The E-learning method is applied to some courses. The goal of the method is to empower the best learners in terms of space, time, and knowledge. However, this teaching method requires a great investment in teachers, so it can be implemented in a few courses.

Linking teaching and learning methods with the program learning outcomes (POLs) are showed following:



6.1.2. Improvements, advancement teaching quality

- The training programme is reviewed every 2 years /1 to meet the innovative requirements about programmes and textbooks.

- In each semester, the departments build the teaching plans of lecturers, especially young lecturers, to interchange and share knowledge and teaching methods, to improve the lecturers' capacity.

- The courses of the programme are regularly surveyed student feedback about the quality, talent, heart, faith, the responsibility of the teacher.

6.2. Assessment method

6.2.1. Assessment scale

Use the 10-point scale for all assessments in the course.

6.2.2. Form, evaluation criteria, and weighting points

Credits	Number of process evaluation points	Total
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	Diligence	Regularly	Number of recurring exams	number of points
2	1	1	1	3
3-4	1	2	2	5
5	1	2	3	6

- Percent points

+ Evaluation process: 50% (including periodic test 25%, 25% of the remaining score by the Faculty regulations)

+ Final assessment: 50%

II. DESCRIPTION OF THE CURRICULUM

1. Curriculum structure

Nº	Knowledge block, credits	Course type	Credits
1.	General educational knowledge, 28 credits (no including Physical education and Defense courses)	Compulsory	26
		Elective	02
2.	Professional education knowledge, 67 credits		
2.1.	Fundamental knowledge, 19 credits	Compulsory	17
		Elective	02
2.2.	Specialized knowledge, 48 credits	Compulsory	44
		Elective	04
3.	Educative knowledge, 31 credits	Compulsory	27
		Elective	04
4.	Thesis, replaced courses the graduation thesis, 7 credits	Compulsory	0
		Elective	07
Total			133

- General educational knowledge block consists of 20 courses. This knowledge block helps students having a steady knowledge of social sciences, political science and law, Ho Chi Minh thought, the revolutionary path of the Communist Party of Vietnam, English, physical educations to apply that knowledge in planning and organizing chemistry teaching and educational activities in high schools.

- Professional education knowledge block consists of 32 courses. This knowledge block helps students having the comprehensive professional knowledge to apply in chemistry teaching and educating students in high school, at the same time learners develop scientific research capacity and have been able to continue studying at a higher level.

* Educative knowledge block consists of 18 courses. This knowledge block helps students understand and apply teaching methods, testing methods to assess learning and training results of the students; helps learners having the ability to apply the learned knowledge in research, teaching, organizing experience activities on Chemistry science for students in high school.

- Thesis or replaced courses the graduation thesis consists of 6 courses. This knowledge block helps students having comprehensive analysis and application into the subject teaching method to enhance the ability of chemistry teaching and diversified education for students; at once improves scientific research capacity and organize experience activities for students in high school.

Knowledge block	Programme Learning Outcomes													
	General knowledge		Professional knowledge			General skills			Professional skills				Autonomy and responsibility	
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14
General	3	2	0	0	1	1	1	3	1	0	0	1	3	2
Professional	0	0	3	2	3	2	2	2	2	3	1	2	1	3
Educative	0	3	2	3	2	3	2	2	3	3	2	2	2	3
Thesis, courses replace the graduation thesis	0	0	2	1	2	1	2	2	1	2	2	2	1	2

2. Courses List

Nº	Code	Course name	Credit	Credit hour kind					Prerequisite course	Before course	Semester
				On class							
				Theory	Exercise	Experiment	Seminar	Practice in school			
1.	General knowledge		28								
1.1. Compulsory Courses			26								
1	55SPH131	Marxism – Leninism’s Philosophy	3	25	10	10	20				1
2	55SPE121	Marxist - Leninist political economy	2	15	10	10	10			55SPH131	2

N ^o	Code	Course name	Credit	Credit hour kind					Prerequisite course	Before course	Semester
				On class							
				Theory	Exercise	Experiment	Seminar	Practice in school			
3	55SSO121	Science socialism	2	15	10	10	10			55SPH131 55SPE121	3
4	55HCM121	Ho Chi Minh’s Thought	2	15	10	10	10			55SPH131 55SPE121 55SSO121	4
5	55HPV121	History of the Communist Party of Vietnam	2	15	10	10	10			55SPH131 55SPE121 55SSO121 55HCM121	5
6	55EDL121	General law	2	15	10	10	10			55SPH131 55SPE121 55SSO121	6
7	55ENG131	English 1	3	15	15	30	15				1
8	55ENG132	English 2	3	15	15	30	15			55ENG131	2
9	55ENG143	English 3	4	20	20	40	20			55ENG132	3
10	55GIF131	Basic informatics	3	20		40	10				2
1.2. Elective courses (2 credits)			2								
11	55GME121	Public and educational administration	2	15	10	12	8				1
12	55EDE121	Environment and development	2	20	8		12				1
13	55VIU121	Vietnamese in use	2	15	15	15					1
14	55VCF121	Vietnamese culture’s foundation	2	21	4	6	8				1
15	55LOG121	Basic logic	2	20	10	5	5				1
16	55CDE121	Culture and development	2	21		6	12				1
1.3	Physical education										
17	55PHE111	Physical education 1									2
18	55PHE112	Physical education 2								55PHE111	3

Nº	Code	Course name	Credit	Credit hour kind					Prerequisite course	Before course	Semester
				On class							
				Theory	Exercise	Experiment	Seminar	Practice in school			
19	55PHE113	Physical education 3								55PHE112	4
1.4	Defense Education										
20	55MIE131	Defense Education		05 weeks							3
2. Professional education knowledge			67								
2.1. Fundamental knowledge			19								
Compulsory Courses			17								
21	55MPC221	Advanced mathematics for chemistry	2	20	18		2				1
22	55PHY241	Physics	4	30	24	30	6				2
23	55BIO241	Biology	4	42		30	6				1
24	55CMS341	Chemistry of material structure	4	42	21		15				2
25	55TCP331	Fundamental theory of chemistry process	3	33	15		9			55CMS341	3
Elective courses			2								
26	55ECB221	Ecology and biodiversity	2	22		16					3
27	55AST221	General astronomy	2	22	13		3				3
28	55EAS221	Earth Science	2	20	10		10				3
2.2. Specialized knowledge			48								
Compulsory Courses			44								
29	55PBC321	Practice basic chemistry	2			60					3
30	55CNE331	Chemistry of non-metallic elements	3	33	14		10			55TCP331	3
31	55CME341	Chemistry of metallic elements	4	42	20		16			55TCP331 55CNE331	4
32	55PIC321	Practice inorganic chemistry	2			60					4

Nº	Code	Course name	Credit	Credit hour kind					Prerequisite course	Before course	Semester
				On class							
				Theory	Exercise	Experiment	Seminar	Practice in school			
33	55THC331	Thermodynamic chemistry	3	30	15		15			55TCP331	4
34	55KCH321	Kinetic chemistry	2	18	12		12			55THC331	5
35	55ECH321	Electrochemistry	2	18	12		12			55KCH321	5
36	55PPC321	Practical physical Chemistry	2			60					5
37	55TOC321	Theoretical principle of organic chemistry	2	21	9		9			55TCP331	4
38	55HDC321	Hydrocarbon	2	21	9		9			55TOC321	4
39	55DHE331	Derivatives of hydrocarbon excess	3	30	15		15			55HDC321	5
40	55COP321	Complex organic molecular and polymer	2	21	9		9			55DHE331	6
41	55POC321	Practical organic chemistry	2			60					6
42	55TAC321	Fundamentals of analytical chemistry	2	18	15		9			55TCP331	5
43	55QAC331	Quantitative analytical chemistry	3	30	15		15			55TAC321	6
44	55PAC321	Analytical chemistry experiment	2			60					6
45	55CFL321	Chemistry for life 1	2	21	9		9			55CNE331 55CME341 55DHE331	7
46	55CFL322	Chemistry for life 2	2	15	6	15	9			55CFL321	7
47	55CCC321	Chemistry of coordination compounds	2	21	12		6			55TCP331	7
Elective courses			4								

N°	Code	Course name	Credit	Credit hour kind					Prerequisite course	Before course	Semester
				On class							
				Theory	Exercise	Experiment	Seminar	Practice in school			
48	55ASC321	Application spectrometry method on chemistry	2	18	12		12				7
49	55ECS321	Statistical data handling of experimental chemistry	2	21	12		6			55TAC321	7
50	55CHM321	Material chemistry	2	21	12		6			55CNE331 55CME341	7
51	55SOC321	Synthesis organic chemistry	2	21	9		9			55COP321	7
52	55QCH321	Quantum chemistry	2	18	12		12			55CMS341	7
3. Educative knowledge			31								
Compulsory Courses			27								
53	55EPS431	Educational psychology	3	30	6	16	8				1
54	55PEP441	Pedagogics	4	42	8	12	16			55EPS431	2
55	55TTC431	Theory of teaching chemistry	3	23	20		12	12		55SPH131 55PEP441	3
56	55TMC431	Chemical teaching methods in high school	3	30		8	10	12		55TTC441 55CNE331 55CME341	5
57	55CES421	Chemical experiments in high school	2			60				55CNE331 55CME341 55DHE331	6
58	55ESC431	Chemical exercises in high school	3	30	15		15			55CNE331 55CME341 55DHE331	6
59	55PTT421	Pedagogical training in teaching chemistry 1	2			60				55PEP441	4
60	55PTT422	Pedagogical training in teaching chemistry 2	2			60				55TMC431 55PTT421	7

Nº	Code	Course name	Credit	Credit hour kind					Prerequisite course	Before course	Semester
				On class							
				Theory	Exercise	Experiment	Seminar	Practice in school			
61	55TRA421	Pedagogical practice 1	2	3 weeks in school					55TTC441 55PTT421	5	
62	55TRA432	Pedagogical practice 2	3	3 weeks in school					55TRA421 55PTT422 55TMC431	8	
Elective courses			4								
63	55IAT421	Informatic application in chemistry teaching	2	12		30	6			55TMC431	6
64	55TOE421	Teaching in the online environment	2	15		21	9			55TMC431	6
65	55HOC421	History of chemistry	2	15	12		18			55TMC431	7
66	55TDC421	Differentiated teaching in chemistry teaching at high school.	2	15	24		6			55TMC431	7
67	55ETC421	Equipment teaching chemistry	2	15		30				55TMC431	7
68	55EAT421	Extracurricular activities in teaching chemistry	2	10		10	10	20		55TMC431	7
69	55NSC421	Natural scientific topics of chemistry in high school.	2	15	9		21			55TMC431	6
70	55UEC421	Using English in chemical teaching	2	15	15		15			55TMC431	6
4. Thesis, courses replace the graduation thesis			7								
Thesis											
71	55CTE971	Thesis	7								8
Courses replace the graduation thesis (7 credits)			7								

N ^o	Code	Course name	Credit	Credit hour kind					Prerequisite course	Before course	Semester
				On class							
				Theory	Exercise	Experiment	Seminar	Practice in school			
72	55TPD931	Chemical teaching in schoolunder the positive direction	3	30		15	15			55TMC431	8
73	55TAT931	Measurement and assessment in chemical teaching	3	30	15		15			55TMC431	8
74	55NPR921	Natural Product	2	21	9		9			55COP321	8
75	55CPM921	Corrosive and protection of metal	2	18	12		12			55ECH321	8
76	55CCH921	Colloidal chemistry	2	20	8		12			55ECH321	8
77	55PTE921	General technicals for environmental treatment	2	21	12		6			55QAC331 55CFL321 55CFL322	8
Total			133								

3. Training plan

Semester 1

N ^o	Code	Course name	Credit	Compulsory Courses	Elective courses	Note
1	55SPH131	Marxism – Leninism's Philosophy	3	☒		
2	55ENG131	English 1	3	☒		
3	55GME121	Public and educational administration	2		☒	Select a course
4	55EDE121	Environment and development	2		☒	
5	55VIU121	Vietnamese in use	2		☒	

6	55VCF121	Vietnamese culture's foundation	2		☒	
7	55LOG121	Basic logic	2		☒	
8	55CDE121	Culture and development	2		☒	
9	55MPC221	Advanced mathematics for chemistry	2	☒		
10	55BIO241	Biology	4	☒		
11	55EPS431	Educational psychology	3	☒		

Semester 2

Nº	Code	Course name	Credit	Compulsory Courses	Elective courses	Note
1	55SPE121	Marxist - Leninist political economy	2	☒		
2	55ENG132	English 2	3	☒		
3	55GIF131	Basic informatics	3	☒		
4	55PHE111	Physical education 1		☒		
5	55PHY241	Physics	4	☒		
6	55CMS341	Chemistry of material structure	4	☒		
7	55PEP441	Pedagogics	4	☒		

Semester 3

Nº	Code	Course name	Credit	Compulsory Courses	Elective courses	Note
1	55SSO121	Science socialism	2	☒		
2	55ENG143	English 3	4	☒		
3	55PHE112	Physical education 2		☒		
4	55MIE131	Defense Education		☒		

5	55TCP331	Fundamental theory of chemistry process	3	☒		
6	55PBC321	Practice basic chemistry	2	☒		
7	55CNE331	Chemistry of non-metallic elements	3	☒		
8	55TTC431	Theory of teaching chemistry	3	☒		
9	55ECB221	Ecology and biodiversity	2		☒	Select a course
10	55AST221	General astronomy	2		☒	
11	55EAS221	Earth Science	2		☒	

Semester 4

Nº	Code	Course name	Credit	Compulsory Courses	Elective courses	Note
1	55HCM121	Ho Chi Minh's Thought	2	☒		
2	55PHE113	Physical education 3		☒		
3	55CME341	Chemistry of metallic elements	4	☒		
4	55PIC321	Practice inorganic chemistry	2	☒		
5	55THC331	Thermodynamic chemistry	3	☒		
6	55TOC321	Theoretical principle of organic chemistry	2	☒		
7	55HDC321	Hydrocarbon	2	☒		
8	55PTT421	Pedagogical training in teaching	2	☒		

		chemistry 1				
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Semester 5

Nº	Code	Course name	Credit	Compulsory Courses	Elective courses	Note
1	55HPV121	History of the Communist Party of Vietnam	2	☒		
2	55KCH321	Kinetic chemistry	2	☒		
3	55ECH321	Electrochemistry	2	☒		
4	55PPC321	Practical physical Chemistry	2	☒		
5	55DHE331	Derivatives of hydrocarbon excess	3	☒		
6	55TAC321	Fundamentals of analytical chemistry	2	☒		
7	55TMC431	Chemical teaching methods in high school	3	☒		
8	55TRA421	Pedagogical practice 1	2	☒		

Semester 6

Nº	Code	Course name	Credit	Compulsory Courses	Elective courses	Note
1	55EDL121	General law	2	☒		
2	55COP321	Complex organic molecular and polymer	2	☒		
3	55POC321	Practical organic chemistry	2	☒		
4	55QAC331	Quantitative analytical chemistry	3	☒		

5	55PAC321	Analytical chemistry experiment	2	☒		
6	55CES421	Chemical experiments in high school	2	☒		
7	55ESC431	Chemical exercises in high school	3	☒		
8	55IAT421	Informatic application in chemistry teaching	2			Select a course
9	55TOE421	Teaching in the online environment	2			
10	55NSC421	Natural scientific topics of chemistry in high school.	2			
11	55UEC421	Using English in chemical teaching	2			

Semester 7

N°	Code	Course name	Credit	Compulsory courses	Elective courses	Note
1	55CFL321	Chemistry for life 1	2	☒		
2	55CFL322	Chemistry for life 2	2	☒		
3	55CCC321	Chemistry of coordination compounds	2	☒		
4	55ASC321	Application spectrometry	2		☒	Select 2

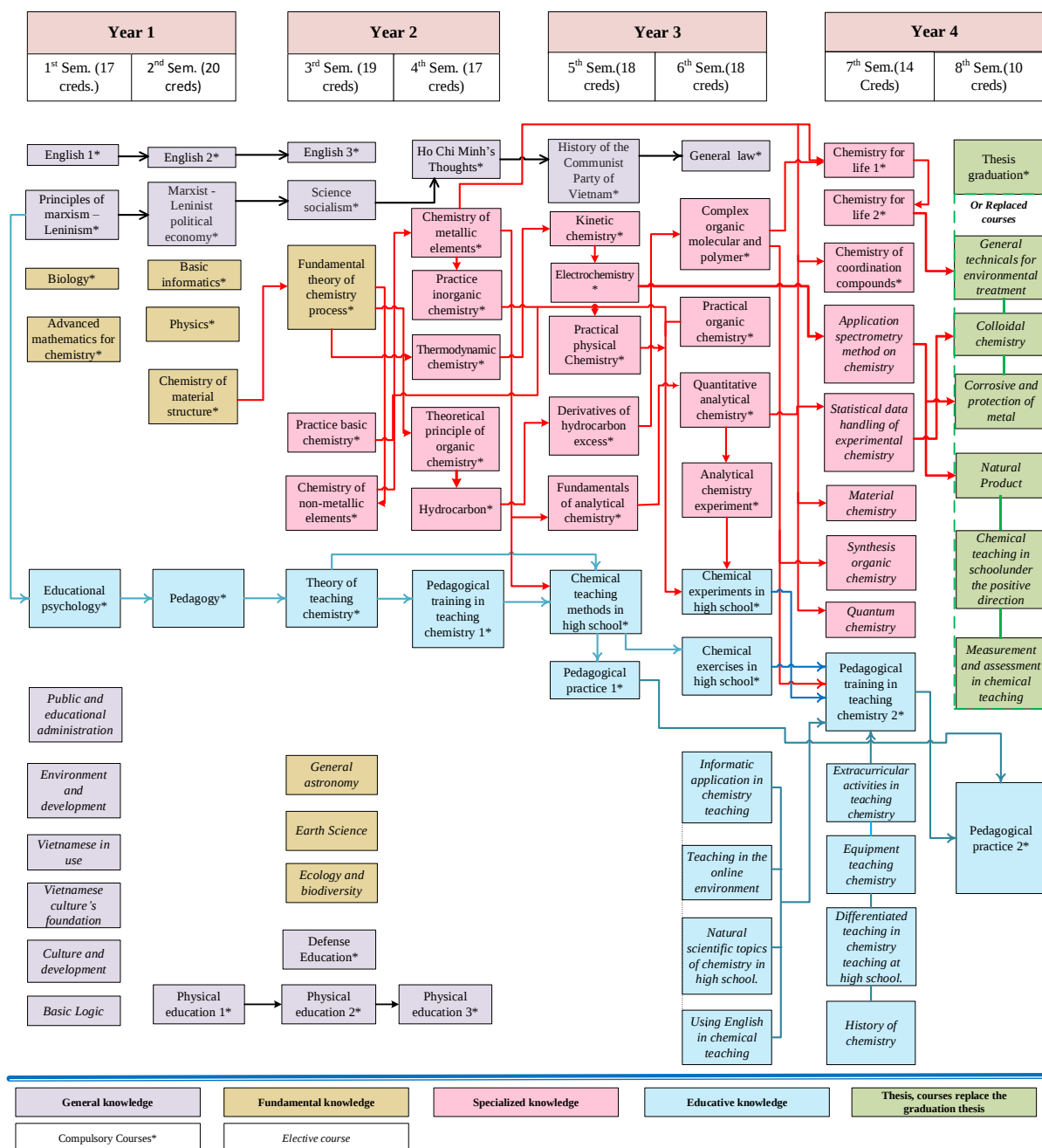
		method on chemistry				courses
5	55ECS321	Statistical data handling of experimental chemistry	2		☒	
6	55CHM321	Material chemistry	2		☒	
7	55SOC321	Synthesis organic chemistry	2		☒	
8	55QCH321	Quantum chemistry	2		☒	
9	55PTT422	Pedagogical training in teaching chemistry 2	2	☒		Select a course
10	55HOC421	History of chemistry	2		☒	
11	55TDC421	Differentiated teaching in chemistry teaching at high school.	2		☒	
12	55ETC421	Equipment teaching chemistry	2		☒	
3	55EAT421	Extracurricular activities in teaching chemistry	2		☒	

Semester 8

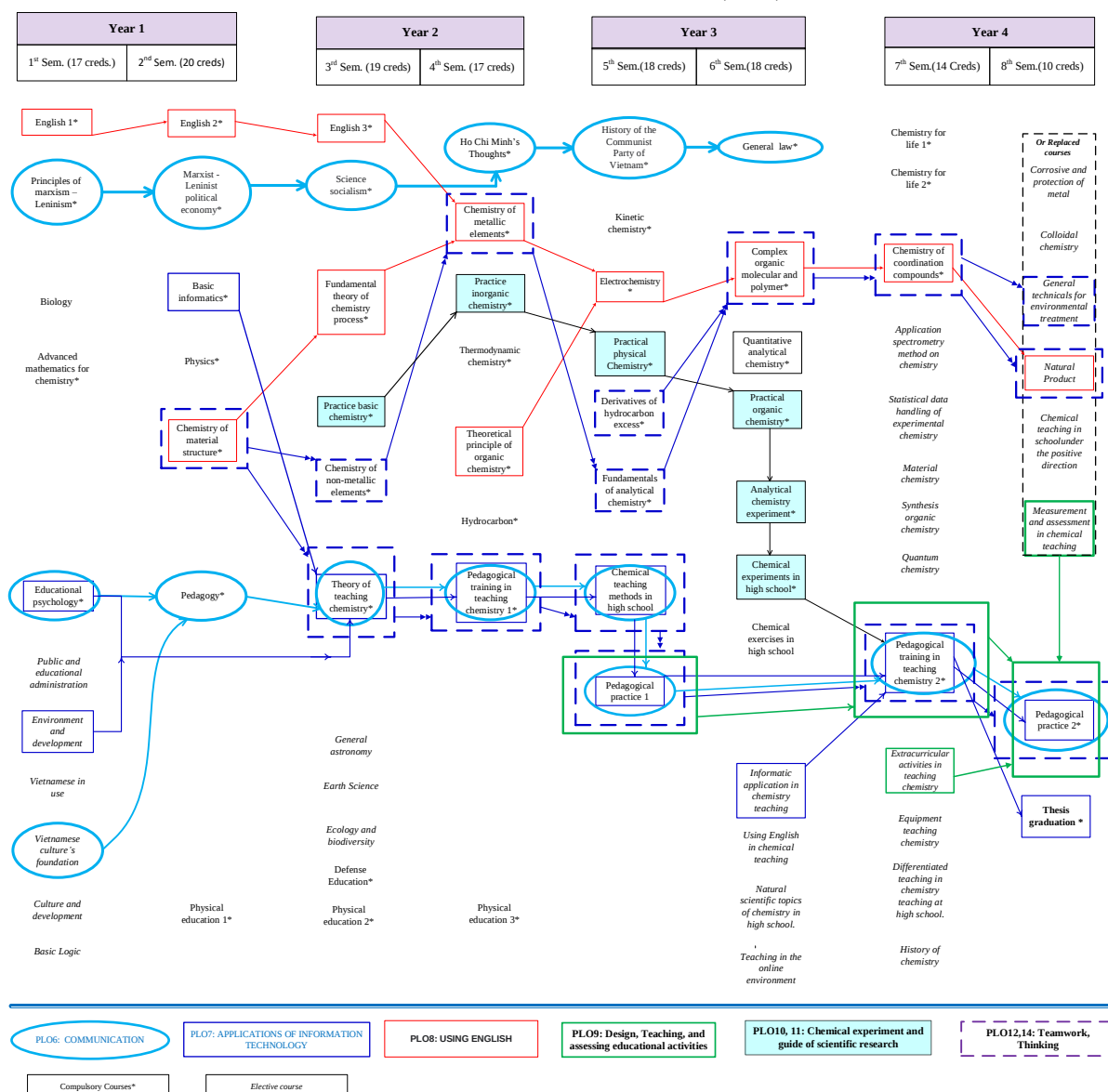
Nº	Code	Course name	Credit	Compulsory Courses	Elective courses	Note
1	55TRA432	Pedagogical	3	☒		

		practice 2				
2	55CTE971	Thesis	7	☒		
3	55TPD931	Chemical teaching in school under the positive direction	3		☒	If do not thesis, student must be selected 7 credits
4	55TAT931	Measurement and assessment in chemical teaching	3		☒	
5	55NPR921	Natural product	2		☒	
6	55CPM921	Corrosive and protection of metal	2		☒	
7	55CCH921	Colloidal chemistry	2		☒	
8	55PTE921	General technicals for environmental treatment	2		☒	

CURRICULUM OF BCEP ROADMAP (2020)



SKILLS OF BCEP ROADMAP (2020)



4. Matrix between courses and programme learning outcomes

Code	Name	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14
55SPH131	Marxism – Leninism’s Philosophy	3	0	0	0	0	3	0	0	0	0	0	0	2	0
55SPE121	Marxist - Leninist political economy	3	0	0	0	0	1	0	0	0	0	0	0	1	1
55SSO121	Science socialism	3	0	0	0	0	1	0	0	0	0	0	0	1	1
55HCM121	Ho Chi Minh’s Thought	3	0	0	0	0	1	0	0	0	0	0	0	1	1
55HPV121	History of the Communist Party of Vietnam	3	0	0	0	0	1	0	0	0	0	0	0	0	2
55EDL121	General law	3	0	0	0	0	2	0	0	0	0	0	0	1	1
55ENG131	English 1	0	0	0	0	0	2	2	3	0	0	0	0	0	2
55ENG132	English 2	0	0	0	0	0	2	2	3	0	0	0	0	0	2
55ENG143	English 3	0	0	0	0	0	2	2	3	0	0	0	0	0	2
55GIF131	Basic informatics	0	0	0	0	0	0	3	0	0	0	0	0	0	2
55GME121	Public and educational administration	1	3	0	0	0	0	0	0	0	0	0	0	1	1
55EDE121	Environment and development	0	0	3	0	1	1	3	3	3	1	0	0	1	3
55VIU121	Vietnamese in use	0	0	0	0	0	3	1	1	0	0	0	0	0	2
55VCF121	Vietnamese culture’s foundation	0	3	0	0	0	3	3	1	0	0	0	0	2	3

Code	Name	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14
55LOG121	Basic logic	0	0	0	0	0	3	0	0	0	0	0	0	0	2
55CDE121	Culture and development	0	2	0	0	0	1	1	0	0	0	0	0	1	1
55PHE111	Physical education 1	0	0	0	0	0	3	0	0	0	0	0	0	0	3
55PHE112	Physical education 2	0	0	0	0	0	3	0	0	0	0	0	0	0	3
55PHE113	Physical education 3	0	0	0	0	0	3	0	0	0	0	0	0	0	3
55MIE131	Defense Education														
55MPC221	Advanced mathematics for chemistry	0	0	2	0	0	0	1	0	0	0	0	2	1	1
55PHY241	Physics	0	0	3	1	0	0	1	0	0	0	0	0	1	2
55BIO241	Biology	0	0	3	0	0	1	1	0	0	0	0	0	0	3
55CMS341	Chemistry of material structure	0	0	3	0	0	1	1	2	0	0	0	2	0	2
55TCP331	Fundamental theory of chemistry process	0	0	3	0	0	2	2	1	0	0	0	2	0	2
55ECB221	Ecology and biodiversity	0	0	3	0	1	1	1	1	0	0	0	0	0	1
55AST221	General astronomy	0	0	3	0	0	1	1	1	0	0	0	2	0	1
55EAS221	Earth Science	1	1	3	1	1	1	1	0	0	0	1	0	1	2
55PBC321	Practice basic chemistry	0	0	2	0	0	3	1	1	0	3	0	1	0	2

Code	Name	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14
55CNE331	Chemistry of non-metallic elements	0	0	3	0	0	1	1	1	0	0	0	2	0	2
55CME341	Chemistry of metallic elements	0	0	3	0	0	1	1	1	0	0	0	1	0	1
55PIC321	Practice inorganic chemistry	0	0	2	0	0	3	1	1	0	3	0	1	0	1
55THC331	Thermodynamic chemistry	0	0	3	0	0	1	1	1	0	0	0	1	0	1
55KCH321	Kinetic chemistry	0	0	3	0	0	1	1	1	0	0	0	2	0	1
55ECH321	Electrochemistry	0	0	2	0	0	1	1	1	0	0	1	2	0	1
55PPC321	Practical physical Chemistry	0	0	3	0	1	1	1	1	0	3	0	1	1	1
55TOC321	Theoretical principle of organic chemistry	0	0	3	0	1	1	1	1	0	0	0	1	1	1
55HDC321	Hydrocarbon	0	0	3	0	0	1	1	1	0	0	0	2	0	1
55DHE331	Derivatives of hydrocarbon excess	0	0	3	0	0	1	1	1	0	0	0	2	0	1
55COP321	Complex organic molecular and polymer	0	0	3	0	0	1	1	1	0	0	0	2	0	1
55POC321	Practical organic chemistry	0	0	3	0	1	1	1	1	0	3	0	1	1	1
55TAC321	Fundamentals of analytical chemistry	0	0	3	0	0	2	2	1	0	0	0	1	0	1
55QAC331	Quantitative analytical chemistry	0	0	3	0	0	2	1	1	0	0	0	1	0	1
55PAC321	Analytical chemistry experiment	0	0	3	0	0	1	1	1	0	3	1	1	0	1

Code	Name	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14
55CFL321	Chemistry for life 1	0	0	3	0	1	1	1	1	0	0	0	1	0	1
55CFL322	Chemistry for life 2	0	0	3	0	1	0	1	1	1	3	0	1	0	1
55CCC321	Chemistry of coordination compounds	0	0	3	0	0	1	1	1	0	0	0	2	0	1
55ASC321	Application spectrometry method on chemistry	0	0	3	0	0	1	1	1	1	0	1	1	0	1
55ECS321	Statistical data handling of experimental chemistry	0	0	2	0	0	1	1	1	1	0	1	1	0	1
55CHM321	Material chemistry	0	0	3	0	0	1	1	1	0	0	0	1	0	1
55SOC321	Synthesis organic chemistry	0	0	3	0	0	1	1	1	0	0	0	2	0	1
55QCH321	Quantum chemistry	0	0	3	0	0	1	1	1	0	0	0	2	0	1
55EPS431	Educational psychology	0	3	0	0	0	3	3	0	0	0	0	0	2	1
55PEP441	Pedagogy	0	3	0	0	0	1	0	0	0	0	0	0	0	1
55TTC431	Theory of teaching chemistry	0	2	3	1	0	1	1	1	3	0	1	2	0	1
55TMC431	Chemical teaching methods in high school	0	0	1	2	0	2	1	1	3	0	0	2	0	2
55CES421	Chemical experiments in high school	0	0	3	0	0	0	1	0	3	3	0	1	0	1
55ESC431	Chemical exercises in high school	0	0	3	0	0	1	1	0	3	0	0	2	0	1
55PTT421	Pedagogical training in teaching chemistry 1	0	0	2	0	0	0	1	0	3	3	0	1	0	1

Code	Name	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14
55PTT422	Pedagogical training in teaching chemistry 2	0	0	1	1		0	1	0	3	1	0	1	0	1
55TRA421	Pedagogical practice 1	0	3	1	0	0	2	1	0	3	0	0	1	1	2
55TRA432	Pedagogical practice 2	1	2	1	1	1	2	1	0	3	0	0	1	1	1
55IAT421	Informatic application in chemistry teaching	0	0	1	2	0	1	3	0	3	0	0	2	0	1
55TOE421	Teaching in the online environment	0	1	2	1	0	1	1	0	3	0	0	2	0	1
55HOC421	History of chemistry	0	0	3	0	0	1	1	0	3	0	0	2	0	1
55TDC421	Differentiated teaching in chemistry teaching at high	0	2	3	2	0	2	1	0	3	0	1	2	0	1
55ETC421	Equipment teaching chemistry	0	0	1	2	0	1	1	0	3	0	0	2	0	1
55EAT421	Extracurricular activities in teaching chemistry	0	0	1	1	2	1	1	0	3	0	0	2	0	1
55NSC421	Natural scientific topics of chemistry in high school.	0	0	3	0	0	1	1	0	3	0	0	1	0	1
55UEC421	Using English in chemical teaching	0	0	2	0	0	0	1	3	3	0	0	1	0	1
55CTE971	Thesis	2	2	3	2	2	2	2	2	2	3	2	2	2	2
55TPD931	Chemical teaching in school under the positive	0	2	3	1	1	1	1	0	3	0	1	2	0	1
55TAT931	Measurement and assessment in chemical	0	0	3	0	0	1	1	0	3	0	0	2	0	1
55NPR921	Natural product	0	0	3	0	0	1	1	1	0	0	0	2	0	2

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55CPM921	Corrosive and protection of metal	0	0	3	0	0	1	0	0	1	0	1	1	0	1
55CCH921	Colloidal chemistry	0	0	3	0	0	1	0	0	0	0	0	2	0	1
55PTE921	General technicals for environmental treatment	0	0	3	0	1	0	0	0	1	0	1	1	0	1

Note: “0” = None; “1” = Low (0-19% of CLOs of course contributing to PLO); “2” = Medium (20-39% of CLOs of course contributing to PLO); “3” = High (40-100% of CLOs of course contributing to PLO).

III. COURSE ABSTRACT

N ^o	Code	Course name	Credit	Course abstract
1.	General knowledge		28	
1.1. Compulsory Courses			26	
1	55SPH131	Marxism – Leninism’s Philosophy	3	This module is in the general knowledge block, providing a background knowledge of the philosophical principles of Marxism-Leninism, including issues of dialectical materialistic worldview and material dialectic, such as Dialectical relationship between matter, consciousness; two principles, three laws, and six pairs of categories of the materialistic dialectic; Cognitive reasoning problems. The module also provides basic knowledge reflecting the law of social movement and development, which is shown in the following contents: Socio-economic morphology; the issue of class and humanity; state issues and social revolution; social problems and social consciousness; human problem in Marxist-Leninist philosophy.
2	55SPE121	Marxist - Leninist political economy	2	The module belongs to the general education knowledge block, providing basic knowledge, the foundation of ideas for learners, which is the political-economic theory of Marx and Lenin on the production of goods and the market; on the origin, nature, and manifestations of residual value; on competition and monopoly in modern capitalism. At the same time, the module also approaches theoretical and practical issues about the political economy during the transition to socialism in Vietnam.
3	55SSO121	Science socialism	2	The scientific socialism module clarifies the socio-political laws and normality of the process of formation and development of communist socio-economic form; the basic principles, the conditions, the path, the form, and the method for the building of socialism. The scientific socialism module focuses on explaining the content of the

N ^o	Code	Course name	Credit	Course abstract
				historical mission of the working class, socialist, democracy, and socialist state, on the issue of the class coalition, issues of ethnicity, religion, and family in the process of building socialism.
4	55HCM121	Ho Chi Minh's Thought	2	Ho Chi Minh's Thought is a compulsory subject in the section of general education, to provide basic knowledge about the basics, the process of formation, and development of Ho Chi Minh's thought. At the same time, focus on explaining the content of basic topics of Ho Chi Minh's thought on national independence and socialism; thoughts on the Communist Party of Vietnam and the State of the people, for the people, for the people; ideas of great national solidarity and international solidarity; thought about culture, morality, and people
5	55HPV121	History of the Communist Party of Vietnam	2	The History of the Communist Party of Vietnam studies the formation and development of the Communist Party of Vietnam as well as the process of the Party leading the Vietnam revolution from 1930 to 2018. Chapter 1 studies the departure. life of the Communist Party of Vietnam and the leadership struggle for the government (1930 - 1945); Chapters 2 and 3 study the process of the Party leading two resistance wars, completing national liberation, national reunification, transitioning to socialism, and reform (1945 - 2018). General conclusion about the great lessons of the Vietnamese revolution since the birth of the Communist Party of Vietnam
6	55EDL121	General law	2	The general law is a compulsory subject belonging to the general education knowledge section of all training programs. The course provides theoretical knowledge about the state and law, the basic contents of some important law disciplines in the Vietnamese legal system such as Constitutional Law, Administrative Law, Criminal Law, Civil Law. Law on Marriage and

Nº	Code	Course name	Credit	Course abstract
				Family.
7	55ENG131	English 1	3	English 1 is a compulsory subject in the general knowledge block of the bachelor's education programme. English 1 provides students with basic grammar such as present simple tense, present continuous tense, past simple tense, past continuous tense, comparative structures, and basic vocabulary on topics: health, sports, transport, and adventure. This course helps students to gain English skills to express opinions, give explanations in communication situations, write correctly short notes, or simple messages on familiar everyday topics. Through lessons in class and exercises online on MyELT and Edmodo, students can not only consolidate their knowledge but also develop their self-study skills.
8	55ENG132	English 2	3	English 2 is a compulsory subject in the general knowledge block of the bachelors education programme. English 2 provides students with basic grammar such as countable and uncountable nouns, quantifiers, articles, to-verbs, future forms, prepositions, present perfect tenses, identified relative clause, conditional sentences – type 0 & type 1, and basic vocabulary on topics: environment, life events, occupations and science-technology. This course helps students to gain English skills to express opinions, give explanations in communication situations, write correctly short notes, or simple messages on familiar everyday topics. Through lessons in class and exercises online on MyELT and Edmodo, students can not only consolidate their knowledge but also develop their self-study skills.
9	55ENG143	English 3	4	English 3 is a compulsory subject in the general knowledge block of the bachelor's education programme. English 3 continues to supplement students with

N ^o	Code	Course name	Credit	Course abstract
				vocabulary on topics of Language and learning, Travel and holiday, History, Nature and with basic grammar such as present simple passive and past simple passive, past perfect tense, subject and object questions, -ing/-ed adjectives, In this module, students continue to be trained in four English communication skills: listening -speaking-reading-writing, which help them to confidently join in conversations, interviews and present personal views, ideas, plans or write a paragraph or an essay about familiar topics. Along with English 1, 2, at the end of English 3, students are expected to achieve level 3 at the average level of the 6-level Language Proficiency Framework for Vietnam.
10	55GIF131	Basic informatics	3	The General Informatics module provides the basics of the general structure of the computer; handling basic errors of the computer; operating system. Format text, insert objects into documents, tables, editing assistant tools in Microsoft Word. Format and process data, formulas, basic functions, and charts in Microsoft Excel. Manipulating slides; format, set effects for objects and slides; create hyperlinks in Microsoft PowerPoint. Computer network and information security; some basic applications on the Internet.
1.2. Elective courses (2 credits)			2	
11	55GME121	Public and educational administration	2	The subject of State administrative management and education-training management is optional in the programme of education management bachelor. The subject provides the basic knowledge of state administrative management (nature, content, method, law,...; state management of education and training (properties, characteristics, principles, internal content, the state management apparatus of education and training; the lines and views of the Party and State on education and training) and legal documents on education and training;

N ^o	Code	Course name	Credit	Course abstract
				helping students to receive be aware of their own responsibility in the implementation of legal documents on education The subject has a close relationship with the general law subject, the subject of education, the subject of school organization and management.
12	55EDE121	Environment and development	2	The content of environmental and development subjects includes groups of basic knowledge about the environment, population, needs, and activities that satisfy human needs, the current state of natural resources, environmental pollution, and key policies. books on environmental protection - sustainable development. The contents are mentioned at an extensive level in the world and analyzed in-depth in Vietnam. Also, the subject provides knowledge about the relationship between people and the environment; the consequences of the population explosion; the impact of population growth on the environment; the influence of modern society on the natural environment; the current state of natural environmental pollution; population relationship, socio-economic development, and natural resources.
13	55VIU121	Vietnamese in use	2	Vietnamese for practice (optional subjects) is structured with 2 chapters. Chapter 1: Practice skills in spelling, spelling, word use and sentence formation. Chapter 2: Practice skills in receiving and creating documents. The course equips students with knowledge of: spelling, spelling, word use, sentence formation, and word creation. On that basis, necessary skills are formed to help learners improve their communication capacity in reading, writing, listening and speaking activities.
14	55VCF121	Vietnamese culture's foundation	2	The course equips students with basic and specific knowledge of Vietnamese culture. The subject consists of 3 chapters, providing learners with an overview of culture, culture and specific issues such as: positioning Vietnamese culture;

N ^o	Code	Course name	Credit	Course abstract
				Vietnamese cultural process; some cultural factors; Vietnamese cultural regions ... Since then, it helps students to have a sense of appreciating, preserving and promoting the good cultural values of the nation.
15	55LOG121	Basic logic	2	The formal logic module is in the general education knowledge block. This module equips learners with basic knowledge about forms and laws of thinking, helping learners to think independently and know how to solve problems related to thinking. Formal logic is closely related to theoretical sciences such as philosophy; with computational sciences such as mathematics; with the humanities social sciences such as linguistics, psychology, etc.
16	55CDE121	Culture and development	2	The subject is in the basic knowledge block, a group of elective modules, including three chapters. Chapter 1. The relationship between culture and development, presenting some concepts, analyzing the relationship between culture and development; the role, influence, and impact of culture on economic, social development, and vice versa. Chapter 2. Cultural globalization and cultural diversity in Vietnam present characteristics of Vietnamese culture in the context of cultural globalization and cultural diversity. Chapter 3. Culture and development: policy and solution, analysis of culture and development policies in the world and Vietnam, discussion of solutions
1.3	Physical education			
17	55PHE111	Physical education 1	2	This module equips learners with a basic understanding of the origin and development history of Swimming; Meaning, the effect of Swimming for enhancing and exercising health for people; The role of swimming practice and competition in all levels of physical training and sports and Olympic congresses. Understanding of the properties of the water environment related to

Nº	Code	Course name	Credit	Course abstract
				swimmers such as Hydrodynamic principles, hydrodynamic principles, resistance forces affecting the swimmer's body; Learn the stages of an athletic swimming technique (frog swimming): How to float, water surf, learn leg movement, hand technique, hand-to-hand coordination, breathing movements, hand coordination - Foot-breathing and perfecting all techniques of Sports Frog Swimming.
18	55PHE112	Physical education 2	2	Martial arts is an optional subject in Physical Education II for non-professional students Physical Education of Thai Nguyen University of Education. The course equips students with the knowledge of martial arts and hygiene, health care; Training content includes basic techniques, exercise, exercise, and general fitness development exercises to help students improve their health, contribute to the training of moral qualities, willpower, quick behavior. agility, team spirit ... create favorable conditions for training in other sports as well as for one's health.
19	55PHE113	Physical education 3	2	Physical Education 3 (Volleyball) is an optional subject in the Physical Education module for non-professional students. The module equips students with the benefits, effects, basic technical principles, laws, and strategies in volleyball competition. Forming basic technical skills and techniques in volleyball, helping students improve their health, contributing to the practice of moral qualities, willpower, agility, collective spirit ... facilitate practice in other sports.
1.4	Defense Education			
20	55MIE131	Defense Education		
2. Professional education knowledge			67	
2.1. Fundamental knowledge			19	
Compulsory Courses			17	
21	55MPC221	Advanced	2	The Mathematical Basics for Physics - Chemistry

Nº	Code	Course name	Credit	Course abstract
		mathematics for chemistry		module initially equips learners specialized in physics and chemistry with basic knowledge of advanced mathematics, including: - The knowledge of the calculus of a real variable function: Limit, continuity, derivative, differential, integral. - Important applications of the above knowledge in mathematics itself, in other subjects, especially in physics and chemistry. Mathematical Foundations for Physics - Chemistry provides students with math knowledge that can be used as a tool and method to study Physics, Chemistry and other subjects, as well as mastering related math knowledge in the course of teaching Physics, Chemistry, Natural Sciences programmes in high school.
22	55PHY241	Physics	4	The content of the subject includes the most general and general theoretical knowledge about motion patterns in nature from the movements of atoms, charges to the motion of planets and celestial bodies; the four types of interactions and forces in nature; currents in solid, liquid environments, ... and practical applications such as casting technology, electroplating, painting, and safe use of electricity; optical phenomena; energy, types of energy and energy sources in nature and the problem of economical and efficient use of energy. The practice part trains students in experimental physics skills, and reinforces their theoretical knowledge. The practical part includes a number of typical experiments to investigate phenomena, physical processes, determine physical quantities such as free-fall motion, Ácsimeter repulsion, electrical charges, electric fields, currents in the media. school.
23	55BIO241	Biology	4	The natural sciences module provides basic knowledge about the origin of life, the generation of life on earth, the sex division systems;

N ^o	Code	Course name	Credit	Course abstract
				structure, function, metabolism and energy, reproduction of cells; physical foundations of genetic phenomena and genetic laws; Classic and modern evolutionary views. In addition, the module also provides an overview of the plant and animal kingdom including: plant body structure, processes of acquiring and metabolizing substances in the plant body; structure and operation of organs in the animal and human body. The module also provides the basic contents of the ecology, the biosphere, the relationship and interaction between the inorganic and organic worlds in nature, and the human role in those activities. From there, we can see the nature, impact and impact of climate change on the lives of humans and other living beings in the world to consciously preserve and protect nature.
24	55CMS341	Chemistry of material structure	4	Chemistry of material structure module provides learners with modern knowledge of atom structure, the periodic table of chemical elements, molecular structure, chemical bonding in substances, and forms of condensation. of matter. The module aims to form and develop in learners the skills to apply knowledge of the subject to solve chemical problems, explain the laws and properties of substances, problems in teaching, science, and life. The module also aims to develop in learners the ability to communicate effectively, self-study, and lifelong learning.
25	55TCP331	Fundamental theory of chemistry process	3	The theoretical basis of chemical processes provides the system with modern knowledge of thermodynamic quantities, processes of change, the characteristics of reaction systems, equilibrium systems, solutions, and electrochemical systems. The module aims to form and develop in learners the skills to apply knowledge of the subject to solve problems, problems in teaching, in science, and life. The module also aims to develop in learners the

N ^o	Code	Course name	Credit	Course abstract
				ability to communicate effectively, self-study, and lifelong learning skills.
Selective courses			2	
26	55ECB221	Ecology and biodiversity	2	Ecology and biodiversity are compulsory subjects in the curriculum. The course provides students with concepts about ecology, environment, ecological factors, populations, communities, ecosystems, biosphere, biodiversity, and biodiversity conservation. The course helps students understand the impact of ecological factors on biological life and the adaptation of organisms, relationships among individuals in populations, characteristics of populations, other relationships. species in the community, the characteristics of the community, the ecological succession, and the flow of matter and energy in the ecosystem. Values of biodiversity, biodiversity degradation and the causes of it, methods of biodiversity conservation and biodiversity in Vietnam
27	55AST221	General astronomy	2	Astronomy studies the laws of motion of celestial bodies in the relationship between the Earth and the sky; study of natural phenomena on Earth related to the motion characteristics of the Earth and the relative position between three celestial bodies: Earth, Moon, and Sun. At the same time, it helps students of Chemistry Education have a better understanding of the sections of Astrophysics, From micro to macroscopic and other related contents in integrated programmes in high school.
28	55EAS221	Earth Science	2	Earth science subjects including basic knowledge of the rules arise, the development of the natural world, the natural phenomena in the universe, the solar system and the Earth, Geological-topographic, Climate and weather, Hydrosphere, soil sphere, this is fundamental knowledge to help students can explain the scientific basis of natural phenomena occur

Nº	Code	Course name	Credit	Course abstract
				frequently around us.
2.2. Specialized knowledge			48	
Compulsory Courses			44	
29	55PBC321	Practice basic chemistry	2	The basic chemistry practice is a subject of specialized knowledge block, included 12 practical lessons. This subject equips students with laboratory rules; safety regulations when working with toxic substances; theoretical basis and steps for conducting experiments on basic chemistry. The learners can apply the knowledge of chemical subjects of substance structure and theoretical basis of chemical processes to explain the nature and phenomena of experiments occurring. At the same time, they can research and solve problems in practice, help to teach chemistry in high school.
30	55CNE331	Chemistry of non-metallic elements	3	This module provides the most basic scientific knowledge about nonmetals and their compounds, including Position, atomic structure, some properties, characteristic quantities, principles, and general methods for preparing the non-metallic elements; structural characteristics, properties, preparation and application of single and compound hydrogen, non-metallic elements of group IIIA, IVA, VA, VIA, VIIA and elements of group VIIIA.
31	55CME341	Chemistry of metallic elements	4	This module provides the most basic scientific knowledge about metal elements and their compounds, including location, structural characteristics, crystal structure, general physical and chemical properties of metals, the distribution of metals in nature, metal manufacturing methods and metal corrosion protection methods; structural characteristics, characteristic properties, preparation methods and applications of metals and their compounds in groups IA to IVA and the first and second range of transition elements.
32	55PIC321	Practice	2	The inorganic chemical practice is a subject

Nº	Code	Course name	Credit	Course abstract
		inorganic chemistry		of specialized knowledge block, included 12 practical lessons. This subject equips students with a theoretical basis and steps to conduct experiments. The module applies the knowledge of the non-metallic elements subject and metal elements subject to explain the nature and phenomena of occurred experiments. At the same time, students can research and solve problems in practice, help to teach chemistry in high school.
33	55THC331	Thermodynamic chemistry	3	Chemical thermodynamics subject to the theoretical basis of thermodynamics to explain phenomena in chemistry. Form and develop in learners skills to apply knowledge of the subject to solve chemical problems, explain the laws and properties of substances, and problems in teaching, in science, and in life. Develops in learners the ability to communicate effectively, self-study, and lifelong learning skills.
34	55KCH321	Kinetic chemistry	2	The course provides students with knowledge about kinetics, quantifying the factors that affect the reaction speed such as concentration, temperature, catalysis; reaction mechanism. Form and develop in learners skills to apply subject knowledge to solve chemical problems, explain factors affecting reaction speed, problems in teaching, in science and in life. Develops in learners the ability to communicate effectively, self-study, and lifelong learning skills.
35	55ECH321	Electrochemistry	2	This course studies the rules of interchange between chemistry energy and electrical energy with the basic knowledge of the theory of electrolyte solution; Equilibrium between the electrode and the solution; Electrochemical processes are irreversible. Application of some electrochemical reactions in real life and production.
36	55PPC321	Practical physical	2	This course equips the students with knowledge and skills to perform well

Nº	Code	Course name	Credit	Course abstract
		Chemistry		experiments in physical chemistry such as Thermodynamics, Kinetic Chemistry, and Electrochemistry. The subject also helps students confidently to participate in scientific research, perform extracurricular content, and experience interdisciplinary.
37	55TOC321	Theoretical principle of organic chemistry	2	The theoretical principle of organic chemistry is the fundamental knowledge of organic chemistry, such as research methods, chemical bonding, hybridization, isomer, nomenclature, configurations, stereochemistry, electron and spatial effect, organic reactions, and mechanism of organic reactions.
38	55HDC321	Hydrocarbon	2	Hydrocarbon is a subject that provides the most basic scientific knowledge about hydrocarbon compounds, including composition, molecular structure characteristics, isomers, properties nomenclature, application and preparation method of hydrocarbon compounds, source of hydrocarbon in nature.
39	55DHE331	Derivatives of hydrocarbon excess	3	This module provides the most basic scientific knowledge of hydrocarbon derivatives, including structural characteristics, isomers, nomenclature, physicochemical properties, preparations, and applications. The use of compounds of halogen derivatives, mechanical elements, phenol-alcohol-ether, carbonyl compounds, carboxylic acids, and their derivatives.
40	55COP321	Complex organic molecular and polymer	2	Complex compounds and polymers are a part of basic scientific knowledge, modern, always associated with real production life. This course provides knowledge of the structure, chemical, properties, application, and preparation of complex and polymeric compounds. From there, forming skills for students to apply knowledge to solve problems in science and life.
41	55POC321	Practical	2	Practical organic chemistry is one of the

Nº	Code	Course name	Credit	Course abstract
		organic chemistry		important modules of Organic Chemistry. This course provides learners with experimental results to demonstrate knowledge and skills about the practice of organic synthesis, extraction of compounds, determination of the elemental compositions and properties of complex groups of hydrocarbons, hydrocarbon derivatives, complex compounds, and polymers. Forming skills for learners to use laboratory equipment and tools, safety skills when working with toxic organic substances.
42	55TAC321	Fundamentals of analytical chemistry	2	The course equips learners with the knowledge of the Fundamentals of analytical chemistry. Helping learners to clearly understand, present, applying the equilibriums, the processes that occur in solution, the factors that influence those processes, how to predict and explain the phenomena occurring in electrolyte solution based on qualitative, semi-quantitative assessments, etc. The equilibrium calculation is deployed by using the approximately continuous method and ignores the ionic force effect.
43	55QAC331	Quantitative analytical chemistry	3	The course provides learners with basis knowledge of common quantitative analysis methods using in chemistry and related fields. By the end of the course, the learners can apply the methods to determine substance content upon different analytical objectives.
44	55PAC321	Analytical chemistry experiment	2	Practical analytics chemistry is one of the subjects of specialized knowledge. This course helps learners apply the theory of ionic equilibrium in solutions to explain, understand the properties of inorganic substances in the solution, predict the ability of reactions, strengthen the studied theory... The subject also equips for learners the qualitative and quantitative determination of substances by conventional and modern analytical methods. Besides, the course also helps students

Nº	Code	Course name	Credit	Course abstract
				confidently participate in scientific research, implementing extracurricular content, interdisciplinary experience. Moreover, learners can fully identify and quantify substances in different analytical objects.
45	55CFL321	Chemistry for life 1	2	Chemistry with Life 1 equips learners with the knowledge of the production process, application of chemical products; Environmental issues related to the production and use of chemical products. Equipping learners with this knowledge will help them connect, apply them to life as well as professionals.
46	55CFL322	Chemistry for life 2	2	The Chemistry for Life 2 module equips learners with basic knowledge about fertilizers, pesticides, food safety, and environmental pollution in the field of agricultural production. Learners will gain a deep understanding of the effects of fertilizers, pesticides, antibiotics on the environment, and food safety.
47	55CCC321	Chemistry of coordination compounds	2	The Complex chemistry module provides learners with a modern knowledge system about composition, structure, chemical bonding, properties, and reactivity ability of complexes. The module aims to form and develop learners' skills to apply domain knowledge of the subject to solve problems in teaching, in science, and in real life. The module also aims to develop in learners the ability to communicate effectively, self-study, and lifelong learning skills.
Selective courses			4	
48	55ASC321	Application spectrometry method on chemistry	2	The course provides students with the following knowledge: Theoretical foundations of infrared spectrum (IR), ultraviolet-visible spectrum (UV-Vis), mass spectrometry (MS). Some characteristics, spectral measurement principles and applications of infrared and visible ultraviolet spectrum, mass.
49	55ECS321	Statistical data	2	The course provides learners with the basic concepts of statistical mathematics used in

Nº	Code	Course name	Credit	Course abstract
		handling of experimental chemistry		the experimental statistical data processing of Chemistry. Help learners understand, apply, analyze, and statistically evaluate the data sets collected in Chemistry experiment. Form and develop in learners the skills of calculating characteristic quantities of data sets, testing of errors, indirect errors, comparing variance, comparing mean values, testing hypotheses statistics, and correct experimental data presentation of Chemistry. The course also outlines some practical software and analysis of variance to help learners process statistics effectively with large data sets.
50	55CHM321	Material chemistry	2	This module provides the most basic scientific knowledge about materials, including concept, classification, structure, types of bonds in materials, properties of materials. Also, the module discusses the specific properties and main use areas of some common materials (ceramic, composite, inorganic polymers) and advanced materials (nanomaterials).
51	55SOC321	Synthesis organic chemistry	2	Organic synthesis is the most basic knowledge in the synthesis of organic compounds and the synthesis methods in the production of organic substances. From there, forming skills for students to apply knowledge to solve problems in teaching, in science, especially in production for life.
52	55QCH321	Quantum chemistry	2	This course introduces students to the basic and most important knowledge of quantum mechanics applied to chemistry, helping students to understand the basis of knowledge about atomic and molecular problems. Form and develop in learners skills to apply subject knowledge to solve chemical problems, explain problems in teaching, in science, and life. Develops in learners the ability to communicate effectively, self-study, and lifelong learning skills.
3. Educative knowledge			31	

Nº	Code	Course name	Credit	Course abstract
Compulsory Courses			27	
53	55EPS431	Educational psychology	3	The course equips students with basic knowledge of educational psychology such as nature, functions, and human psychological phenomena; psychological development characteristics of children in each age period; Psychological basis of teaching activities; Psychological basis of ethical education activities. In particular, the course provides learners with the basic content of ethical principles and psychological support skills in schools to apply in teaching, studying human psychology, forming and developing develop student personality, support students to solve psychological difficulties
54	55PEP441	Pedagogy	4	Academic education is a compulsory subject of pedagogical knowledge block in teacher training programme: Education is a science of human education; Factors affecting personality formation and development; educational purposes and duties. Concept of teaching process, structure, tasks, nature of teaching process, laws, dynamics, logic of teaching process; principles and teaching methods, forms of organizing teaching. The concept of the educational process, the characteristics, the nature of the educational process, the logic of the educational process; The principles and methods of education; knowledge and skills to organize a number of educational activities in high schools. Requirements on teacher personality, pedagogical labor characteristics, role and work content of homeroom teachers in a multicultural environment and revolutionary 4.0;
55	55TTC431	Theory of teaching chemistry	3	Chemistry teaching theory subject has the content of general and theoretical issues about the process of teaching chemistry in high schools. The content of the subject includes teaching theory of chemistry in high schools (Theoretical foundations of high school chemistry teaching

Nº	Code	Course name	Credit	Course abstract
				process), scientific research on high school chemistry teaching process, steps first to be familiar with the principles and steps of developing the subject-oriented curriculum in high schools. After completion, in addition to the basic knowledge system, this module also helps students to apply knowledge of psychology and education into teaching and educational science research in the teaching process. chemistry, initially forming the necessary qualities of a future chemistry teacher.
56	55TMC431	Chemical teaching methods in high school	3	This module provides learners with the most basic knowledge of the content, curriculum of high school chemistry textbooks, methods, and techniques for teaching chemistry lessons in high school.
57	55CES421	Chemical experiments in high school	2	This module provides the knowledge of using experiments in chemistry teaching and training students in the techniques of conducting and performing experiments.
58	55ESC431	Chemical exercises in high school	3	This module provides the most basic knowledge of chemical exercises methods in the content of General Chemistry; Inorganic chemistry; Organic Chemistry and How to Use Chemistry in school chemistry
59	55PTT421	Pedagogical training in teaching chemistry 1	2	Pedagogical Practices courses 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 have initially formed the basic teaching capacity, especially the ability to use language, the language of chemical, 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.

Nº	Code	Course name	Credit	Course abstract
60	55PTT422	Pedagogical training in teaching chemistry 2	2	This subject includes 2 credits, the content of the subject is to practice the necessary teaching skills for a chemistry teacher in high school. Completing the subject, students will master the skills to prepare and conduct lessons in teaching chemistry in high schools, applying the knowledge of psychology and education into teaching implementation, learn, apply theoretical knowledge into teaching practice, be trained to master skills in the practice of teaching chemistry in high schools.
61	55TRA421	Pedagogical practice 1	2	Contents of Pedagogical Practice 1 subject to help learners understand educational reality, interact with students and teachers of internships, thereby forming professional feelings, promoting self-training according to the requirements of the profession; understands the content of the professional work of the subject teachers, has initial skills in-class assignment.
62	55TRA432	Pedagogical practice 2	3	The content of the subject Pedagogical Practice 2 aims to help learners improve the skills of class organizations, educational activity, improve the emotional, professional ethics; have basic skills in lesson preparation, class promotion; organize lectures; assess students' learning outcomes; can be independent in class to lecture and be a class direction.
Selective courses			4	
63	55IAT421	Informatic application in chemistry teaching	2	Applied Informatics in chemistry teaching equips students with basic knowledge of information and communication technology application in chemistry teaching and testing; Basic software in chemistry teaching to design e-lessons, electronic lesson plans, electronic textbooks, E-Learning, compile and mix multiple-choice questions ... students' creativity, improving the effectiveness of chemistry teaching and integrated teaching.

Nº	Code	Course name	Credit	Course abstract
64	55TOE421	Teaching in the online environment	2	The course equips students with the theoretical knowledge of the environment and popular online teaching aids, skills in designing and managing online courses by subject. Students will apply teaching theory to design online courses on Moodle LMS systems, focusing on improving information technology skills, creating good interactions with learners in the online teaching environment.
65	55HOC421	History of chemistry	2	The course equips students with the history of chemistry, content, and methods of using historical resources to improve the quality of chemistry teaching.
66	55TDC421	Differentiated teaching in chemistry teaching at high school.	2	This subject presents some of the most important contents of the concepts, how to organize teaching in the direction of differentiation (DHPH) in chemistry teaching. Because of its characteristics, DHPH also has different principles, of which the most prominent of this teaching point of view is that the teacher has to admit that the student is different; value quality over quantity; focus on learners, learning is relevant and exciting; integrating classroom, group, and individual teaching. The subject will also guide learners on teaching PH skills in teaching chemistry in high schools to develop students' capacities, to meet the requirements of the renovation of general education after 2018.
67	55ETC421	Equipment teaching chemistry	2	Teaching means are material objects used by teachers as a means of organizing and controlling learners' cognitive activities to achieve teaching objectives. The content of this module consists of two parts: The theory section includes the basic knowledge of general teaching facilities, traditional teaching facilities, Chemistry teaching facilities, multimedia in teaching, and The application of multimedia in teaching chemistry in high schools. The practical part helps students

Nº	Code	Course name	Credit	Course abstract
				to use general teaching facilities and teaching facilities in teaching Chemistry in particular.
68	55EAT421	Extracurricular activities in teaching chemistry	2	This course equips students with a basic understanding of experiential activities in general education and chooses content, how to design, organize and evaluate experiential activities by the goals, Chemistry content, and curriculum in high school
69	55NSC421	Natural scientific topics of chemistry in high school.	2	This course equips students with the knowledge of chemistry related to practical issues, demonstrates a deep interdisciplinary relationship with other subjects, as a basis for designing topics. interdisciplinary chemistry meets the requirements of integrated teaching in high school chemistry teaching. This course 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 course including such issues as The state of substance, Acids and bases, metals, Inorganic carbon, Energy, Atmospheric Chemistry, Ocean, Organic synthesis technologies, etc. will help students mount the Chemical knowledge to practical life, develop problem-solving ability and creativity to students, etc., and help students relate Chemical knowledge with practical life, improving the capacity of problem-solving and creativeness for students.
70	55UEC421	Using English in chemical teaching	2	This module aims to form and develop students 'English proficiency, through which also form and develop students' self-study capabilities, professional self-development capacities, and component skills of the competencies, teaching chemistry, especially the competency in chemical

Nº	Code	Course name	Credit	Course abstract
				knowledge and language use.
4. Thesis, courses replace the graduation thesis			7	
Thesis				
71	55CTE971	Thesis	7	
Courses replace the graduation thesis (7 TC)			7	
72	55TPD931	Chemical teaching in school under the positive direction	3	This subject outlines the most general features of the innovation orientation Teaching methods (in general) and chemistry teaching methods in high schools (in particular), in which focus on researching teaching perspectives "Teaching learners-centered learning ", the main orientation is to deploy active teaching. The practical part of the course provides students with basic skills to develop a chemistry lesson in a positive direction, using basic teaching methods, teaching techniques, and assessment. to improve the effectiveness of the high school chemistry teaching process.
73	55TAT931	Measurement and assessment in chemical teaching	3	This module provides the basics of positions, roles, functions, and assessment methods in education in general and in chemistry teaching in particular, training students the skills to define goals. of the subject and lessons, techniques for processing exam questions, exams to get the best exam questions, building a process of assessment, and self-assessment of course learning results.
74	55NPR921	Natural Product	2	Natural products are an important part of organic chemistry. This course provides learners with basic concepts and methods of studying natural organic compounds while systematizing the physical, chemical, bioactive, and application properties of compounds in plants, animals, and microorganisms such as terpene and terpenoids, steroids, alkaloids, and polyphenols.
75	55CPM921	Corrosive and protection of	2	The role of the student is to know how to solve the problem of metal corrosion or encounter in real life. The course provides

N°	Code	Course name	Credit	Course abstract
		metal		students with the knowledge of metal corrosion, the economic importance of the problem of metal corrosion. Mechanism of electrochemical corrosion, methods against corrosion of metals, and ways of determining the rate of metal corrosion.
76	55CCH921	Colloidal chemistry	2	This course will introduce students to basic knowledge about the highly distributed system, the role, and importance of this system in production and life, biology, and materials technology. Composition and method of preparation and purification of colloid. Surface phenomena, adsorption of the colloidal. Some optical, kinetic, electrical properties, and the phenomenon of flocculation of colloidal systems. Introduction of some dispersion and semi-colloidal systems such as emulsions and foams, agar, and gel.
77	55PTE921	General technicals for environmental treatment	2	This course will equip learners with knowledge about analysis and assessment of environmental impacts, thereby proposing solutions to handle and remedy the consequences of environmental pollution. In particular, learners will be systematically equipped with knowledge related to the techniques for treating a polluted environment. This knowledge will support them effectively in life, teaching, and guide students to do scientific research projects in high school.
Total			133	

RECTOR



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