CAN THO UNIVERSITY

COLLEGE OF NATURAL SCIENCES

PROGRAMME SPECIFICATION

Academic year 2020-2021

BACHELOR IN CHEMISTRY

Can Tho – 2021

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Programme specification was last revised on May 29, 2020 by CTU's Rector.

Programme: **Chemistry** Programme code: 7440112

Mode of training: Full-time Training time: 4 years

Degree: Bachelor

Administration unit: Department of chemistry, College of natural sciences

APPENDICES

Part 1. GENERAL INFORMATION OF THE PROGRAMME

1.1 General information

- Programme: **Chemistry**
- Programme code: 7440112
- Groups of subjects admission: Mathematics - Physics - Chemistry (A00); Mathematics - Chemistry - Biology (B00); Mathematics - Chemistry - English (D07)
- Mode of training: Full-time
- Training time: 4 years
- Degree: Bachelor
- Administration unit: Department of Chemistry, College of Natural Sciences

1.2 Introduction

- The Bachelor of science in Chemistry (BScC) program equips students with basic to advanced knowledge and basic practical skills in the field of chemistry to be able to work in the fields of agriculture, fisheries, environment, food and pharmaceutical.
- Chemistry students can learn basic and in-depth knowledge of chemistry including general chemistry, inorganic chemistry, organic chemistry, physical chemistry, analytical chemistry, quantum chemistry, biochemistry; skills, practical operations, analytical skills, using modern analytical equipment such as gas chromatography, gas chromatography coupled mass spectrometry, liquid chromatography, infrared spectroscopy, ultraviolet-visible spectroscopy knowledge,... applied in the fields of analysis, chemistry, physics, biology, medicine, and pharmacy. Chemistry graduates are fully qualified to work or continue studying in master's and doctoral programs at home and abroad.

1.3 Job position

- Research staff in the field of chemistry and related fields.
- Lecturer, teacher teaching on chemistry subjects.
- Testers, technicians.

- Sales staff of chemicals and chemical equipment.
- Managers of chemical production and trading.
- Officials at the ward (commune), district, administration levels, provincial (city) departments and agencies in charge of the fields of work related to chemistry and science - technology in general.

1.4 Place to work after graduation

- Research institutes and research centers in the field of chemistry.
- Universities, colleges, high schools (need to accumulate more pedagogical modules).
- Center for analysis and testing, Sub-department of standards, measurement and quality.
- Companies, factories, factories producing and processing plant protection drugs, fertilizers, veterinary drugs, aquatic drugs, dyes, leather shoes, etc.
- The company buys, sells and trades in chemicals and chemical equipment.
- Departments of science and technology, department of environment and natural resources,...
- Facilities with chemistry applications.

Part 2. PROGRAM OBJECTIVES AND PROGRAM LEARNING OUTCOMES

2.1 Program objectives

The program objectives (POs) of the BScC program are listed as follows:

- PO1: To possess solid background knowledge in chemical science, self-study capacity, self-research to adapt to the development of industry and society.
- PO2: To demonstrate in-depth knowledge and skills in chemistry (including modern analytical techniques, chemical synthesis, natural compounds, food, and the environment).
- PO3: To apply professional competence to work in chemical-related agencies, organizations and companies.
- PO4: To demonstrate competence for scientific research and pursuing postgraduate study at domestic and foreign universities.
- PO5: To effectively use foreign languages and information technology in research, work and social communication.
- PO6: To have consciousness in health protection, and attitude, personal ethics and responsibility, and professional ethics.

2.2 Program learning outcomes

After completion, the graduates are able to:

Group	PLOs
Knowledge	
General education knowledge block	PLO 1: Demonstrate understanding of the national philosophy and policies. PLO 2: Demonstrate basic knowledge of law, social sciences and humanities, natural sciences to meet the requirements of acquiring professional education knowledge.
Fundamental knowledge block	PLO 3: Apply knowledge of basic principles in the field of general chemistry, physical chemistry, general quantum chemistry as a theoretical foundation to solve practical problems for the chemistry sector. PLO 4: Apply basic knowledge and skills in the field of chemistry (including inorganic chemistry, organic chemistry, physical chemistry, analytical chemistry, and biochemistry) to solve practical problems for chemical fields. PLO 5: Apply knowledge of laboratory technical safety and laboratory management in practice.

Specialized/ professional knowledge block	PLO 6: Demonstrate theoretical and practical knowledge of using modern equipment such as MS, GC-MS, HPLC, NMR, UV-VIS, IR, ... to conduct chemical analysis in other fields such as food, medicine, environment, materials, ... PLO 7: Demonstrate knowledge about writing plans/ proposals and organizing experiments for chemical research, processing and evaluating research results data, and building experimental models. PLO 8: Apply knowledge about using chemical methods and chemical compounds to create new compounds and new materials, on the principle of not causing harm to the environment.
Skills	
Academic skills	PLO 9: Use modern analytical equipment in chemical analysis. PLO 10: Propose and create chemical research models that contribute to solving practical problems related to chemistry.
Soft skills	PLO 11: Work independently, cooperate in teamwork. PLO 12: Use foreign languages (English or French) and software and information technology applications for learning, research, working and social communication activities.
Attitude and Awareness	PLO 13: Promote the importance of chemistry in the development of the country. PLO 14: Instill a sense of collective, teamwork, cooperation and sharing with everyone. PLO 15: Practice lifelong learning (i.e, actively planning to develop personal and professional competencies). PLO 16: Live and work responsibly, in a civilized manner, respect the law, and protect national and ethnic values.

2.3 Correlation Matrix between the POs and the PLOs

POs	**PLOs**															
	Knowledge								**Generic Skills**				**Attitude and Awareness**			
	General education knowledge		***Fundamental knowledge***			***Professional knowledge***			***Academic skills***		***Soft skills***					
	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	PLO 15	PLO 16
PO1			X	X	X						X					
PO2						X	X	X	X	X						
PO3									X	X	X	X				
PO4										X	X	X				
PO5												X			X	
PO6	X	X											X	X	X	X

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Part 3. CURRICULUM AND TRAINING PROGRAM

3.1 Curriculum

Knowledge blocks	Credits		
	Required credits	Elective credits	Total
General Knowledge	36	15	51
Fundamental Knowledge	43	2	45
Specialized Knowledge	29	16	45
Total	**108**	**33**	**141**

3.2 Training program

- Name of the programme: **Chemistry** - Code of the programme: 7440112
- Mode of training: Full-time, on campus - Training time: 4 years
- Administration unit: Department of Chemistry, College of Natural Sciences, Can Tho University
- Eligibility for graduation: **141 credicts**
- Minimum grade point average (GPA): **2.0**

No	Course ID	Course Name	Course Name	Required credits	Elective credits	Theory hours	Practicehours	Prerequisite course	Parallel course	Semester opened
I. General Knowledge										
1	QP010	National Defence Education 1 (*)	2	2		37	8	Taught in groups of majors		
2	QP011	National Defence Education 2 (*)	2	2		22	8	Taught in groups of majors		
3	QP012	National Defence Education 3 (*)	2	2		14	16	Taught in groups of majors		
4	QP013	National Defence Education 4 (*)	2	2		4	56	Taught in groups of majors		
5	TC100	Physical Education 1+2+3 (*)	1+1+1		3		90			I,II,III
6	XH023	General English 1 (*)	4		10 credits	60				I,II,III
7	XH024	General English 2 (*)	3			45		XH023		I,II,III
8	XH025	General English 3 (*)	3			45		XH024		I,II,III
9	XH031	Level B1 English 1 (*)	4			60		XH025		I,II,III

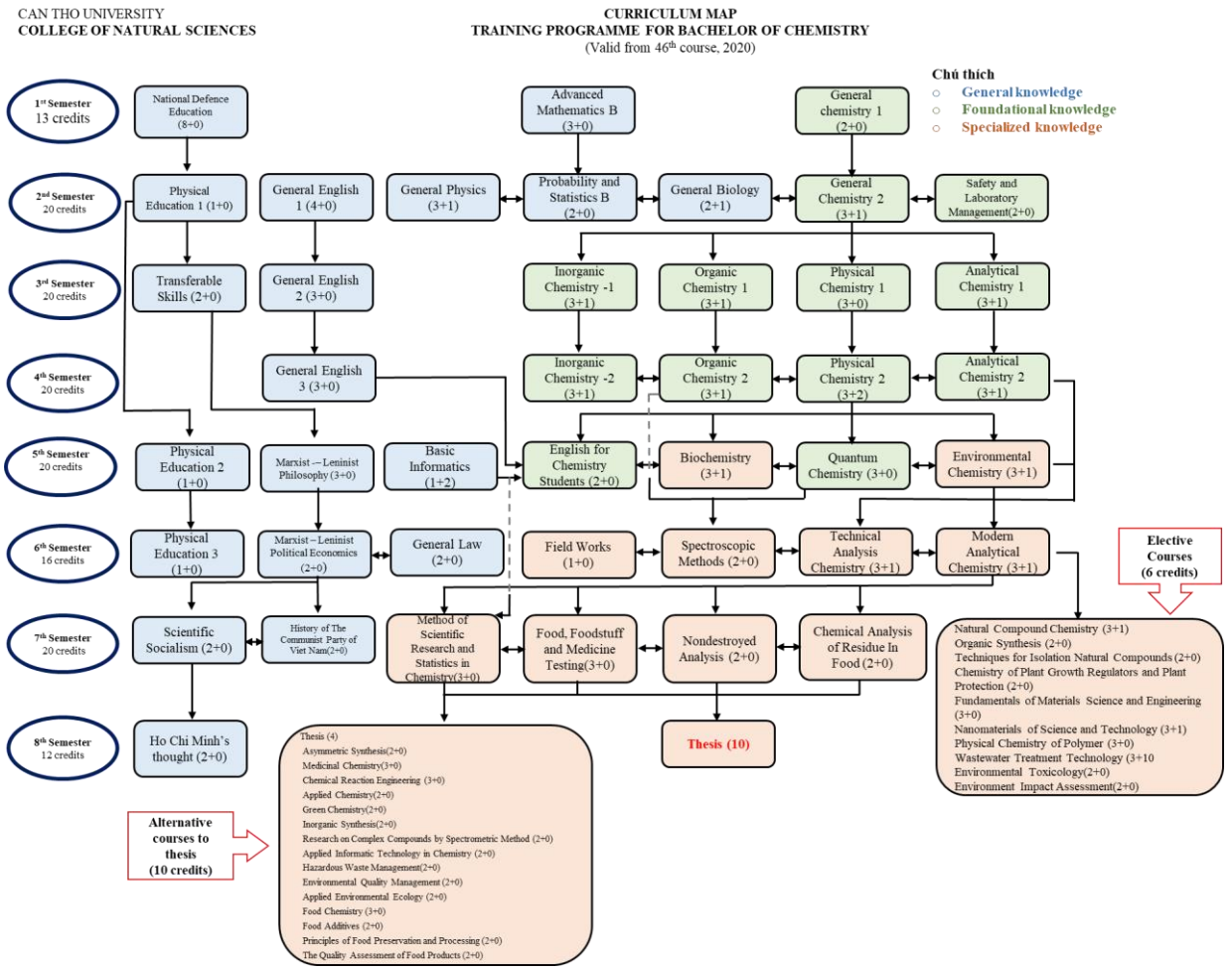
No	Course ID	Course Name	Course Name	Required credits	Elective credits	Theory hours	Practicehours	Prerequisite course	Parallel course	Semester opened
10	XH032	Level B1 English 2 (*)	3		of English or 10 credits of French	45		XH031		I,II,III
11	XH033	Level B1 English 3 (*)	3			45		XH032		I,II,III
12	FL001	General French 1 (*)	4			60				I,II,III
13	FL002	General French 2 (*)	3			45		FL001		I,II,III
14	FL003	General French 3 (*)	3			45		FL002		I,II,III
15	FL007	Intensive French 1 (*)	4			60		FL003		I,II,III
16	FL008	Intensive French 2 (*)	3			45		FL007		I,II,III
17	FL009	Intensive French 3 (*)	3			45		FL008		I,II,III
18	TN033	Basic Informatics (*)	1	1		15				I,II,III
19	TN034	Basic Informatics Practice (*)	2	2			60		TN033	I,II,III
20	ML014	Marxist - Leninist Philosophy	3	3		45				I,II,III
21	ML016	Marxist - Leninist Political Economy	2	2		30		ML014		I,II,III
22	ML018	Scientific Socialism	2	2		30		ML016		I,II,III
23	ML019	History of the Communist Party of Vietnam	2	2		30		ML018		I,II,III
24	ML021	Ho Chi Minh's Ideology	2	2		30		ML019		I,II,III
25	KL001	General Law	2	2		30				I,II,III
26	ML007	Basic Logic	2		2	30				I,II,III
27	XH028	Overview of Sociology	2			30				I,II,III
28	XH011	Basic Vietnamese Culture	2			30				I,II,III
29	XH012	Vietnamese in Use	2			30				I,II,III
30	XH014	General Management Documents and Archive	2			30				I,II,III
31	KN001	Transferable Skills	2			20	20			I,II,III
32	KN002	Innovation and Entrepreneurship	2			20	20			I,II,III
33	TN059	Advanced Mathematics B	3	3		45				I,II,III
34	TN044	Probability and Statistics B	2	2		30				I,II,III
35	TN048	General Physics	3	3		45				I,II,III
36	TN049	General Physics practice	1	1			30		TN048	I,II,III
37	TN042	General Biology	2	2		30				I,II,III
38	TN043	Experiment on General Biotogy	1	1			30		TN042	I,II,III
Total: 51 credits (compulsory credits: 36; elective credits: 15)										
II. Fundamental Knowledge										
39	TN427	Safety and Laboratory Management	2	2		30				I,II
40	TN101	General Chemistry 1	2	2		30				I,II
41	TN102	General Chemistry 2	3	3		45		TN101		I,II
42	TN103	General Chemistry Laboratory 2	1	1			30		TN102	I,II
43	TN236	Inorganic Chemistry 1	3	3		45		TN102		I,II
44	TN173	Inorganic Chemistry Laboratory 1	1	1			30		TN236	I,II
45	TN247	Inorganic Chemistry 2	3	3		45		TN236		I,II

No	Course ID	Course Name	Course Name	Required credits	Elective credits	Theory hours	Practicehours	Prerequisite course	Parallel course	Semester opened
46	TN107	Inorganic Chemistry Laboratory 2	1	1			30		TN247	I,II
47	TN111	Organic Chemistry 1	3	3		45		TN102		I,II
48	TN112	Organic Chemistry Laboratory 1	1	1			30		TN111	I,II
49	TN249	Organic Chemistry 2	3	3		45		TN111		I,II
50	TN178	Organic Chemistry Laboratory 2	1	1			30		TN249	I,II
51	TN108	Physical Chemistry 1	3	3		45		TN102		I,II
52	TN109	Physical Chemistry 2	3	3		45		TN108		I,II
53	TN110	Physical Chemistry Laboratory	2	2			60		TN109	I,II
54	TN115	Analytical Chemistry l	3	3		45		TN102		I,II
55	TN180	Analytical Chemistry Laboratory l	1	1			30		TN115	I,II
56	TN117	Analytical Chemistry 2	3	3		45		TN115		I,II
57	TN182	Analytical Chemistry Laboratory 2	1	1			30		TN117	I,II
58	TN436	Quantum Chemistry	3	3		45		TN101		I,II
59	TN163	English for Chemistry Students	2		2	30				I,II
60	XH019	French for Science and Technology	2			30				I,II
Total: 45 credits (compulsory credits: 43; elective credits: 2)										
III. Specialized Knowledge										
61	TN235	Biochemistry	3	3		45		TN249		I,II
62	TN364	Biochemistry Laboratory	1	1			30		TN235	I,II
63	TN437	Environmental Chemistry	3	3		45		TN117		I,II
64	TN312	Environmental Chemistry Laboratory	1	1			30		TN437	I,II
65	TN438	Technical Analysis Chemistry	3	3		45		TN117		I,II
66	TN322	Technical Analysis Chemistry Laboratory	1	1			30		TN438	I,II
67	TN308	Modern Analytical Chemistry	3	3		45		TN117		I,II
68	TN309	Modern Analytical Chemistry Laboratory	1	1			30		TN308	I,II
69	TN361	Spectroscopic Methods	2	2		30		TN249		I,II
70	TN439	Food, Foodstuflf and Medicine Testing	3	3		45				I,II
71	TN292	Nondestroyed Analysis	2	2		30				I,II
72	TN245	Chemical Analysis of Residue In Food	2	2		30		TN117		I,II
73	TN319	Field Works	1	1			30			I,II
74	TN468	Method of Scientific Research and Statistics in Chemistry	3	3		30	30			I,II
75	TN452	Natural Compound Chemistry	3		6	45				I,II

No	Course ID	Course Name	Course Name	Required credits	Elective credits	Theory hours	Practicehours	Prerequisite course	Parallel course	Semester opened
76	TN379	Natural Compound Chemistry Laboratory	1				30		TN452	I,II
77	TN327	Organic Synthesis	2			30				I,II
78	TN395	Techniques for Isolation Natural Compounds	2			30				I,II
79	CN247	Chemistry of Plant Growth Regulators and Plant Protection	2			30				I,II
80	KC120	Fundamentals of Materials Science and Engineering	3			45				I,II
81	KC289	Nanomaterials of Science and Technology	3			45				I,II
82	TN473	Practice of nanomaterials synthesis	1				30		KC289	I,II
83	CN199	Physical Chemistry of Polymer	3			30	30			I,II
84	MT338	Wastewater Treatment Technology	3			45				I,II
85	MT339	Lab Session on Wastewater Treatment	1				30		MT338	I,II
86	TN339	Environmental Toxicology	2			30				I,II
87	MT342	Environment Impact Assessment	2			30				I,II
88	TN338	Graduate Thesis	10				300	$\geq$ 105 TC		I,II
89	TN246	Graduate Essay	4				120	$\geq$ 105 TC		I,II
90	TN387	Asymmetric Synthesis	2			30				I,II
91	TN367	Medicinal Chemistry	3			45				I,II
92	CN231	Chemical Reaction Engineering	3			35	20			I,II
93	TN300	Applied Chemistry	2			30				I,II
94	KC310	Green Chemistry	2			30				I,II
95	TN362	Inorganic Synthesis	2			30				I,II
96	TN326	Research on Complex Compounds by Spectrometric Method	2		10	30				I,II
97	TN313	Applied Informatic Technology in Chemistry	2			15	30			I,II
98	MT331	Hazardous Waste Management	2			30				I,II
99	MT309	Environmental Quality Management	2			30				I,II
100	MT301	Applied Environmental Ecology	2			30				I,II
101	NS318	Food Chemistry	3			30	30			I,II
102	NN151	Food Additives	2			30				I,II

No	Course ID	Course Name	Course Name	Required credits	Elective credits	Theory hours	Practicehours	Prerequisite course	Parallel course	Semester opened
103	NN180	Principles of Food Preservation and Processing	2			30				I,II
104	NS321	The Quality Assessment of Food Products	2			30				I,II
Total: 45 credits (compulsory credits: 29; elective credits: 16)										
Total: 141 credits (compulsory credits: 108; elective credits: 33)										

3.3 Curriculum map



3.4 Mapping of courses to PLOs

Courses			Expected Learning Outcomes (PLOs)															
			Knowledge								Skills				Autonomy and responsibility			
			General Knowledge		Fundamental Knowledge			Specialized Knowledge			Hard Skills		Soft Skills					
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14	PLO15	PLO16
I. General Knowledge																		
1	QP010	National Defence Education 1 (*)	X										X					X
2	QP011	National Defence Education 2 (*)	X										X					X
3	QP012	National Defence Education 3 (*)	X										X					X
4	QP013	National Defence Education 4 (*)	X										X					X
5	TC100	Physical Education 1+2+3 (*)		X									X					X

6	XH023	General English 1 (*)			X									X		X	X	
7	XH024	General English 2 (*)			X									X		X	X	
8	XH025	General English 3 (*)			X									X		X	X	
9	XH031	Level B1 English 1 (*)			X									X		X	X	
10	XH032	Level B1 English 2 (*)			X									X		X	X	
11	XH033	Level B1 English 3 (*)			X									X		X	X	
12	FL001	General French 1 (*)			X									X		X	X	
13	FL002	General French 2 (*)			X									X		X	X	
14	FL003	General French 3 (*)			X									X		X	X	
15	FL007	Intensive French 1 (*)			X									X		X	X	
16	FL008	Intensive French 2 (*)			X									X		X	X	
17	FL009	Intensive French 3 (*)			X									X		X	X	
18	TN033	Basic Informatics (*)			X									X		X	X	
19	TN034	Basic Informatics Practice (*)			X									X		X	X	
20	ML014	Marxist - Leninist Philosophy	X										X					X
21	ML016	Marxist - Leninist Political Economy	X										X					X
22	ML018	Scientific Socialism	X										X					X

23	ML019	History of the Communist Party of Vietnam	X										X					X
24	ML021	Ho Chi Minh's Ideology	X										X					X
25	KL001	General Law		X									X					X
26	ML007	Basic Logic		X									X			X		
27	XH028	Overview of Sociology		X									X			X		
28	XH011	Basic Vietnamese Culture		X									X			X		
29	XH012	Vietnamese in Use		X									X			X		
30	XH014	General Management Documents and Archive		X									X			X		
31	KN001	Transferable Skills		X									X				X	
32	KN002	Innovation and Entrepreneurship		X									X				X	
33	TN059	Advanced Mathematics B		X							X					X		
34	TN044	Probability and Statistics B		X							X					X		
35	TN048	General Physics		X							X					X		
36	TN049	General Physics practice		X							X					X		
37	TN042	General Biology		X							X					X		
38	TN043	Experiment on General Biotogy		X							X					X		
II. Fundamental Knowledge																		

39	TN427	Safety and Laboratory Management					X				X				X			
40	TN101	General Chemistry 1			X										X			
41	TN102	General Chemistry 2			X										X			
42	TN103	General Chemistry Laboratory 2			X								X		X	X		
43	TN236	Inorganic Chemistry 1				X									X			
44	TN173	Inorganic Chemistry Laboratory 1				X							X		X	X		
45	TN247	Inorganic Chemistry 2			X	X							X			X	X	
46	TN107	Inorganic Chemistry Laboratory 2				X							X		X	X		
47	TN111	Organic Chemistry 1		X		X						X	X		X		X	
48	TN112	Organic Chemistry Laboratory 1				X							X		X	X		
49	TN249	Organic Chemistry 2		X		X						X	X		X		X	
50	TN178	Organic Chemistry Laboratory 2				X							X		X	X		
51	TN108	Physical Chemistry 1				X									X			
52	TN109	Physical Chemistry 2				X									X			
53	TN110	Physical Chemistry Laboratory				X			X			X	X	X			X	

54	TN115	Analytical Chemistry l				X							X			X	X	
55	TN180	Analytical Chemistry Laboratory l				X							X		X	X		
56	TN117	Analytical Chemistry 2				X							X		X	X		
57	TN182	Analytical Chemistry Laboratory 2				X							X		X	X		
58	TN436	Quantum Chemistry				X					X		X				X	
59	TN163	English for Chemistry Students				X		X		X				X	X			
60	XH019	French for Science and Technology				X		X		X				X	X			
III. Specialized Knowledge																		
61	TN235	Biochemistry				X						X			X			
62	TN364	Biochemistry Laboratory				X					X		X		X	X		
63	TN437	Environmental Chemistry						X			X	X			X			
64	TN312	Environmental Chemistry Laboratory						X			X		X		X	X		
65	TN438	Technical Analysis Chemistry						X			X	X			X			
66	TN322	Technical Analysis Chemistry Laboratory						X			X		X		X	X		

67	TN308	Modern Analytical Chemistry						X			X	X			X			
68	TN309	Modern Analytical Chemistry Laboratory						X			X		X		X	X		
69	TN361	Spectroscopic Methods						X			X	X			X			
70	TN439	Food and Medicine Testing						X			X	X			X			
71	TN292	Nondestroyed Analysis						X			X	X			X			
72	TN245	Chemical Analysis of Residue In Food						X			X	X			X			
73	TN319	Field Works									X		X		X	X		
74	TN468	Method of Scientific Research and Statistics in Chemistry							X			X			X			
75	TN452	Natural Compound Chemistry								X		X			X			
76	TN379	Natural Compound Chemistry Laboratory								X	X		X		X	X		
77	TN327	Organic Synthesis								X		X			X			
78	TN395	Techniques for Isolation Natural Compounds								X		X			X			
79	CN247	Chemistry of Plant Growth Regulators and Plant Protection								X		X			X			

80	KC120	Fundamentals of Materials Science and Engineering								X		X			X			
81	KC289	Nanomaterials of Science and Technology								X		X			X			
82	TN473	Practice of nanomaterials synthesis								X	X		X		X	X		
83	CN199	Physical Chemistry of Polymer								X		X			X			
84	MT338	Wastewater Treatment Technology								X	X	X			X			
85	MT339	Lab Session on Wastewater Treatment								X	X		X		X	X		
86	TN339	Environmental Toxicology								X		X			X			
87	MT342	Environment Impact Assessment								X		X			X			
88	TN338	Graduate Thesis		X			X		X		X	X	X		X		X	
89	TN246	Graduate Essay							X	X	X	X	X	X	X	X		
90	TN387	Asymmetric Synthesis								X		X			X			
91	TN367	Medicinal Chemistry								X		X			X			
92	CN231	Chemical Reaction Engineering								X		X			X			
93	TN300	Applied Chemistry								X		X			X			

94	KC310	Green Chemistry								X		X			X			
95	TN362	Inorganic Synthesis								X		X			X			
96	TN326	Research on Complex Compounds by Spectrometric Method								X		X			X			
97	TN313	Applied Informatic Technology in Chemistry								X		X		X	X			
98	MT331	Hazardous Waste Management								X		X			X			
99	MT309	Environmental Quality Management								X		X			X			
100	MT301	Applied Environmental Ecology								X		X			X			
101	NS318	Food Chemistry								X		X			X			
102	NN151	Food Additives								X		X			X			
103	NN180	Principles of Food Preservation and Processing								X		X			X			
104	NS321	The Quality Assessment of Food Products								X		X			X			

Part 4. BRIEF OUTLINE OF ALL COURSES IN THE PROGRAMME

4.1 National Defence Education 1

- Course number: QP010

- Credit: 02

- Hours: 37 theory hours and 8 practice hours

- Prerequisite course: None

- Parallel course: None

Course description

This course presents the Party's basic theory of the military policy, including: the basic issues Marxist-Leninist Theory, Ho Chi Minh's thought on war, the army and the defense of the country; Party's views on the people war, building the armed forces, the all-people defense, the people's security; the Party's views on combining socio-economic development with strengthening national defense and security. In addition, the course introduces some basic contents about the history of Vietnamese military art through the periods.

4.2 National Defence Education 2

- Course number: QP011

- Credit: 02

- Hours: 22 theory hours and 8 practice hours

- Prerequisite course: None

- Parallel course: None

Course description

This course presents the basic contents of the defense and security tasks of the Party and State in the new situation, including: building the militia, self-defense, mobilization reserve force; increasing the potentials of national defense and technical and material foundations; defeating the strategy of "peaceful evolution", and riot to overthrow hostile forces toward the Vietnamese revolution. The course addresses a

number of issues of ethnicity, religion and the fight against the enemies who take advantage of issues of ethnicity and religion to fight the Vietnamese revolution; building and protecting border sovereignty, sovereignty over islands, national security, fighting crime prevention and maintaining social order and safety, combating non-traditional security threats in Vietnam.

4.3 National Defence Education 3

- Course number: QP012

- Credit: 02

- Hours: 14 theory hours and 16 practice hours

- Prerequisite course: None

- Parallel course: None

Course description

The course provides theory combined with practice to provide students with some basic skills to practice shooting with pistols, basic knowledge of maps, military terrain, and combat against the enemies with a weapon, high-tech gas, forging bravery and health through military content, training for class and block formation. The contents of the course include the followings: unit team (platoon level); training combat skills; commanding combat units; combat synergies in attack and defense.

4.4. National Defence Education 4

- Course number: QP013

- Credit: 02

- Hours: 4 theory hours and 56 practice hours

- Prerequisite course: None

- Parallel course: None

Course description

The course introduces the history, traditions of the army, the army, the organization of the forces of the army, visiting to learn the history, units in the armed forces. The course helps students: 1) master basic knowledge about the military in the Vietnam People's Army; 2) raising awareness in building, consolidating the people's

armed forces, being ready to join militia and self-defense force, reserve mobilization and military service; and 3) training for quality, strong political bravery, patriotism, love of socialism and building and strengthening the people's armed forces.

4.5 Physical Education 1+2+3

- Course number: TC100

- Credit: 03

- Hours: 90 practice hours and 180 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

Physical Education 1+2+3 (*) is a general course that represents the Physical Education courses. All students who are not majoring in Physical Education must study these courses to complete the curriculum of their majors.

To complete the Physical Education courses, the students do not register for course TC100, instead, students must register for each specific course depending on their ability and desire to learn. For example, if a student wants to learn Taekwondo, they register for the following 3 modules: Taekwondo 1 (TC003), Taekwondo 2 (TC004) and Taekwondo 3 (TC019). The other Physical Education courses are the same.

4.6 General English 1

- Course number: XH023

- Credit: 04

- Hours: 60 theory hours and 120 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

This course provides students with common English vocabulary for basic communication, focusing on topics such as introduction to personal information, family, residence, and daily life items, sports, free time activities, basic shopping,

eating habits, food, festivals, culture and facilities. In addition to developing the ability to communicate some basic communication situations in English on these topics, the course also aims to develop foreign language skills at level 2 for students according to the 6-level Foreign Language Proficiency Framework applied for Vietnam.

4.7 General English 2

- Course number: XH024

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: XH023

- Parallel course: None

Course description

This course provides students with common English vocabulary for basic communication, focusing on topics such as introduction to travel, fashion, art and the environment. In addition to developing the ability to communicate some basic communication situations in English on these topics, the course also aims to develop foreign language skills at level 2 for students according to the 6-level Foreign Language Proficiency Framework applied for Vietnam.

4.8 General English 3

- course number: XH025

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: XH024

- Parallel course: None

Course description

This course reviews common English words in basic communication, focusing on topics such as introduction to personal information, family, residence, daily life items, technology equipment, sports, free time activities, festivals, basic shopping, learning, etc. In addition to developing the ability to communicate some basic communication situations in English on these topics, the course also aims to develop

foreign language skills at level 3 for students according to the 6-level Foreign Language Proficiency Framework applied for Vietnam.

4.9 Level B1 English 1

- Course number: XH031

- Credit: 04

- Hours: 60 theory hours and 120 self-study hours

- Prerequisite course: XH025 or Equivalent

- Parallel course: None

Course description

This course provides students with English knowledge and the opportunity to practice the skills needed to suit the requirements of international communication competency with common situations. The course presents the following principles and characteristics: (1) towards developing competency-based learning; (2) integrated and blended learning method; (3) promote self-study (promoting learner independence in learning); (4) learning by interaction and by doing; (5) purposeful learning; and (6) flexibility. In addition to developing the ability to communicate and use language, the course also aims to support students to reach level B1 (level 3) in the 6-level Foreign Language Proficiency Framework applied for Vietnam (through VSTEP exam)..

4.10 Level B1 English 2

- Course number: XH032

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: XH031

- Parallel course: None

Course description

This course provides students with English knowledge and the opportunity to practice the skills needed to suit the requirements of international communication competency with common situations. The course gives the following principles and characteristics: (1) towards developing competency-based learning; (2) integrated and

blended learning method; (3) promote self-study (promoting learner independence in learning); (4) learning by interaction and by doing; (5) purposeful learning; and (6) flexibility. In addition to developing the ability to communicate and use language, the course also aims to support students to reach level B1 (level 3) in the 6-level Foreign Language Proficiency Framework applied for Vietnam (through VSTEP exam).

4.11 Level B1 English 3

- Course number: XH033

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: XH032

- Parallel course: None

Course description

This course provides students with English knowledge and the opportunity to practice the skills needed to suit the requirements of international communication competency with common situations. The course provides the following principles and characteristics: towards developing competency-based learning; (2) integrated and blended learning method; (3) promote self-study (promoting learner independence in learning); (4) learning by interaction and by doing; (5) purposeful learning; and (6) flexibility. In addition to developing the ability to communicate and use language, the course also aims to support students to reach level B1 (level 3) in the 6-level Foreign Language Proficiency Framework applied for Vietnam (through VSTEP exam).

4.12 General French 1

- Course number: FL001

- Credit: 04

- Hours: 60 theory hours and 120 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

The course aims to help students to communicate in daily life, such as introducing themselves, family, talking about habits, interests, getting to know and referring someone, talking and writing about hours in the usual and administrative ways, etc. In addition, knowledge of the language and French culture is also incorporated into the course content. Through this course, the students will be familiar with the pronunciation, intonation, alphabet of French, know how to conjugate verbs of group I, group II and some verbs of group III at present, write a simple sentence numbers, etc.

4.13 General French 2

- Course number: FL002

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: FL001

- Parallel course: None

Course description

The course provides students with basic knowledge of grammar, phonetics, vocabulary, etc. of the French language. The course content is aimed at helping students to communicate in daily life, such as asking for information, explaining, accepting invitations or declining, talking about their working days, talking about their future plans, etc.

The students will be familiar with how to make questions with complex French pronouns, know how to conjugate group I, group II verbs and some group III verbs in the imperative form, know directions, locate in the space, etc. In addition, knowledge of French language and culture is also incorporated into the course content.

4.14 General French 3

- Course number: FL003

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: FL002

- Parallel course: None

Course description

The course aims to help students communicate in daily life such as discussing holidays, New Year, food, describing people, objects, clothes, expressing their choices, and quantity, introducing family members, retelling a story of the past, etc. In this course, the students are introduced to texts of 100 words or more, long dialogues, writing paragraphs of about 100 words and writing letters. The students can apply their knowledge of grammar in their writing such as noun matching, adjective conjugation, past tense conjugation, past tense combination, etc. After completing the course, the students will also know how to explain and make simple arguments.

4.15 Intensive French 1

- Course number: FL007

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: FL003

- Parallel course: None

Course description

The course aims to help students communicate in daily life such as introducing family members, getting to know someone, narrating daily activities, describing people and places, and comparing quantity or quality, etc. In addition, knowledge of French language and culture is also incorporated into the course content.

4.16 Intensive French 2

- Course number: FL008

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: FL007

- Parallel course: None

Course description

The course provides students with a rich and diverse range of vocabulary and grammatical structures to help them develop comprehensively four skills (listening, speaking, reading and writing) related to six main topics: eating habits, sports, employment, education, communication and entertainment.

4.17 Intensive French 3

- Course number: FL009

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: FL008

- Parallel course: None

Course description

This course provides students with a rich and diverse range of vocabulary and grammar structures to help students develop comprehensively the four skills (listening, speaking, reading and writing) related to six main topics of expression when speaking, such as talking about memories, traveling, habits, personal motivation, narrating other people's words.

4.18 Basic Informatics

- Course number: TN033

- Credit: 01

- Hours: 15 theory hours and 30 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

This course provides students with a basic theoretical understanding of Informatics technology: the concept of Informatics, the general structure of computers, the Windows operating system, and commands and operations for word processing by Microsoft Word, processing spreadsheets by Microsoft Excel, presenting reports by Microsoft Powerpoint, using Internet and E-mail.

4.19 Basic Informatics Practice

- Course number: TN034

- Credit: 02

- Hours: 30 practice hours and 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

This course helps students to apply the basic Informatics theory which they have learned by practicing on computers, students can practice skills: Using Windows operating system, editing documents using Microsoft Word, processing spreadsheets using Microsoft Excel, presenting reports using Microsoft Powerpoint, using Internet and E-mail. In the practical part, skills in writing scientific reports are also integrated, skills in composing presentations on multimedia projectors.

4.20 Marxist - Leninist Philosophy

- Course number: ML014

- Credit: 03

- Hours: 30 theory hours, 15 group discussion report hours and 90 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

This course provides students with basic and in-depth knowledge of Marxist-Leninist philosophy, including: philosophy and its role in social life; Marxist-Leninist philosophy and its role in social life; dialectical materialism: matter and consciousness, materialistic dialectic and cognitive reasoning; historical materialism: socio-economic morphology, class and nation, state and social revolution, man’s social consciousness and philosophy.

4.21 Marxist - Leninist Political Economics

- Course number: ML016

- Credit: 02

- Hours: 30 theory hours, 60 self-study hours

- Prerequisite course: ML014

- Parallel course: None

Course description

In this course, students are provided with basic and in-depth knowledge of Marxist-Leninist political economy, including: subjects, research methods and functions of Marxist-Leninist Political Economy; goods, the market and the role of actors when participating in the market; surplus values in the market economy; competition and monopoly in the market economy; the socialist-oriented market economy and economic interest relations in Vietnam.

4.22 Scientific Socialism

- Course number: ML018

- Credit: 02

- Hours: 30 theory hours, 60 self-study hours

- Prerequisite course: ML016

- Parallel course: None

Course description

In this course, students will study the common theoretical issues of socialism and practice in the construction of socialism in our country today. The course content mainly focuses on a number of issues such as: the birth and development of scientific socialism; the historic mission of the working class, socialism and the transition to socialism; socialist democracy and a socialist state; alliances of class, class; ethnicity, religion issues; the family problem in the transition to socialism.

4.23 History of The Communist Party of Vietnam

- Course number: ML019

- Credit: 02

- Hours: 30 theory hours, 60 self-study hours

- Prerequisite course: ML018

- Parallel course: None

Course description

The course equips students with the understanding of objects, purposes, tasks, research methods, learning of the Party History course and the basic, core and systematic knowledge about the Party's birth (1920-1930), the Party leadership process in the struggle for power (1930-1945), leading in two resistance wars against the French colonialists and American imperialists, completing national liberation, unification of the country (1945-1975), transitional leadership to socialism and national renewal (1975-2018). Thereby, the course affirms the successes, raises the limitations, summarizes the experiences of the revolutionary leadership of the Party to help learners increase awareness, belief in the Party and the ability to apply knowledge, which has just been learned, into practice work to contribute to building and defending the Socialist Vietnam Fatherland.

4.24 Ho Chi Minh's Thought

- Course number: ML021

- Credit: 02

- Hours: 30 theory hours, 60 self-study hours

- Prerequisite course: ML019 or ML020

- Parallel course: None

Course description

Together with Marxist-Leninist Philosophy, Marxist-Leninist Political Economy, Scientific Socialism, History of the Communist Party of Vietnam, this course creates an understanding of the ideological foundation, the guideline for the Party's actions and our country's revolution. It continues to provide basic knowledge about Marxism-Leninism, contributing to building a new human moral foundation. The course consists of 6 chapters, which present the basic contents of Ho Chi Minh's Thought according to the objectives of the module, providing a systematic understanding of Ho Chi Minh's ideology, morality and values.

4.25 Gerenal Law

- Course number: KL001

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description

This course is designed to teach non-law students. It introduces the basic theoretical issues of the Marxist-Leninist doctrine of the state and the law from the origin, nature, form, function as well as the types of state and the law that have formed, existed and developed through different socio-economic forms in human history. In addition, the course also includes the study of the position of the state in the political system, the composition of the state apparatus, and the systems of state agencies. A large amount of basic knowledge in the common law disciplines of Vietnam is also introduced such as basic rights and obligations of citizens, crimes, violation of administrative laws, regulations of law on marriage, divorce, inheritance, etc.

4.26 Basic Logic

- Course number: ML007

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description

The course provides the knowledge of formal logic. It provides the rules and requirements of the basic laws of thought such as the law of identity, non-contradictory law, the law of dismissing the third thing, the law of full reason. The course also introduces basic forms of thinking such as concepts, judge, deductive, hypothesis, proving, refuting and sophistication.

4.27 Overview of Sociology

- Course number: XH028

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description

The course provides the law, the regularity of formation, movement, changing relationships, interactions between people and society. The module focuses on social relationships, social interactions manifested through human-to-person behaviors in groups, organizations and social systems.

4.28 Vietnamese Culture

- Course number: XH001

- Credit: 02

- Hours: 30 theory hours, 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

The course content is presented in 5 chapters, covering from theory to practice. In Chapter 1, after introducing necessary scientific concepts and terminology (culture, cultural studies, cultural processes, cultural exchange, cultural acculturation, etc.), it presents the types of Vietnamese culture. Chapters 2, 3 and 4 present knowledge about the valuable aspects of culture and their rich and varied manifestations in the material and spiritual life of Vietnamese people. Chapter 5 focuses on discovering characteristics of the national culture and future.

4.29 Vietnamese in Use

- Course number: XH012

- Credit: 02

- Hours: 30 theory hours, 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

The course is designed into 4 chapters. Each chapter consists of two main parts which are interwoven: theory and practice exercises. Chapter 1 focuses on writing and spelling. Chapter 2 focuses on practicing word skills. Chapter 3 teaches students about sentences. Chapter 4 trains students' skills in creating and using texts.

4.30 General Management Documents and Archive

- Course number: XH014

- Credit: 02

- Hours: 30 theory hours, 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

This course provides students with theoretical knowledge and practice skills of management documents and archives. It helps the students to realize the role of administrative documents and archives in management. In addition, this module also helps learners to master the systematic methods of editing and managing various types of administrative documents; know how to select and classify documents for archiving; know how to search, use archives to be able to do a good job of management at schools as well as at agencies in general.

4.31 Transferable Skill

- Course number: KN001

- Credit: 02

- Hours: 20 theory hours, 20 practice hours, and 30 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

The course provides basic knowledge and instructions to train the necessary skills for learners: communication skills, general principles of communication; effective listening, speaking, and presentation skills; team work skills to ensure good cooperation in learning and working; creative thinking skills; time management skills and emotional management skills.

4.32 Innovation and Entrepreneurship

- Course number: KN002

- Credit: 02

- Hours: 25 theory hours, 5 start-up project hours, and 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

The course focuses on the general knowledge of creativity, innovation and conceptualization for entrepreneurship, choosing the type of business ownership, basic understanding of intellectual property rights. In addition, students are also provided with basic knowledge and skills about the market such as assessment of strengths, opportunities, threats, risks of product commercialization from business ideas, discovery of potential businesses and planning for start-up. More importantly, the students have the opportunity to share their startup experiences from successful entrepreneurs and/or visit a successful startup model.

4.33 Advanced Mathematics B

- Course number: TN059

- Credit: 03

- Hours: 45 theory hours, and 90 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

The course introduces basic knowledge of advanced mathematics such as systems of linear equations, functions, limits, continuity, derivatives, integrals of a variable and functions of many variables.

4.34 Probability and Statistics B

- Course number: TN044

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description:

The course consists of 3 chapters. Chapter 1 includes the definition of probability, random variables, and probability distribution; Calculate the characteristic parameters of random variables, such as mean, variance, standard deviation, mode, etc. In this chapter, the learners will be able to analyze the problem and calculate the probability of events of the problem. Therefore, they will have appropriate decisions. Chapter 2 is statistics and parameters estimation. This chapter involves descriptive statistics and point estimation and interval estimation of a random variable, such as mean estimation, proportionality estimation, and variance estimation. Chapter 3 is statistical hypothesis testing. This chapter provides methods for testing problems, such as testing true mean (one-sample test, two samples test, and more), testing of proportion, and testing of variance, etc.

4.35 General Physics

- Course number: TN048

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description:

The general physics course consists of 13 chapters that will provide students with a background and understanding of the kinetics of particles, the types of particle motion. Fundamental laws of particle dynamics, mechanical forces. Conservation laws. Types of Rigid Body motions, the fundamental forces of particles, and rigid bodies. Concepts, theorems, the law of conservation of momentum, conservation of angular momentum, conservation of mechanical energy, and The Huygen's - Steiner theorem about the moment of inertia. Concepts of the continuity equation, the fundamental Equation of ideal fluids in motion, Bernoulli's Equation, Pascal's principles, and internal friction. Types of mechanical vibrations, vibration analysis, synthesis, interference, and diffraction of mechanical waves, Huygens's principle, Doppler effect, et. The kinetic theory of gases, Equation of state for an ideal gas, surface tension, principles of thermodynamics. Electric field, magnetic field, interference, diffraction, et fundamental laws, the characteristic physics quantity in the electric field, magnetism and wave optics, properties of conductors, dielectrics, magnetic materials, and light in the environment. Radioactivity, fission, fusion, and applications. From there, students can understand and explain natural phenomena, the principles of structure, and the operation of essential mechanical, thermal, electrical, and optical equipment. In addition, the course is one of the primary subjects to help students majoring in engineering learn well the essential subjects and majors.

4.36 General Physics Practice

- Course number: TN049

- Credit: 01

- Số tiết học phần: 30 theory hours and 60 self-study hours

- Prerequisite course: None

- Parallel course: TN048

Course description

The practice of general physics course includes six practice exercises. Lesson 1 deals with the use of essential measuring tools to measure some simple objects. Lessons 2-6 have content related to the inspection of the laws of conservation of mechanical energy, the indentify of some physical quantities, and the survey of thermal and optical related artifacts.

4.37 General Biology

- Course number: TN042

- Credit: 02

- Hours: 30 theory hours and 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

Students will learn the general knowledge of biology, including the structure of primitive cells and eukaryotic cells, metabolism process in cells, and the molecular basis of heredity. Students will study the general and advanced knowledge of plant anatomy and taxonomy, plant growth hormones, the structure of organs and organ systems in animals. In addition, students will have an overview of the diversity of animals and plants. During the learning process, students will be able to apply biological knowledge to explain the real-life problems in specialized subjects.

4.38 General Biology Practice

- Course number: TN043

- Credit: 01

- Hours: 30 practice hours

- Prerequisite course: None

- Parallel course: TN042

Course description

In this course, students will learn an overview of the principles of construction and use of microscopes and stereoscopes. Students will learn how to make temparory slides to observe plants tissues, animals and protozoan cells. Students will recognize organelles in plant and animal cells. They will learn how to survey and identify the organs and organ systems in the vertebrate body. Students will observe representatives of phyla in the plant kingdom to learn the diversity and evolution in vegetative and reproductive organs of plants, as well as they will observe representatives from lower to higher level of invertebrates to learn diversity and evolution of invertebrates.

4.39 Safety and Laboratory Management

- Course number: TN427

- Credit: 02

- Hours:30 theory hours và 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description:

The course aims to provide basic knowledge of safety techniques in laboratory, institutes, universities, and industries in our country. Concept of course focuses on the rules in laboratory, first aid when accidents happen, fire extinguishers in laboratory. Besides, how to work safely with glassware, electrical equipment, heated equipment, organic solvents, alkali metals, organometallic compounds, mercury, acids, and alkalis are also introduced. Thence, the implementation of safety solutions are launched in laboratory. Moreover, the course also mentions how to manage the laboratory according to Vietnamese and international standards.

4.40 General Chemistry I

- Course number: TN101

- Credit: 02

- Hours:30 theory hours và 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

To provide the student with a general introduction to chemistry as it applies to the subjects that will be mentioned in the course description and a basic foundation of problem solving skills. To achieve the goals above, students will be introduced to the following concepts:

- Introduction to atomic structure and the periodic table: how to name ionic compound, molecular compound and introduction to the periodic table.

- Chemical bonding and Molecular geometry: Valence shell electron pair repulsion (VSEPR) theory; Valence Bond theory (VB theory); using VSEPR and VB theory to predict the geometric shapes of molecules, and MO (Molecular Orbital).

4.41 General Chemistry 2

- Course number: TN102

- Credit: 03

- Hours:45 theory hours và 90 self-study hours

- Prerequisite course: TN101

- Parallel course: None

Course description

Chemical thermodynamics: calculating the change in enthalpy, entropy, and free energy of a reaction; predicting spontaneous change.

- Chemical kinetics: expressing rate in terms of reactant and product concentrations. reaction order terminology; integrated rate laws for first and second order reactions; determining the reaction order from the integrated rate law; reaction half-life; determining reaction orders experimentally; the effect of temperature on reaction rate-Arrhenius equation.

- Solution and colligative properties: colligative properties of nonvolatile nonelectrolyte solutions; using colligative properties to find solute molar mass.

- Chemical equilibrium: using quantities to determine the equilibrium constant, using the equilibrium constant to determine quantities, the relation between K_C and K_P; the equilibrium state: Le Châtelier's Principle.

- Solubility equilibrium: The ion-product expression (Q_{sp}) and the solubility-product constant (K_{sp}); calculations involving the solubility-product constant, the effect of a common ion on solubility and predicting the formation of a precipitate.

- Acid-Base equilibrium: calculating the pH of strong acid, base; weak acid, base; the pH of salt; the pH of buffer solution, the common-ion effect, the Henderson-Hasselbalch equation.

- Electrochemistry: construction and operation of a voltaic; cell notation for a voltaic cell; standard cell potentials; standard cell potential and the quilibrium constant; the effect of concentration on cell potential-Nernst equation.

4.42 General Chemistry Practice 2

- Course number: TN103

- Credit: 01

- Hours: 30 practice hours và 30 self-study hours

- Prerequisite course: TN102

- Parallel course: None

Course description

- The experiments should illustrate the concepts learned in the classroom;

- The experiments should be clearly and concisely written so that students will easily understand the task at hand, will work with minimal supervision because the manual provides enough information on experimental procedures, and will be able to perform the experiments in three hours laboratory period;

- In each of experiment, an effort has been made to use environmentally less toxic or non–toxic materials. This was not only done to protect students but also to reduce the impact upon the environment;

- No specialized equipment is required.

They are solubility product constant, K_{sp}; acid–base titration; heat of reaction; using freezing–point depression to find molecular weight; reaction rate of sodium thiosulfate and hydrochloric acid; redox reaction and electrochemistry.

4.43 Inorganic Chemistry 1

- Course number: TN236

- Credit: 03

- Hours: 30 theory hours, 15 exercises hours and 90 self-study hours

- Prerequisite course: TN101, TN102

- Parallel course: None

Course description:

The course is designed to illustrate that inorganic chemistry is not only a science of elements and their compounds but also closely related to physical principles and will provide an overview of fundamental topics in inorganic chemistry. Topics covered include chemical bonding, molecular structures, redox and acid - base reactions. The chemistry of nonmetal elements will also be investigated in some details. The concepts developed in this module provide the requisite knowledge and skills for upcoming courses such as inorganic and analytical chemistry.

4.44 Inorganic Chemistry Practice 1

- Course number: TN173

- Credit: 01

- Hours: 30 practice hours and 30 self-study hours

- Prerequisite: None

- Parallel course: TN236

Course description:

The course is designed to provide basic knowledge of Inorganic Chemistry 1 in the form of chemistry experiments. These experiments are related to Hydrogen - Hydroperoxide; Group IA, IIA Elements; Group IIIA, IVA Elements; Group VA Elements; Group VIA, VIIA Elements; and Synthesis of Octophosphoric Acid.

4.45 Inorganic Chemistry 2

- Course number: TN247

- Credit: 03

- Hours: 30 theory hours, 15 exercises hours and 90 self-study hours

- Prerequisite course: TN236

- Parallel course: None

Course description:

This course will provide students with fundamental knowledge about transition elements, focusing on the crystal structure of metals, chemical bonds, energy and electronic properties of coordination compounds. Other important aspects including properties and medical applications of transition metal complexes will also be covered.

The concepts developed in this subject provide students a foundation for dealing with structural aspects of advanced materials as well as the bio-inorganic chemistry of metalloproteins and biominerals.

4.46 Inorganic Chemistry Practice 2

- Course number: TN107

- Credit: 01

- Hours: 30 practice hours and 30 self-study hours

- Prerequisite course: None

- Parallel course: TN247

Course description:

The course is designed to provide basic knowledge of Inorganic Chemistry 2 in the form of chemistry experiments. The experiment lessons consist of Copper Reactions; Coordination Compounds; Iron - Chromium; Cobalt - Nickel - Copper; Preparation and Properties of Potassium tris(oxalato)ferrate(III); Preparation of tetraamminecopper(II) sulfate.

4.47 Organic chemistry 1

- Course number: TN111

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: TN101, TN102

- Parallel course: None

Course description:

This course contents fundamental topics in organic chemistry which include properties and foundation of organic reactions, types of organic reactions and their mechanisms; Energy effect, electronic effect, and stereoisomer in organic chemistry; Structure–property relationship of organic compounds; Acid–base definition; Nucleophilic substitution reaction and elimination reaction of alkyl halides; and chemistry of hydrocarbons such as alkanes, alkenes, alkadienes, alkynes, and arenes.

4.48 Organic chemistry Practice 1

- Course number: TN112

- Credit: 01

- Hours: 30 practice hours and 30 self-study hours

- Prerequisite course:

- Parallel course: TN111

Course description:

Provides knowledge of quantitative organic functions, methods of determining physical constants, steam attraction distillation, solid-liquid extraction method and liquid-liquid extraction method, recrystallization, performing column chromatography.

4.49 Organic chemistry 2

- Course number: TN249

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: TN111

- Parallel course: None

Course description:

The organic chemistry 2 provides students basic knowledge about structure, property, synthesis, and applications of organic molecules bearing common heteroatom-containing functional groups such as alcohol, phenol, ether, thiol, and sulfide; aldehyde and ketone; amine, and carboxylic acid and its derivatives. Heterocycles are also briefly introduced.

4.50 Organic chemistry Practice 2

- Course number: TN178

- Credit: 01

- Hours: 30 practice hours and 30 self-study hours

- Prerequisite course: None

- Parallel course: TN249

Course description:

Equip learners with basic organic synthesis knowledge: Esterification reactions: from alcohol, from phenol; primary acylation of amines reaction; aldolization reaction; diazotization and diazonium fusion reactio; self-oxidationreaction.

4.51 Thermochemistry 1

- Course number: TN108

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

This course is going to provide learners the knowledge about basic concepts of system, function of state, heat, work, etc. Moreover, the contents of the first law of thermodynamics and its application to chemical processes, as well as the second law of thermodynamics and the combination of these two laws are presented. Equations of states and conditions for process direction and limitation are the important parts of this course. Phase equilibrium for pure components and types of solution such as dilute, ideal, real solution, and chemical equilibrium can not be ignored in this course. The last but essential part of the course is colloidal systems.

4.52 Physical Chemistry 2

- Course number: TN109

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: TN108

- Parallel course: None

Course description

Students will be introduced to the following concepts: Basic concepts of kinetics (reaction rate, reaction order, rate law, reaction mechanism); Integrated rate law (Zero–order reaction, first–order reaction, second–order reaction; chain reaction, photochemical reaction); Kinetics of some complex reactions (Parallel reaction, reversible reaction and consecutive reaction); The effect of temperature on reaction rate (Arrhenius equation); Electrode potential and galvanic cell (Nernst equation) and Electrical conduction in solution (Debye–Huckel Onsager equation, Debye–Huckel limiting, Khlrausch law)

4.53 Physical Chemistry Practice

- Course number: TN110

- Credit: 02

- Hours: 60 practice hours

- Prerequisite course: TN109

- Parallel course: None

Course description

- Physical chemistry lab consists of 12 experiments that cover thermodynamics (Thermodynamics of the Dissolution of Borax, Colligative Properties of Solutions, Determination of an Equilibrium Constant, Investigation of the Ternary Phase Diagram), chemical kinetics (Determination of the Order of Reaction between Fe^{3+} and I^{-}, Kinetics of the Decomposition of Hydrogen Peroxide, Determination of the Activation Energy of the Hydrolysis, Rate of the Inversion of Sucrose), electrochemistry (The Effect of Temperature and Concentration on EMF, Conductivity of Electrolyte Solutions) and colloid chemistry (Determination of the Adsorption Isotherm of Acetic Acid, Determination of a coagulation threshold).

- An objective for performing an experiment at the beginning of each experiment.

- Background section that contains all the information necessary to understand the experiment. All the relevant principles and their applications are reviewed in this section.

- The detailed list of reagents and instrumentation and glassware needed for a group of 2–3 students also involve in each experiment.

- Experimental procedure provides a step–by–step description of the experiment.

- In the report we not only ask for the recording of raw data, but we also require some calculations to yield secondary data.

4.54 Analytical Chemistry 1

- Course number: TN115

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: TN101, TN102

- Parallel course: None

Course description

This course provides basic knowledge, general principles of analytical chemistry, and calculating ionic balance in solutions such as acid-base balance, redox-redox balance, insoluble matter balance, complexation balance, distributional balance. Furthermore, quantitative analysis theory presents the basis of quantitative analysis methods such as volumetric and mass analysis methods. In addition, it also shows the statistical processing of experimental data, methods of collecting and processing samples.

4.55 Analytical Chemistry Practice 1

- Course number: TN112

- Credit: 01

- Hours: 30 practice hours and 30 self-study hours

- Prerequisite course : TN101, TN102, TN115

- Parallel course: None

Course description

The course helps students to become familiar with the operations and standard methods of chemical analysis such as mass analysis, volumetric analysis, and how to use laboratory instruments and equipment proficiently.

4.56 Analytical Chemistry 2

- Course number: TN117

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: TN101, TN102

- Parallel course: None

Course description

The subject provides basic knowledge about the Absorption of molecules in the UV-VIS region, the fundamental laws of light absorption, the conditions for applying the law, and the scope of analysis. Electrochemical processes, standard electrochemical analysis methods: potentiometric method, electrolytic method, inductive method, polarographic method. Simple extraction methods for the identification and quantification of substances.

4.57 Analytical Chemistry Practice 2

- Course number: TN182

- Credit: 01

- Hours: 30 practice hours and 30 self-study hours

- Prerequisite course: TN101, TN102, TN117

- Parallel course: None

Course description

The subject helps students familiarize themselves with the operations and common methods of chemical analysis using supporting equipment such as UV-Vis spectrometer, pH meter, conductivity meter, meter. Electrolysis, plates, chromatographic columns. Help students know how to use tools and equipment in the laboratory proficiently.

4.58 Quantum Chemistry

- Course number: TN436

- Credit: 03

- Hour: 45 theory hours + 15 exercises hours and 90 self-study hours.

- Prerequisite course: TN101

- Parallel course: None

Course description

The course is designed to provide students with the principles, results and basic applications of quantum mechanics in chemistry. Theoretical models will be introduced at different stages to show that even abstract ideas are closely related to practice problems. At the end of the course, students will have solid and complete understanding of chemical bonding, spectroscopy, molecular activity, and many other aspects of chemistry. The concepts developed in this subject provide students with a solid foundation for dealing with issues related to molecular simulation, NMR, IR spectroscopy, modern inorganic and organic chemistry.

4.59 English for Chemistry Students

- Course number: TN163

- Credit: 02

- Hours: 30 theory hours and 60 self-study hours

- Prerequisite course: Students have to finish a modul of basic English courses

- Parallel course: None

Course description:

This course is an English review based on specifically chemical lectures and articles for the third year students in Chemistry. Many topics of chemistry are covered, including general chemistry, inorganic chemistry, organic chemistry, and applied chemistry which were studied in Vietnamese by students in the first and second years. This course focuses the student's attention on which problems they can actually use such as listening, speaking, reading and writing about popular topics in chemistry.

4.60 French for science and technology

- Course number: XH019

- Credit: 02

- Hours: 30 theory hours and 60 practice hours

- Prerequisite course: XH006

- Parallel course: None

Course description:

French for science and technology (XH019) aims to help students to communicate in French about science and technology topics such as introducing yourself (age, job, levels of education…), science and technique activities, presenting science and technology projects, writing and exchanging professional emails with science and technology vocabulary… Moreover, the grammatical and cultural knowledge in French is also introduced during studying process.

4.61 Biochemistry

- Course number: TN235

- Credits: 03

- Hours: 45 theory hours and và 90 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description:

Biochemistry is the science that studies life at the molecular level, which is closely related to other sciences such as zoology, botany, physiology, cytology, etc. When it comes to the major of modern biology, we must first talk about biochemistry which is a basic subject that helps clarify related issues, such as species identification by biochemical tests, as well as improve crop and livestock productivity by interfering with metabolic processes. Understanding the metabolic processes in the body contributes to the cause and prevention of diseases. Thus, biochemistry can be said to be the basic foundation for understanding other scientific fields of biology, agriculture and medicine. In general, the course content consists of 2 main components as follows: (1) The molecular structure of organisms, and creating biological catalysts involved in the process of metabolism *in vivo*. (2) Metabolic processes and energy metabolism in the organism. The relationship between metabolic processes in the organism.

4.62 Biochemistry Practice

- Course number: TN364

- Credits: 01

- Hours: 30 practice hours

- Prerequisite course: None

- Parallel course: TN235

Course description:

The course includes practice of extraction of biomolecules such as carbohydrates, lipids and proteins from the organism (liver, eggs, rice germs). As well as determining the properties or quantification of these molecules by chemical reactions. In addition, the course also includes practice on *in vitro* biochemical reactions (such as enzyme-catalyzed reactions and redox reactions).

4.63 Environmental Chemistry

- Course number: TN437

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: None

- Parallel course: TN117

Course description:

Environmental Chemistry provides learners with basic knowledge in environmental chemistry research. The course introduces specialized terms, parameters to assess the quality of water, gas, and soil environment and these parameters' qualitative and quantitative determination. The course also clearly explains the basis of reactions, transport, effects, and the existence of chemical substances in the air, water, and living organisms and studies the effects of these activities of human influence on these processes and measures to overcome these effects.

4.64 Environmental Chemistry Practice

- Course number: TN312

- Credit: 01

- Hours: 30 practice hours

- Prerequisite course: None

- Parallel course: TN437

Course description:

Environmental Chemistry Practice provides learners with the following knowledge: Reaction mechanism, influencing factors, and how to conduct quantification of basic parameters to assess environmental quality such as dissolved oxygen content soluble in surface water; chemical oxygen demand, concentrations of pollutants N-NH_3, total phosphate in domestic wastewater; total iron content in well water and NO_2 content in the air. In addition, this course also provides how to set up calculation formulas, process results, and evaluate results according to Vietnamese Standards and Regulations on the environment.

4.65 Technical Analysis Chemistry

- Course number: TN438

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: None

- Parallel course: TN117

Course description:

The Chemical-Technical Analysis provides learners with documents on how to organize and test a standard laboratory, the criteria for evaluating and validating an analytical method according to Vietnamese and ISO Standards. This course also provides students with knowledge about how to collect and handle complex inorganic and organic sample matrices, macro and trace samples, and the principles and methods of conducting sample analysis such as foods, foodstuffs, synthetic detergents, metals, alloys, fertilizers, plant protection chemicals.

4.66 Technical Analysis Chemistry Practice

- Course number: TN322

- Credit: 01

- Hours: 30 practice hours

- Prerequisite course: None

- Parallel course: TN438

Course description:

Chemical-Technical Analysis Practice provides learners with the following knowledge: reaction mechanisms, influencing factors and conducting quality control tests for food products, fertilizers, and cleaning products synthesis such as CO_2 content, acid, total sugar in freshwater; content of salt, total nitrogen, nitrogen formol, nitrogen ammonia in samples of soy sauce, fish sauce, soy sauce, porridge...; content of surfactants, NaCl, Na_2SO_4, foam, foam column stability, pH in synthetic cleaning products such as washing powder, shampoo, dishwashing liquid, …; K_2O, P_2O_5 content effective in synthetic fertilizers. In addition, this course also trains students' skills: how to set up calculation formulas, process results, and evaluate results according to Vietnamese Standards and international standards in advanced countries such as ISO, FAO, AOAC.

4.67 Modern Analytical Chemistry

- Course number: TN308

- Credit: 03

- Hours: 45 hours (theory + exercises) and 90 self-study hours

- Prerequisite course: TN117

- Parallel course: None

Course description:

Modern Analytical Methods provides basic knowledge and theoretical basis for students about modern types of chromatography; Chromatographic devices include gas chromatography, high-performance liquid chromatography and their applications in analysis, inspection, quality assessment of environment, food and pharmaceutical products, pharmaceuticals. At the same time, this module also provides students with basic knowledge, the basic theory of analytical methods based on absorption or emission of molecules, atoms, principles for sample preparation, sample atomization,

methods of excited atomic emission spectroscopy, devices for measuring nuclear spectra, and methods of determining the qualitative and quantitative composition of objects.

4.68 Modern Analytical Chemistry Practice

- Course number: TN309

- Credit: 01

- Hours: 30 practice hours

- Prerequisite course: None

- Parallel course: TN308

Course description:

Provide students with an understanding of the nature of sample processing procedures; how to use classical and modern machinery and equipment; Influential factors and how to conduct quality control testing of food and pharmaceutical products with modern analytical methods using machines such as AAS atomic absorption spectroscopy, GC gas chromatography HPLC high-pressure liquid chromatography.

Students know how to set up calculation formulas, process results and evaluate results according to Vietnam Standards, Vietnam Pharmacopoeia and international standards, and other advanced countries such as ISO, FAO, AOAC, BP, USP…

4.69 Spectrosccopic methods in organic chemistry - B

- Course number: TN361

- Credit: 02

- Hours: 30 theory hours and 60 self-study hours

- Prerequisite course: TN249

- Parallel course: None

Course description:

This course introduces to characteristic and active mechanisms of modern optical instruments and guides to the interpretation of the ultraviolet, infrared, nuclear magnetic resonance and mass spectra to structural analysis and elucidating of organic

compounds. This course also describes how an assembly of spectroscopic experiments can lead to the deduction of precise chemical structures.

4.70 Food, Foodstuff and Medicine Testing

- Course number: TN439

- Credit: 03

- Hours: 45 theory hours and 90 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description:

Food and Pharmaceutical Analysis provides students with knowledge of the quality control and management system of dietary supplements, cosmetics, and pharmaceutical products in Vietnam. Introduction of standard documents and procedures for building quality control procedures for functional food, pharmaceutical, and cosmetic products such as AOAC, BP, USP, JP, ISO, WHO, TCVN, Vietnam Pharmacopoeia, Chinese Pharmacopoeia, Indian Pharmacopoeia... At the same time, this course also provides methods for processing experimental results according to statistical standards. The lecture also introduces specific analytical procedures for functional food, pharmaceutical and cosmetic products such as vitamin and mineral supplements to support diabetes and heart disease, pulses…, all kinds of pills, capsules, powdered medicine, nuggets, injections…., cosmetics such as shampoo, perfume, cream makeup.

4.71 Non-destroyed Analysis

- Course number: TN292

- Credit: 02

- Hours: 30 theory hours and 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description:

This course was aimed to teach student the physical principles and techniques of some advanced measuring methods. They are optical microscope, transmission electron and scanning electron microscopes, scanning probe for surfaces analysis; x ray diffraction method to analyze crystal structures and phases changes, thermal properties analysis, magnetic analysis and x ray fluorescent. This help students to understand analyze their experimental results and others research.

After the course, students will have an overall looking of how to characterize some physical properties of materials from the physical measuring data. And that help them in their research. The course supplies the physical and some technique information of some physical measuring devices, therefore, students can decide which method is suitable for using in their research. For example they can analyze particle size and shape and their arrangements, crystals structure, surfaces properties, thermal properties, chemical component and their arrangement on surface of samples. That helps them to analyze their experimental results and their selection for suitable measuring method in their research.

4.72 Chemical Analysis of Residue In Food

- Course number: TN245

- Credit: 02

- Hours: 20 theory hours and 10 hours of case study

- Prerequisite course: None

- Parallel course: None

Course description:

The course provides knowledge on (i) chemical, physical and microbial residue hazards in food processing; (ii) regulations on chemical use in food production; (iii) Origin and residue of contaminant chemicals as pesticides, PAH and heavy metal (iv) selected methods for chemical residue analysis; (v) validation for analytical methods of antibiotic and pesticides residue following EU regulations; Teaching methods include theory, case study and discussions for solving problems.

4.73 Field Works

- Course number: TN319

- Credit: 01

- Hours: 30 theory hours (6 tours)

- Prerequisite: None

- Parallel course: None

Course description:

The course will offer a chance for students to visit the factories, then students can well-understand and approach to the production and testing processes of chemicals, foods, and pharmaceuticals, …

4.74 Method of Scientific Research and Statistics in Chemistry

- Course number: TN468

- Credit: 03

- Hours: 30 theory hours and 30 practice hours

- Prerequisite course: None

- Parallel course: None

Course description:

This course helps students with knowledge about: Determining the purpose and objectives of a scientific research project; Knowing how to apply scientific research forms to the research process; Searching for references and assessing the reliability of references; How to present scientific research works; Statistical methods in chemistry to objectively evaluate experimental results, provide directions to improve the correctness and accuracy of quality measurements in chemical laboratories.

4.75 Natural Compound Chemistry

- Course number: TN452

- Credit: 03

- Hours: 40 theory hours and 5 exercise hours

- Prerequisite: None

- Parallel course: None

Course description:

The course presents knowledge of intergrated judgment of natural substances. Natural origin, overview of some typical biosynthesis, extraction and isolation of the secondary metabolism compounds as terpenoids, steroids, alkaloids, flavonoids, cerebrosides, glycosides, tannins… The basic physicochemical properties, chemical structure, biological acivity and classification of each group of substances.

4.76 Natural Compound Chemistry Practice

- Course number: TN379

- Credit: 01

- Hours: 40 practice hours

- Prerequisite: None

- Parallel course: TN452

Course description:

Practical guide to essential oil extraction, how to extract of carotenoid, alkaloid, flavonoid and glycoside from plants, perform carotenoid column chromatography and and perform thin-layer chromatography

4.77 Organic synthesis

- Course number: TN327

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description:

The course covers principals, reaction types, reagents and mechanism for preparation of organic molecules with applications in health and material sciences. Details: Retrosynthesis, protecting groups, condensation reactions with carbonyl compounds, transformation of functional groups, … of organic compounds.

This course also focuses on general methods and strategies for the synthesis of organic molecules and determine structures of synthesized compounds.

Knowledge about impacts of organic chemistry with society and environment.

4.78 Techniques for Isolation Natural Compounds

- Course number: TN395

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: TN317

- Parallel course: None

Course description:

This course presents the basic knowledge of organic compounds extraction methods and the means to improve the efficiency of manual extraction methods. Teaching methods of extraction and quick indentification of organic functional group to isolate natural compounds from raw materials; basic introductions for the operation of several semi-automatic and automatic analyser.

4.79 Chemistry of Plant Growth Regulators and Plant Protection

- Course number: CN247

- Credit: 02

- Hours:30 theory hours

- Prerequisite course: TN019, TN121

- Parallel course: None

Course description

This course helps students to understand the history of research and development processes of plant growth regulators and pesticides also achievements in many fields of practical applications. The subject expresses basic knowledge about chemical structures, biological roles, mechanism of actions and the relationships between plant growth regulators and pesticides with other substances in plant life processes. This course also expresses chemical research methods on plant growth regulators and pesticides to help students do their own research in the future. Based on

the roles and biological effects of substances, principles of chemical applications and production standards, which products can be manufactured to fix the practical requirements.

4.80 Fundamentals of Materials Science and Engineering

- Course number: KC120
- Credit: 03
- Hours: 45 theory hours
- Prerequisite course: None
- Parallel course: None

Course description

This course will help students have basic knowledge such as structure of materials, types of defects, phase transitions in materials. Introduction to materials (e.g. metals, ceramics, polymer-composites, biological materials, semiconductor materials, nanomaterials,...), know some of the properties of materials: mechanical, thermal, electromagnetic, optical, etc. properties and applications of materials.

4.81 Nanomaterials of Science and Technology

- Course number: KC289
- Credit: 03
- Hours: 40 theory hours, 15 practice/experiment/exercise hours
- Prerequisite course: None
- Parallel course: None

Course description

This course introduces students to the basic science and technology knowledge of manufacturing materials, functional structures and components in nanostructures. Current applications and future trends of nanotechnology. Briefly introduce the structures, properties and applications of some nanomaterials. Presentation of nanotechnology in electronics and biomedicine.

4.82 Nanomaterials of Science and Technology Practice

- Course number: TN473
- Credit: 01
- Hours:30 practice hours
- Prerequisite course: None
- Parallel course: None

Course description

Môn After following the course, the student will have a fundamental knowledge of nanomaterials. The student can understand basic properties, mechanism of nanostructured materials, and its application in real life

4.83 Physical Chemistry of Polymer

- Course number: CN199
- Credit: 03
- Hours: 30 theory hours and 30 practice hours
- Prerequisite course: TN121
- Parallel course: None

Course description

This course introduces one of the important specialized in the field of Chemistry. Students get knowledge from basics of polymers (concepts, general properties of physico-chemical) to applications of polymers in industry.

4.84 Wastewater Treatment Technology

- Course number: MT338
- Credit: 03
- Hours: 45 theory hours
- Prerequisite course: None
- Parallel course: None

Course description:

This course provides a basic understanding of the principles of wastewater treatment processes. Students are guided in detail on the structure, operating principles of the stages in the process, wastewater treatment, and application of knowledge to operate the processes.

4.85 Wastewater Treatment Technology Practice

- Course number: MT339
- Credit: 01
- Hours: 30 practice hours
- Prerequisite course: None

- Parallel course: None

Course description:

The course provides practical instructions for treating water and wastewater on equipment and simulation models. It focuses on the principles of the method learned from the theory, thereby analyzing, commenting and evaluating the effectiveness of the method. Simultaneously instructing skills on sample analysis for water quality assessment and treatment model operation. The practical contents of water treatment include: sedimentation, filtration and flocculation methods. The practical contents of wastewater treatment include: assisted flocculation (polymer), oxidation (ozone, fenton), flotation (pressure), activated sludge (SBR, USBF).

4.86 Environmental Toxicology

- Course number: TN339

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description:

Toxicology can be defined as a branch of science dealing with transport and fate of toxicants in the environment. In this course, definitions about toxicology as well as poison or toxicant are clarified. In addition, the interaction between toxicants and living organisms, a cascade of events starting with exposure, proceeding through distribution and metabolism, and ending with interaction with cellular macromolecules such as DNA or protein and the expression of a toxic end point, is also elucidated.

4.87 Environmental Impact Assessment

- Course number: MT342

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description:

Humans and the environment are always mutually interacting. This process is always accompanied by the use of land, wood, water, air, fossil fuels, resources of all kinds. The process also discharges wastes (solid, liquid, and gas) into the environments. Therefore, it is essential to evaluate the impact of waste discharges on the environments. The environmental impact assessment is an indispensable step in the approval procedures for development projects and management of production facilities before, during and after operation. This course guides students to identify, analyze, evaluate and predict the environmental impacts of a project, and propose appropriate solutions to protect the environment when the project is implemented.

4.88 Undergraduate Thesis - Chemistry

- Course number: TN338

- Credit: 10

- Hours: 150 practice hours

- Prerequisite course: Students must pass at least 120 qualified credits

- Parallel course: None

Course description:

This course will help students to well-study the specialized knowledge of Chemistry through reading and looking for the publications as well as performing the experiments in the fields of Inorganic Chemistry, Analytical Chemistry, Physical Chemistry, Organic Chemistry, and Chemistry of Materials, ... Some specific research fields related to this module include:

- Synthesis of pharmaceuticals: Study and synthesis of bio-active molecules, molecules used as drugs, investigation and preparation of medicinal herbs, etc.

- Analytical Chemistry: Apply for the analysis of foods, environments, antibiotics, toxins, and pesticides, pharmaceutical testing, evaluation and development of analytical procedures, etc.

- Inorganic and Physical Chemistry: Synthesis of inorganic materials, evaluation and determination the structural characteristics of materials and their practical applications.

- Organic Chemistry: Synthesis of biodiesels, bio-active molecules, extraction and evaluation of bio-activities as well as the structural determination of organic compounds, etc.

- Small Sized-Materials: Synthesis of nanomaterials, polymers, ... and their practical applications.

4.89 Undergraduate Essay - Chemistry

- Course number: TN246

- Credit: 04

- Hours: 60 practice hours

- Prerequisite course: Students must pass at least 120 qualified credits

- Parallel course: None

Course description:

This module will help students to well-study the specialized knowledge of Chemistry through reading and looking for the publications as well as performing the experiments in the fields of Inorganic Chemistry, Analytical Chemistry, Physical Chemistry, Organic Chemistry, and Chemistry of Materials, ... Some specific research fields related to this course include:

- Synthesis of pharmaceuticals: Study and synthesis of bio-active molecules, molecules used as drugs, investigation and preparation of medicinal herbs, etc.

- Analytical Chemistry: Apply for the analysis of foods, environments, antibiotics, toxins, and pesticides, pharmaceutical testing, evaluation and development of analytical procedures, etc.

- Inorganic and Physical Chemistry: Synthesis of inorganic materials, evaluation and determination the structural characteristics of materials and their practical applications.

- Organic Chemistry: Synthesis of biodiesels, bio-active molecules, extraction and evaluation of bio-activities as well as the structural determination of organic compounds, etc.

- Small Sized-Materials: Synthesis of nanomaterials, polymers, ... and their practical applications.

4.90 *Asymmetric Synthesis*

- Course number: TN387

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description:

The course describes the recent practical methods for the synthesis of enantiomerically pure organic compounds with a special emphasis on the design of economically feasible chiral processes in chemical and pharmaceutical industries. The course is designed to provide the students an appreciation of the importance of chirality in the context of biological/physiological activity for the approval of chiral drugs.

This course also focuses on general methods and strategies for the synthesis of complex organic molecules. Emphasis is on strategies for stereoselective synthesis, including stereocontrolled synthesis of desired compounds.

Knowledge about impacts of asymmetric synthesis with society and environment.

4.91 Medicinal Chemistry

- Course number: TN367

- Credit: 03

- Hours: 40 theory hours, 5 homework/coursework hours

- Prerequisite course: TN176, TN177

- Parallel course: None

Course description:

Medicinal chemistry provides students an introduction to the field of science including A historical overview; Definition of drug and drug-target interactions; Drug design based on SAR and QSAR; Drugs: structure and function; Some examples of antibiotics, vitamin and mineral, and antiseptic.

4.92 Chemical Reaction Engineering

- Course number: CN231

- Credit: 03

- Hours: 35 theory hours, 20 practice hours

- Prerequisite course: TN109

- Parallel course: None

Course description:

To introduce and develop an understanding of reaction rate kinetics of chemical systems and apply this understanding to design of a typical chemical reactor. This course covers theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, non-isothermal reactors, and bioreactors.

4.93 *Applied Chemistry*

- Course number: TN300

- Credit: 02 credits

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description:

This course focuses on application of chemistry from laboratory to daily living, the relationship and covers a variety of chemical fields, working on various materials including courses of chemistry such as: inorganic, organic, analytical, physical chemistry, cosmetics, agricultural chemistry, doing basic researches and their applications. Introduction of how to formulation in cosmetics (shampoo, toilette, perfume, soap, detergent, ...), pharmaceutics (drugs, biomaterials, …), agriculture (fertilizer, pesticide, …), industry (paint, adhesive, cement, polymer, ...).

4.94 Green Chemistry

- Course number: KC310

- Credit: 02

- Hours: 15 theory hours, 30 practice hours

- Prerequisite course: TN111, TN109

- Parallel course: None

Course description:

The course introduces some key issues on green chemistry, including: (1) Chemical reactions are performed with photocatalysts or recyclable and reusable catalysts (green catalysis); (2) Chemical reactions are carried out in green solvents, such as water, ionic liquids, supercritical fluids; (3) Chemical reaction carried out in the micro reactor; (4) Chemical reaction are conducted with green energy (microwaves and ultrasound).

4.95 Inorganic Synthesis

- Course number: TN362

- Credit: 02

- Hours: 30 theory and exercise hours, 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description:

The course provides students an understanding of the following topics: Technology for the production of nitrogen, hydrogen and oxygen; Ammonia synthesis technology; Nitric acid production technology; Soda production technology; Sulfuric acid production technology; Phosphorus and phosphoric acid production technology; Fertilizer production technology; Salt extraction and refining technology; Electrochemical technology; Cast iron and steel production technology; Production technology of some silicate materials and adhesive materials.

4.96 Research on Complex Compounds by Spectrometric Method

- Course number: TN326

- Credit: 02

- Hours: 16 theory hours and 14 hours for presentation

- Prerequisite course: TN101, TN102

- Parallel course: None

Course description:

This course will help students to apply the photometric method for the study of complexations and development of a complex analytical procedure.

4.97 Applied Informatic Technology in Chemistry

- Course number: TN313

- Credit: 02

- Hours:15 theory hours, 30 tutorial hours, 60 self-study hours

- Prerequisite course: TN033, TN034

- parallel course: None

Course description:

This course aims to provide students skills in designing and formatting scientific reports; advanced search to find specialty chemical knowledge; necessary experience to use basic chemical softwares in solving chemical problems such as creating chemical reactions, 2-D and 3-D approximate chemical formula.

4.98 Hazardous Waste Management

- Course number: MT331

- Credit: 02

- Hours:30 theory hours

- Prerequisite course: TN019, MT124

- parallel course: None

Course description:

The course consists of 30 theoretical periods to provide students of Environmental Engineering with knowledge about hazardous waste management systems and methods. This knowledge includes the origin and composition of hazardous waste, the nature of hazardous waste and their harmful effects on the environment and human health; the system of collection, and storage, transshipment and transportation of hazardous waste; hazardous waste management methods.

4.99 Environmental Quality Management

- Course number: MT309

- Credit: 02

- Hours:30 theory hours and 60 self-study hours

- Prerequisite course: None

- parallel course: None

Course description:

The subject of environmental quality management is a new subject, stemming from the need to innovate teaching methods of environmental majors of many universities around the world. According to the new trend, it is necessary to equip learners with environmental management methodologies, methods and tools instead of just equipping them with knowledge. The subject helps students understand and apply the concepts of environmental quality management, environmental quality management tools towards sustainable development. From there, benefits in environmental quality management into working practice in professions in engineering systems, ecosystems, production and urban management systems have been identified.

4.100 Applied Environmental Ecology

- Course number: **MT301**

- Credit: 02

- Hours: 15 theory hours and 15 practice hours

- Prerequisite course: None

- Parallel course: None

Course description

Applied environmental ecology is a subject in the basic knowledge majors, including basic definitions of the corresponding ecological types affected by the exploitation and use of natural resources. Specifically, activities of mining oil have affected the marine ecosystems; changes in ecological processes caused by salinization, aluminum; soil and water environments in agricultural production have been polluted by using of agro-chemical; natural ecosystems are replaced by urban ecosystems... The course supports students in environmental and relevant majors with knowledge and environmental integrated analytical measures. The applied exploitation of environmental resources in agricultural and industrial production that affected natural ecological processes. The students could make discussion and proposal of good measures to purpose of environmental protection belong to application of the best environmental solutions in production processes...

4.101 Food chemistry

- Course number: **NS318**

- Credit: 03

- Hours: 30 theory hours and 30 practice hours

- Prerequisite course: TN235

- Parallel course: None

Course description

Food chemistry studies the chemistry, biochemistry of foods, but also of agricultural raw materials. This course will discuss systematically the chemistry of the most important components in food, such as: water, proteins, lipids, carbohydrates, enzymes and vitamins. Apart from the theorys, these courses are also linked to practice sessions. Depending on the aim of the analysis and the nature of the food, a different analytical method will be chosen. The aim can be either to get quantitative, qualitative or characeristic information.

4.102 Food Additives

- Course number: **NN151**

- Credit: 02

- Hours: 30 theory hours and 60 self-study hours

- Prerequisite course: None

- Parallel course: None

Course description

The course covers knowledge of classification, physical and chemical properties and the role of food additives; health aspects and principles of using food additives; preservatives and their effect on food preservation; fat antioxidants and their impact in preserving of fat-containing foods; the colloids, emulsifiers, surfactants, detergents, hygiene and their roles; sugar-free sweeteners, natural and synthetic coloring and odorants; enzymes and their role in the food processing.

4.103 Principles of Food preservation and processing

- Course code: **NN180**

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description:

- Factors influencing on spoilage of products during processing and storage

- Food chemical composition, natural antibiotics and antioxidants affecting on quality and storage time of food products

- Principle 1: preventing of food from spoilage and pathogen

- Principle 2: processing and preservation technologies to decline spoilage of food

- Principle 3: processing technologies to eliminate spoiled and pathogenic agents in food products.

- Emerging technologies: extrusion, microwave, high pressure and irradiation.

4.104 The Quality Assessment of Food Products

- Course code: **NS321**

- Credit: 02

- Hours: 30 theory hours

- Prerequisite course: None

- Parallel course: None

Course description:

Assessment of the microbiome present in food and test methods of several microorganisms in different products. Determination of chemical composition of food including moisture, water activity (aw); acid, protein, fat and sugar content. Sensory evaluation of food, principles of sampling and sample preparation, methods of evaluating food, how to handle the results obtained as well as the final conclusion on the sensory value of the food.

Part 5. STUDENT ASSESSMENT METHOD

The assessment of learners is carried out throughout and systematically from the time of enrollment, during the training process until graduation. The student assessment system is implemented as follows:

Classification	**10-grade scale**	**4-grade scale**		**Explaination**
		Letter scale	**Point scale**	
Excellent	9,0– 10,0	A	4,0	Learners fully understand and apply the knowledge of the subject and successfully complete the requirements of the course.
Good	8,0 – 8,9	B+	3,5	Learners master the basic knowledge of the subject and complete the requirements of the module.
Fair	7,0 – 7,9	B	3,0	
Above average	6,5 – 6,9	C+	2,5	Learners understand part of the course knowledge and complete most of the course requirements
Average	5,5 – 6,4	C	2,0	
Pass	5,0 – 5,4	D+	1,5	Learners understand very little about the subject and partially complete the requirements of the course.
Pass	4,0 – 4,9	D	1,0	
Fail (Không đạt)	< 4,0	F	0,0	Learners do not understand the course content and complete very few requirements of the course.

Graduation grading of students is based on the average of all accumulated courses. Graduation grading will correspond to grade point averages and reflect the student's achievement of the respective output standards as described below:

Classification	CGPA	Level of program learning outcomes of the curriculum
Excellent	3,60 – 4,00	Learners master the knowledge and skills of the curriculum perfectly and can apply them creatively in their work
Good	3,20 – 3,59	Learners master the knowledge and skills of the curriculum
Fair	2,50 – 3,19	Learners master most of the knowledge and skills of the curriculum.
Average	2,00 – 2,49	Learners have enough knowledge and skills of the training program and can participate in the labor market.
Below average	1,00 – 1,99	Learners lack a lot of professional knowledge
Poor	<1,00	Weak learners, not meeting professional requirements

The assessment of the course is carried out with a combination of many assessment methods to ensure the reliability and fairness of the assessment. The two most common forms are midterm exams and final exams. The result of the final course score will be announced on the school's general management system. Teaching staff plan to talk directly with students to answer questions or complaints about answers and grades.

For the dissertation modules and graduation year, the College of Natural Sciences provides specific guidance on implementation progress as well as content requirements. The content of the thesis and graduation thesis are closely linked to the ELOs of the module, allowing the correct assessment of students' capabilities as well as ensuring fairness and quality.

Part 6. LEARNING ENVIRONMENT

6.1 Library

The Learning Resource Center (LRC) is located on an area of 7,560 m^2, including 4 floors with a total usable area of 7,200m^2, is one of the largest learning resource centers in the country. LRC provides a rich source of books, newspapers, textbooks, reference materials in both Vietnamese and foreign languages, which are renewed and updated regularly. The Center also has an electronic library system and electronic databases (such as ProQuest, Springerlink, Ebrary, Research4Life...) providing materials in almost all fields of teaching and research of the University, allowing users to access from both inside and outside the School, effectively meeting the usage requirements of lecturers and students. LRC is invested with modern equipment, computer room, discussion room, multimedia room, conference room, live video conferencing system and many modern technical facilities that are globally connected, serving service to the maximum of user needs, providing a professional, comfortable and convenient learning and working environment.

In addition to the main library, LRC, the College of Natural Sciences has its own library with an area of 227 m^2, including a reading and self-study room, a room to store books and reference materials specialized in the fields of natural sciences and mathematics.

6.2 Dormitory, natural and social environment, healthcare system

CTU develops continuously with projects to build more buildings for training activities while ensuring a green, clean and beautiful environment for students and staff of the University. The school's security and order situation is always ensured with the lighting system and security camera system being fully installed in the campus; fire and explosion prevention is carried out continuously; The school's security team operates 24 hours a day. The dormitory of the University has a size of over 10,200 seats, with a occupancy rate of over 98%. CTU also has a healthy living, playing and entertaining environment for staff and students such as amusement parks, parks, sports centers, canteens, mini supermarkets, etc. Officials and students All schools participate in full health

insurance. Every year, cadres, officials and students are supported by the University with a part of the cost to be examined, examined, consulted, and protected. In addition, the University also has a medical room to take care of the health of students and staff, a department to answer questions and provide psychological counseling for learners; Center for Student Counseling, Support and Entrepreneurship.

6.3 Sport

Faculty of Science and Technology has a volleyball court and a ping-pong table for students and faculty members to practice physical fitness, improve health, and have opportunities to live and play together. In addition, CTU also has a gymnasium and sports hall. The building consists of 2 floors, the floor area is 3,465m^2, the usable area is 3,037m^2; the grandstand has a capacity of 1,000 seats; have electricity, lightning protection, water supply and drainage systems and fire protection. CTU's sports stadium is designed in the style of a multi-purpose stadium, including the following items: investment in linking 01 football field for 5 people, 01 volleyball court, marking 1 basketball court and 6 courts. badminton, the rooms have solid doors and around the stadium is a large area. The outdoor area has a total area of 30,200m^2, including the following items: 05 outdoor volleyball courts that can take advantage of the basketball practice space. These facilities are located very close to the student dormitory, contributing to helping students have many advantages in daily physical training.

6.4 Field trip

During the study period, students have the opportunity to visit the company, factory, testing center, etc. to gain more experience as well as get acquainted with the actual working environment. The tour program will be guided by faculty members of the Department. The results of the students' actual visit are assessed through the report after the visit.

6.5 Extra-curricular activities

Besides studying, students will be able to participate in social activities and support the community through the CSHCM Youth Union and the Student

Union. Students will be assessed on soft skills and attitudes and behaviors when participating in these activities and demonstrated through practice scores. This is one of the criteria used to consider and award scholarships to students. Practice scores do not affect student learning outcomes, but students need to achieve a minimum level of practice scores to continue learning. Students who do not meet this minimum score will be warned or expelled.

The Ho Chi Minh Communist Youth Union of the Faculty of Natural Sciences plays an important role in implementing extracurricular activities for students. The main activities that this organization carries out include: Cultural and sports exchanges; social activities; academic activities; international relations activities. Typically, the program to celebrate the 40th anniversary of the establishment of diplomatic relations between Vietnam and the Philippines and the National Day of the Republic of the Philippines; Taipei Cultural Office's Taiwan scholarship referral program; PSU Phuket University's scholarship program (Thailand); Vietnam - Korea cultural and art exchange program; exchange program with the US Consulate General; participate in exchange and volunteer activities between students of Can Tho University and Soonchunhyang University - Korea, etc. In addition, the provincial student unions and associations inside and outside the University also have many activities. extracurricular activities for students to participate in.

6.6 Information technology infrastructure

The College has 01 computer room with 51 machines for general training. In addition, the University's Learning Resource Center has 500 computers to serve students. All computers and information technology equipment of CTU are connected to the Internet. The school also has wireless network coverage in almost all areas to serve learning and research activities. The University's integrated information system has been expanded and continues to be completed, helping CTU implement computerization in most of its activities. To use the College's computers and IT resources (hardware and software), all users have separate accounts. Specifically, students can log in to the system to make study plans, register for courses, view grades, tuition fees

and other activities. Officials and officials use the management system to manage course grades, manage scientific research activities, declare teaching hours, personal income, etc. In addition, CTU also has an online learning system that allows sharing learning materials and academic exchange. All systems have a function that allows users to submit comments directly to improve and improve service quality.

The College of Natural Sciences is equipped with sufficient infrastructure for information technology. The Colleage currently has a total of 85 computers (20 computers in functional rooms and 65 computers in laboratories and practice rooms), 12 projectors, and 11 televisions for teaching and research.

Part 7. AFTER GRADUATION

7.1 Job opportunities

After graduating with a Bachelor in Chemistry, students can work in positions such as: Researcher in the field of Chemistry and related fields; Lecturers, teachers of Chemistry subjects; Testers and technicians; Sales staff of chemicals and chemical equipment; Managers of chemical production and trading; Officials at government levels at wards (communes), districts (districts), departments and agencies at provincial (city) levels in charge of work areas related to Chemistry and science - technology in general.

7.2 Learning to improve level

After completing the undergraduate course in Chemistry, students can continue to study at home and abroad master's and doctoral programs in Chemistry or Chemistry-related fields.

7.3 Alumni network

In 2016, the College of Natural Sciences solemnly celebrated the 50th anniversary of the establishment of the College (1966-2016). On this occasion, the College of Natural Sciences Alumni Association was established with the purpose of gathering and connecting alumni and alumni of the Faculty to share experiences, open up an exchange environment, and seek cooperation opportunities. , supporting each other in work and life, especially creating a bridge for alumni and alumni to connect and support and accompany the development of the Faculty. In the past time, the Association has gathered many former students and alumni with deep professional experience in the fields being trained at the Faculty to create support programs and consulting activities for the Faculty in the field of construction. develop training programs, especially established a scholarship fund to help poor and excellent students. Thanks to this scholarship fund, many students with difficult circumstances have achieved good academic results; Many student activities are also supported, thereby helping to train students' soft skills in addition to professional knowledge.

The College of Natural Sciences appreciates the contributions of the past generations of alumni and students of the College and hopes to continue to receive the support of alumni and students to accompany the Faculty. in the career of training highly qualified human resources for the development of the Mekong Delta region and the whole country.

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