

**THE UNIVERSITY OF DANANG
UNIVERSITY OF SCIENCE AND TECHNOLOGY**

PROGRAM SPECIFICATION

MAJOR:	CONSTRUCTION MATERIALS ENGINEERING AND TECHNOLOGY
CODE:	7510105
MODE OF STUDY:	FULL-TIME
MANAGEMENT FACULTY:	FACULTY OF ROAD AND BRIDGE ENGINEERING (FRBE)

Danang, 2020

TABLE OF CONTENT

Table of Content	1
A. GENERAL INFORMATION	3
B. PHILOSOPHY OF EDUCATION, VISION, AND MISSION	4
I. Philosophy of education	4
II. Vision	4
III. Mision	5
IV. Core values	5
C. OBJECTIVES AND PROGRAM LEARNING OUTCOMES OF THE TRAINING PROGRAM	5
I. Objectives	5
1. General Objectives	5
2. Program Objectives (POs)	5
II. Program Learning outcomes (PLOs)	5
III. Mapping between POs and PLOs of the traning program	6
D. STRUCTURE AND MODULES	6
I. Curriculum Structure	6
II. Knowledge cluster -classified Courses	7
III. Curriculum Roadmap (courses classified following the modules and learning sequence)	1
Note:	2
Required prerequisite courses (the courses at the end of arrow is the prerequisite course of that one in arrowhead).	2
IV. Curriculum	3
V. The mapping between courses and program learning outcomes (PLOs) of CMET Program	13
E. IMPLEMENTation AND ASSESSMENT	17
I. Implementation of training program	17
II. Assessment	20
1. Assessment of student learning outcomes	20
2. Assessment of the courses	20
3. Assessment methods	21
4. Grading	29
F. COURSE DESCRIPTION	30

G. COURSE SYLLABUS	65
H. guidelines FOR IMPLEMENTATION OF THE PROGRAM	65
I. EVALUATING, UPDATING, AND IMPROVING THE TRAINING PROGRAM.....	65
I. Updating the training Program.....	65
II. Evaluating the training Program	65
Appendix 1: Syllabus description	66
APPENDIX 2: LIST OF STAFFS IN THE PROGRAM	67
2.1. List of organic lecturers of the program (*)	67
2.2. List of participating lecturers in the program	69
2.3. List of visiting lecturers in the program	70
APPENDIX 3: comparison table WITH domestic and international PROGRAMS	71
APPENDIX 4: ARRANGEMENT OF THE COURSES based on the learning outcomes.....	78
APPENDIX 5. DiSTRIBUTION OF THE COURSES based on the learning outcomes	95
APPENDIX 6. relationship between the student outcomes of the program and the Vietnamese qualification framework for the university level.....	104

TRAINING PROGRAM

(Issued under Decision No. 1529/QĐ-ĐHKB July 3, 2020 of the Rector of university of Science and Technology-The university of Danang)

A. GENERAL INFORMATION

1. Training program name (Vietnamese)	Công nghệ kỹ thuật vật liệu xây dựng
2. Training program name (English)	Construction Materials Engineering and Technology (CMET)
3. Degree	Bachelor
4. Major code	7510105
5. Learners or enrollment students	Students who graduated from high school and satisfy admission conditions of university
6. Study duration	4 years
7. Mode of study	Full time
8. Total of Credits	130 credits (exclude Physical Education & National Defense Education)
9. Score scale	4 - point scale
10. Graduation conditions	Students who are graduated when they meet the following conditions: 1. Not being prosecuted for penal liability, not being disciplined at the level of academic suspension. 2. Accumulate enough number of courses and credits of the training program. 2. The cumulative GPA of the whole course is 2.00 or higher. 2. Have a certificate of Physical Education and National Defense Education. 3. Meet the required foreign language output standards (Note: depending on the training program, for example, for the CLC program, it requires level 4/6 according to the European framework or equivalent certificates)

	4. Having a certificate of basic information technology application.
11. Type of diploma	Bachelor's in construction Materials Engineering and Technology
12. Job positions/Opportunities	<p>Students who graduated with bachelor's degree in Construction Materials Engineering and Technology major are able to work in the following job positions:</p> <p>Specialized construction laboratories and laboratories in building material production units;</p> <p>Construction, management and quality control of materials for projects and construction works;</p> <p>Technology design for building material production units;</p> <p>Technical and managerial staff in building material production units.</p>
13. Ability to study in higher education program	Students who graduate from this program can continue with an intensive training program to receive an Engineering degree or a master's program in the same or similar major.
14. Other training programs used for matching	<p><i>Advanced program (bachelor's degree) Civil Engineering Bachelor of Science- Northen Arizona University.</i></p> <p><i>Advanced program (bachelor's degree)- Ho Chi Minh City University of Technology (HCMUT)- Major of Construction Materials Engineering and Technology.</i></p>

B. PHILOSOPHY OF EDUCATION, VISION, AND MISSION

I. Philosophy of education

“Thinking – Creating – Humanity Cherishing”

II. Vision

By 2035, University of Science and Technology - The University of Danang will be a research university recognized by the international community, actively collaborating globally in solving socio-economic challenges in the country and the world.

III. Mision

University of Science and Technology - The University of Danang is a higher education institution providing high-quality human resources with capable of innovation, creativity and entrepreneurship in the field of engineering - technology; implementing scientific research and technology transfer to serve the sustainable socio-economic development of the Central area and Highlands, domestically and internationally.

IV. Core values

- Quality and professionalism
- Innovation and creativity
- Humanity and integrity

C. OBJECTIVES AND PROGRAM LEARNING OUTCOMES OF THE TRAINING PROGRAM

I. Objectives

1. General Objectives

The general objectives of the training program in construction Materials Engineering and Technology are to train learners with political, ethical, knowledge, health; the ability to lifelong learning; the ability to be creative; have professional practice skills, research capacity, ability to effectively apply professional knowledge and advances in science and technology in construction materials engineering technology; have professional responsibility and sense of service to the community, meet development requirements in the field of technology and construction materials, serve the needs of socio-economic development, ensure national defense and security and international integration.

2. Program Objectives (POs)

Students who graduated with bachelor's degree in Construction Materials Engineering and Technology major in University of Science and Technology - The University of Danang:

1. Have comprehensive professional knowledge; master the principles and rules of nature and society;
2. Have basic practical skills in construction materials engineering technology;
3. Have ability to work independently and creatively; capable of teamwork; capable of solving technical and technological problems in the field of construction materials engineering technology.

II. Program Learning outcomes (PLOs)

Students graduated from bachelor-level training program in Construction Materials Engineering Technology major meet the requirements of 6-level output standards according to the Vietnam National Qualifications Framework:

1. Ability to apply knowledge of Mathematics, basic science, technology and engineering in analysis, design, construction, evaluation and research on problems in the field of construction materials engineering technology.
2. Having skills in practice, experiment, analysis, and basic data processing in construction materials engineering technology.
3. Having critical thinking, creative thinking, entrepreneurial thinking, professional behavior.
4. Having ethics and professional responsibility.
5. Ability to work in team/groups ; have effective communication skills.
6. Having skills in using foreign languages in their professional fields; have foreign language proficiency TOEIC 450 or equivalent.
7. Having basic skills in using Information Technology (IT) as prescribed in Circular No. 03/2014/TT-BTTTT and being able to use calculation tools in the field of construction materials.
8. Capable of forming ideas for design, construction, planning, participating in management and operation of technological lines in building material production units or construction projects suitable to the business, society and environment context.

III. Mapping between POs and PLOs of the training program

Program Objectives (POs)	Program Learning Outcomes (PLOs)							
	1	2	3	4	5	6	7	8
1	X	X						X
2	X	X						X
3	X		X	X	X	X	X	

D. STRUCTURE AND MODULES

I. Curriculum Structure

Knowledge cluster	Total credits	Compulsive credits	Elective credits
1. Maths and Natural Sciences	30	30	0
2. Core engineering fundamental knowledge	30.5	30.5	0
3. Disciplinary knowledge	25	21	4
4. Project, internship, and thesis	18.5	12.5	6
5. General knowledge	15	15	0
6. Supportive knowledge	11	9	2
Total of credits	130	118	12

Note: The above table does not include compulsory courses on National defense education and physical education.

II. Knowledge cluster -classified Courses

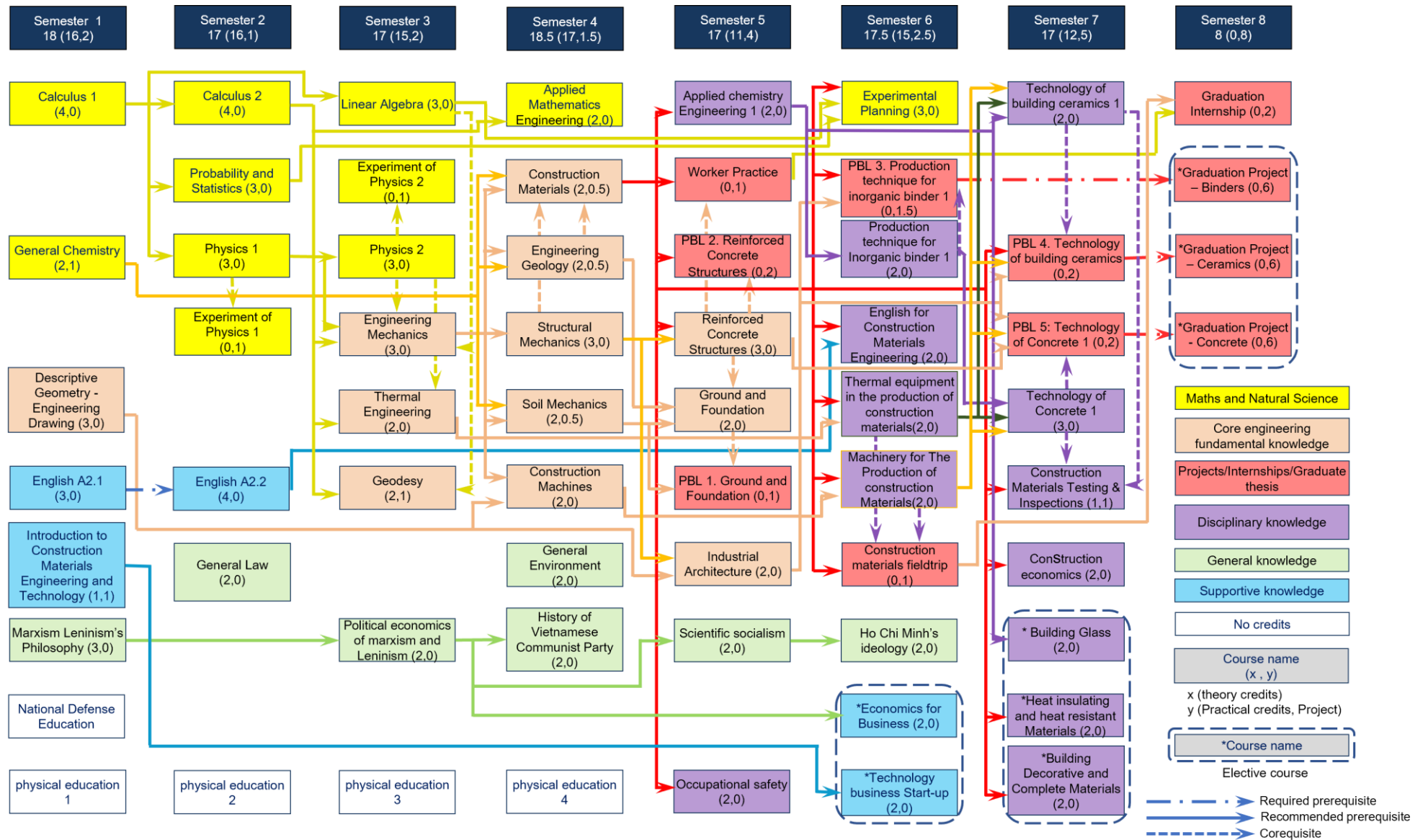
No	Course name	Credits	Courses			Semester	Remark
			Compulsory	Selected Electives	Free Electives		
A.	Maths and Natural Sciences (30 credits)						
1	Calculus 1	4	x			1	
2	General Chemistry	3	x			1	
3	Calculus 2	4	x			2	
4	Probability and Statistics	3	x			2	
5	Physics 1	3	x			2	
6	Experiment of Physics 1	1	x			2	
7	Physics 2	3	x			3	
8	Experiment of Physics 2	1	x			3	
9	Linear Algebra	3	x			3	
10	Applied Mathematics Engineering	2	x			4	
11	Experimental Planning	3	x			6	
B.	Core engineering fundamental knowledge (30.5 tín chỉ)						
1.	Descriptive Geometry – Engineering Drawing	3	x			1	
2	Thermal Engineering	2	x			3	
3	Engineering Mechanics	3	x			3	
4	Geodesy	3	x			3	
5	Structural Mechanics	3	x			4	
6	Construction Machines	2	x			4	
7	Engineering Geology	2.5	x			4	
8	Soil Mechanics	2.5	x			4	
9	Construction materials	2.5	x			4	
10	Ground and Foundation	2	x			5	
11	Reinforced Concrete Structures	3	x			5	
12	Industrial Architecture	2	x			5	

No	Course name	Credits	Courses			Semester	Remark
			Compulsory	Selected Electives	Free Electives		
C.	Disciplinary knowledge (25 credits)						
1.	Applied chemistry Engineering 1	2	X			5	
2.	Occupational safety in construction materials production	2	X			5	
3	Thermal equipments in the production of construction materials	2	X			6	
2	Machinery for the production of construction materials	2	X			6	
4	Production technique for Inorganic binder 1	2	X			6	
5	English for Construction Materials Engineering	2	x			6	
6	Technology of Building Ceramic 1	2	x			7	
7	Technology of Concrete 1	3	x			7	
8	Construction Materials Testing & Inspections	2	x			7	
9	<i>Heat insulating and Heat resistant Materials</i>	4		x		7	Choose 2 out of 3 courses
10	<i>Building Glass</i>			x		7	
11	<i>Building Decorative and Complete Materials</i>			x		7	
12	Construction Economics	2	x			7	
D.	Project, internship, and thesis (18.5 credits)						
1.	PBL 1. Ground and Foundation	1	x			5	
2	PBL 2. Reinforced Concrete Structures	2	x			5	
3	PBL 3. Production technique for Inorganic binder 1	1.5	x			6	
4	PBL 4. Technology of Building Ceramic 1	2	x			7	
5	PBL 5. Technology of Concrete 1	2	x			7	

No	Course name	Credits	Courses			Semester	Remark
			Compulsory	Selected Electives	Free Electives		
6	Worker Practice	1	x			5	
7	Construction materials fieldtrip	1	x			6	
8	Graduation Internship	2	x			8	
9	<i>Graduation Project - Binders</i>	6		x		8	Choose 1 out of 3 courses
10	<i>Graduation Project – Ceramics</i>			x		8	
11	<i>Graduation Project - Concrete</i>			x		8	
E.	General knowledge (15 credits)						
1	Marxism Leninism's Philosophy	3	x			1	
2	General Law	2	x			2	
4	Political economics of Marxism Leninism	2	x			3	
5	History of Vietnamese Communist Party	2	x			4	
6	General Environment	2	x			4	
7	Scientific socialism	2	x			5	
8	Ho Chi Minh's ideology	2	x			6	
F.	Supportive knowledge (11 credits)						
1	Introduction to Construction Materials Engineering and Technology	2	x			1	
2	English A2.1	3	x			1	
3	English A2.2	4	x			2	
4	<i>Technology business Start-up</i>	2		x		6	Choose 1 out of 2 courses
5	<i>Economics for Business</i>			x		6	
6	Physical Education		x				
7	National Defense Education		x				
	Total of credits	130					

(In the remark column, instructions on how to choose electives.)

III. Curriculum Roadmap (courses classified following the modules and learning sequence)



Note:

Required prerequisite courses (the courses at the end of arrow is the prerequisite course of that one in arrowhead).

Recommended prerequisite courses (the courses at the beginning of arrow is the previous course of that one in arrowhead).

Corequisite courses (According to the direction of arrow, course at the end of arrow might be studied without studying simultaneously/pre-studying prerequisite course at in arrowhead; In contrast, course in the arrowhead must be studied simalteniously/pre-studied with that one at the end of the arrow).

IV. Curriculum

No	Semester	Course name	Credit number						Course conditions		
			Theory	Exercise	Project (PBL)	Practice/ Experiment	Field Trip	Total	Required prerequisite	Recommended prerequisite	Corequisite
1	1	Calculus 1	3	1				4			
2	1	General Chemistry	2			1		3			
3	1	Marxism Leninism's Philosophy	3					3			
4	1	Descriptive Geometry – Engineering Drawing	3					3			
5	1	English A2.1	3					3			
6	1	Introduction to Construction Materials Engineering and Technology	1		1			2			
7	2	Calculus 2	3	1				4		Calculus 1	
8	2	Probability and Statistics	3					3		Calculus 1	
9	2	Physics 1	3					3		Calculus 1	

10	2	Experiment of Physics 1				1		1			Physics 1
11	2	General Law	2					2			
12	2	English A2.2	4					4	English A2.1		
13	3	Physics 2	3					3		Physics 1	
14	3	Experiment of Physics 1				1		1			Physics 2
15	3	Linear Algebra	2	1				3		Calculus 1	
16	3	Political economics of Marxism Leninism	2					2		Marxism Leninism's Philosophy	
17	3	Thermal Engineering	2					2		Calculus 2	Physics 2
18	3	Engineering Mechanics	3					3		Physics 1; Calculus 2	Linear Algebra
19	3	Geodesy	2				1	3		Calculus 2	Linear Algebra
20	4	Applied Mathematics Engineering	2					2		Calculus 2	
21	4	History of Vietnamese Communist Party	2					2		Political economics of Marxism Leninism	
22	4	General Environment	2					2			
23	4	Structural Mechanics	3					3		Engineering Mechanics	

24	4	Construction Machines	2					2		Descriptive Geometry – Engineering Drawing; Engineering Mechanics	
25	4	Engineering Geology	2				0.5	2.5		General Chemistry; Engineering Mechanics	
26	4	Soil Mechanics	2			0.5		2.5		General Chemistry; Engineering Mechanics	
27	4	Construction materials	2			0.5		2.5		General Chemistry	Engineering Geology; Structural Mechanics
28	5	Scientific socialism	2					2		Political economics of Marxism Leninism	
29	5	Ground and Foundation	2					2		Soil Mechanics; Engineering Geology	Reinforced Concrete Structures
30	5	PBL 1. Ground and Foundation			1			1		Soil Mechanics	Ground and Foundation

31	5	Reinforced Concrete Structures	3					3		Structural Mechanics; Construction materials	
32	5	PBL 2. Reinforced Concrete Structures			2			2		Construction materials	Reinforced Concrete Structures
33	5	Industrial Architecture	2					2		Descriptive Geometry – Engineering Drawing; Structural Mechanics	
34	5	Applied chemistry Engineering 1	2					2		Construction materials	
35	5	Occupational safety in construction materials production	2					2		Construction materials	
36	5	Worker Practice					1	1		Construction materials	Reinforced Concrete Structures
37	6	Ho Chi Minh's ideology	2					2		Scientific socialism; History of Vietnamese	

										Communist Party	
38	6	Thermal equipments in the production of construction materials	2					2		Thermal Engineering; Construction materials	
39	6	Machinery for the production of construction materials	2					2		Construction Machines; Construction materials	
40	6	Production technique for Inorganic binder 1	2					2		Applied chemistry Engineering 1	
41	6	PBL 3. Production technique for Inorganic binder 1			1.5			1.5		Industrial Architecture; Construction materials	Production technique for Inorganic binder 1
42	6	Experimental Planning	3					3		Probability and Statistics; Linear Algebra; Construction materials	
43	6	English for Construction Materials Engineering	2					2		English A2.2; Construction materials	

	6	<i>Electives 1 (Choose 1 out of below 2 courses)</i>	2					2			
44		<i>Technology business Start-up</i>	2					2		Introduction to Construction Materials Engineering and Technology	
45		<i>Economics for Business</i>	2					2		Political economics of Marxism Leninism	
46	6	Construction materials fieldtrip					1	1		Construction materials	Thermal equipments in the production of construction materials; Machinery for the production of construction materials
47	7	Technology of Building Ceramic 1	2					2		Applied chemistry Engineering	

										1; Machinery for the production of construction materials; Thermal equipments in the production of construction materials	
48	7	PBL 4. Technology of Building Ceramic 1			2			2		Industrial Architecture; Machinery for the production of construction materials; Construction materials	Technology of Building Ceramic 1
49	7	Technology of Concrete 1	3					3		Machinery for the production of construction materials; Thermal equipments in the production of construction	

										materials; Reinforced Concrete Structures; Production technique for Inorganic binder 1	
50	7	PBL 5. Technology of Concrete 1			2			2		Industrial Architecture; Machinery for the production of construction materials; Construction materials	Technology of Concrete 1
51	7	Construction Materials Testing & Inspections	1			1		2		Construction materials	Technology of Building Ceramic 1; Technology of Concrete 1
	7	<i>Electives 2,3 (Choose 2 out of below 3 courses)</i>	4					4			
52		<i>Heat insulating and Heat resistant Materials</i>	2					2		Construction materials	

53		<i>Building Glass</i>	2					2		Applied chemistry Engineering 1	
54		<i>Building Decorative and Complete Materials</i>	2					2		Construction materials	
55	7	Construction Economics	2					2		Construction materials	
56	8	Graduation Internship					2	2		Construction materials fieldtrip; Worker Pratice	
	8	<i>Choose 1 out of below 3 graduation projects</i>						6			
57		<i>Graduation Project - Binders</i>				6		6	PBL 3. Production technique for Inorganic binder 1	All courses of the CMET program	
58		<i>Graduation Project – Ceramics</i>				6		6	PBL 4. Technology of Building Ceramic 1	All courses of the CMET program	

59		<i>Graduation Project - Concrete</i>			6			6	PBL 5. Technology of Concrete 1	All courses of the CMET program		
Total of credits									130			

V. The mapping between courses and program learning outcomes (PLOs) of CMET Program

No	Semester	Course name	Program Learning Outcomes (PLOs)							
			PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
1	1	Calculus 1	IT				I		I	
2	1	General Chemistry	IT	IT			I		I	
3	1	Marxism Leninism's Philosophy	I		IT	I				
4	1	Descriptive Geometry – Engineering Drawing	IT		I				I	
5	1	English A2.1	IT				I	I		
6	1	Introduction to Construction Materials Engineering and Technology	I		I	IT	IT			
7	2	Calculus 2	IT				I		I	
8	2	Probability and Statistics	IT		I					
9	2	Physics 1	IT				I	I		
10	2	Experiment of Physics 1	I	IT			I			
11	2	General Law	IT		T	T				
12	2	English A2.2	IT				I	I		
13	3	Physics 2	IT				I	I		
14	3	Experiment of Physics 2	I	IT			I	I		
15	3	Linear Algebra	IT		I	I			I	
16	3	Political economics of Marxism Leninism	I		IT	I				

17	3	Thermal Engineering	IT							
18	3	Engineering Mechanics	IT							
19	3	Geodesy	IT	IT			U			
20	4	Applied Mathematics Engineering	T		IT	IT				
21	4	History of Vietnamese Communist Party	I		IT	I				
22	4	General Environment	IT		IT	IT				
23	4	Structural Mechanics	IT							T
24	4	Construction Machines	IT							I
25	4	Engineering Geology	IT	IT			U			
26	4	Soil Mechanics	IT	IT			U			
27	4	Construction materials	IT	IT			U			I
28	5	Scientific socialism	I		IT	I				
29	5	Ground and Foundation	IT							
30	5	PBL 1. Ground and Foundation	TU		T		U		U	
31	5	Reinforced Concrete Structures	IT						IT	
32	5	PBL 2. Reinforced Concrete Structures	TU	TU			U		U	I
33	5	Industrial Architecture	IT							T
34	5	Applied chemistry Engineering 1	IT							IT
35	5	Occupational safety in construction materials production	TU		T					IT
36	5	Worker Praticce	T		T	T	U		U	TU

37	6	Ho Chi Minh's ideology	I		I	T	I			
38	6	Thermal equipments in the production of construction materials	TU			I				T
39	6	Machinery for the production of construction materials	TU		T					T
40	6	Production technique for Inorganic binder 1	TU							T
41	6	PBL 3. Production technique for Inorganic binder 1	U	T	T	T	U		U	TU
42	6	Experimental Planning	T	T					T	
43	6	English for Construction Materials Engineering					U	T	U	
	6	Electives 1 (Choose 1 out of below 2 courses)								
44	6	<i>Technology business Start-up</i>				U		U	IT	
45	6	<i>Economics for Business</i>	IT		I					T
46	6	Construction materials fieldtrip			T	T	U		U	T
47	7	Technology of Building Ceramic 1	TU	TU	T					TU
48	7	PBL 4. Technology of Building Ceramic 1	U	T	T	T	U		U	TU
49	7	Technology of Concrete	TU							TU
50	7	PBL 5. Technology of Concrete	U	T	T	T	U		U	TU
51	7	Construction Materials Testing & Inspections	IT	T	U		U			
	7	Electives 2, 3 (Choose 2 out of below 3 courses)								
52	7	<i>Heat insulating and Heat resistant Materials</i>	TU		T	T				T

53	7	<i>Building Glass</i>	TU		T	T				T
54	7	<i>Building Decorative and Complete Materials</i>	TU		T	T				T
55	7	Construction Economics	TU		T					T
56	8	Gradiation Internship	U	U	T	T	U	U	U	TU
	8	Choose 1 out of below 3 graduation projects								
57	8	<i>Graduation Project - Binders</i>	TU	U	TU	TU	U	U	U	TU
58	8	<i>Graduation Project - Ceramics</i>	TU	U	TU	TU	U	U	U	TU
59	8	<i>Graduation Project - Concrete</i>	TU	U	TU	TU	U	U	U	TU

Note:

I: Itrroduction

T: Teaching

U: Utilizing

E. IMPLEMENTATION AND ASSESSMENT

I. Implementation of training program

The curriculum is structured following the credit system. The training process complies with the regulations of the Ministry of Education and Training, The university of Danang, and University of Science and Technology. The training period is 4 years. Each academic year consists of two main semesters (mid-August to late June) and summer semester (early July to mid-August). In the first two years, students learn general knowledge (math and natural sciences, foreign languages,..), and core courses. In the next two years, students continue to study specialized knowledge and do the thesis for graduation.

II. Teaching and Learning Strategies

FRBE has developed teaching and learning strategies, methods and focused on developing all resources, facilitating the implementation of teaching and learning. These teaching strategies and methods help to achieve effective teaching.

A variety of teaching and learning activities are applied to help students not only gain the basic and social knowledge, but also use this knowledge to collaborate with others and develop their skills and strong points. Then, personal skills such as communication, negotiation, teamwork skills... are formed.

The teaching strategies and methods used in the education program are as following:

***Direct Instruction Strategy**

Direct instruction strategy conveys information directly to the students, teachers present, and students listen. This teaching strategy is often applied in traditional classes and shows its effectiveness when transferring basic information, explaining a new skill.

The teaching methods following this strategy applied by CMET includes explicit teaching, lecture, and guest lecture.

Explicit Teaching: This is one of direct instruction strategy in which teachers advise and explain in detail the lesson content, help students achieve the teaching goal of knowledge and skills.

Lecture: Teachers present and explains the lecture contents. Teachers are presenters, lecturers. Students only listen to lectures and occasionally take notes to receive the knowledge

Guest Lecture: Students participate in courses where lecturers are not teachers but man from business. Through the experience and understanding of the lectures, they help students form an overview or specific knowledge on the field.

***Indirect Instruction Strategy**

Indirect instruction strategy is a teaching strategy in which students are facilitated in the learning process without any public teaching activities undertaken by teachers. This is teaching process approaching towards students, a student-centered approach, which instead of directly transferring the content of the lesson to the student, the advisers encourage them to participate in the learning process and to use their critical thinking skills to solve problems.

The teaching methods following this strategy applied by CMET includes Inquiry, Problem Solving, Case Study.

Inquiry: In the teaching process, teachers use open questions or problems, and advise students to answer questions step by step. Students can participate in group discussions to solve problems together.

Problem Solving: In the teaching and learning process, the students work on the problems and learn new knowledge by facing these problems. By finding solutions to the problem, students acquire the knowledge and skills required by the course.

Case Study: This is a method of student-centered approach which helps students to form critical thinking and communicate skills. In this approach, teachers pose practical situations, problems or challenges and ask students to solve them. This could help students create problem-solving, decision-making and research skills.

***Experiential Learning**

Experiential learning is a teaching strategy in which students acquire knowledge and skills through practical experience, observation, and perception. They learn from doing and experiencing.

The teaching methods following this strategy applied by CMET includes models, field trip, experiment, and teaching research team.

Models: Models are the teaching method in which students acquire knowledge and skills through observation, construction process and model design required by teachers.

Field Trip: Through visits, internships and field trips, students could understand the practical working environment of their major. Moreover, they could learn the technology applied, form professional skills and working culture in companies. This method not only helps students form their knowledge and skills but also creates career opportunities after graduation.

Experiment: Teachers do experimental manipulations, then students observe and practice those experiments under teacher advising. By this way, teacher can target to their teaching purpose.

Teaching Research Team: Students are encouraged to participate in research and teaching projects and groups, which help them create research and creative skills. As a result, students could be able to continue studying at the masters and doctoral level after graduation.

***Interactive Instruction**

Teachers combine several activities in classroom such as posing problems or open questions and asks students to discuss and solve problems. Teacher, as an adviser, help students step by step to solve problems. This helps students achieve their learning goals. Students can learn from their classmates or teachers to develop social skills, critical thinking skills, communication, and negotiation to make decisions.

The techniques and methods used by CMET in this strategy are Debate, Discussions, Peer Learning.

Debates: Debates is a teaching process in which teachers pose a problem related to the lesson content, then students with opposing views must analyze, explain, and persuade others to support their point. Through this teaching activity, students develop skills such as critical thinking, negotiation and decision making, or public speaking skills.

Discussion: Students are divided into groups and participate in discussions about the viewpoints on a given topic. In contrast to the debate method, students share the same common goal and find ways to improve their viewpoints and solutions in the discussion method.

Peer Learning: Students are organized into small groups to solve problems together and present group results through reports or presentations to other groups and lecturers.

***Independent Study**

Independent study means that all learning activities of students conducted by individual students with little or no teacher advising. This is a process that helps students orient their learning from their own learning experiences, they have autonomy to control their learning activities through assignments, projects or problems suggested or advised by teachers on class.

The methodology of this strategy is mainly applied by CMET as Work Assignment.

Work Assignment: According to this method, students are assigned homework with contents and requirements given by teachers. By completed the homework, students learn independent study, as well as required knowledge and skills.

The above teaching and learning methods help students acquire the PLOs, as shown in the Table 1.4.

Table 1.4 Mapping between PLOs and Teaching-Learning Strategies and Methods

Chiến lược và phương pháp dạy học (Strategies and Methods of Teaching-Learning)	PLOs							
	1	2	3	4	5	6	7	8
I. Dạy trực tiếp (Direct Instruction)								
1. Giải thích cụ thể (Explicit Teaching)	X	X				X	X	X
2. Thuyết giảng (Lecture)	X	X	X	X	X	X	X	X
3. Tham luận (Guest Lecture)				X	X			X
II. Dạy gián tiếp (Indirect Instruction)								
4. Câu hỏi gợi mở (Inquiry)		X						X

5. Giải quyết vấn đề (Problem Solving)		X	X		X			
6. Học theo tình huống (Case Study)	X	X	X	X	X	X	X	
III. Học trải nghiệm (Experiential Learning)								
7. Mô hình (Models)							X	X
8. Thực tập, thực tế (Field Trip)				X	X			X
9. Thí nghiệm (Experiment)		X						
10. Nhóm nghiên cứu giảng dạy (Teaching Research Team)	X	X	X	X	X	X	X	
IV. Dạy học tương tác (Interactive Instruction)								
11. Tranh luận (Debates)			X		X			X
12. Thảo luận (Discussions)			X		X			X
13. Học nhóm (Peer Learning)			X		X			X
V. Học độc lập (Independent Study)								
14. Bài tập ở nhà (Work Assignment)	X		X	X	X	X	X	

II. Assessment

1. Assessment of student learning outcomes

At the end of the semester, the university uses 4 criteria to evaluate student learning outcomes including: number of registered credits in the semester, semester overall GPA, cumulative GPA, and accumulated credits.

1.1. Number of registered credits in the semester is total credits of registered courses in the semester including the courses for this first time and second onward.

1.2. Semester overall GPA is average score of final grades of all courses in that semester. The final grade of the course is determined using the weighted average of all components which depends on number of credits of that course.

1.3. A cumulative GPA is the weighted average of the courses that the student has accumulated (the score on a 4-point scale is from 1.0 or higher), calculated from the beginning of the course to the time of assessment.

1.4. Accumulated credits is total number of credits of whole courses that have been accumulated (the score on a 4-point scale is from 1.0 or higher) since the beginning of the course.

2. Assessment of the courses

2.1. Depending on the characteristics of each course, the final grade of the course is calculated based on the component scores with weighting percentage including attendance scores; quiz scores; awareness and attitude scores when participating in discussions; scores for the practical/experimental section; mid-term test scores; essay scores, and the final exam score. The final exam is mandatory, and the weighting distribution for the final exam is not less than 50%. The final exam can be a writing exam, multiple choice exam, Q & A exam, essay ... or a combination of those.

2.2. The assessment methods, the weighting distribution of different assessment types (weighting percentage) are specified in the course syllabi when developing and updating the training program and must be approved by the Rector. At the first class, the lecturer in charge of that course announces the

syllabi to the students. The lecturer in charge of the course directly sets the test questions for exams, quiz..., and gives evaluation points.

2.3. Mid-term exam:

The lecturer in charge of the course conducts the mid-term exam in the class, according to the training plan for the school year approved by the Rector.

2.4. Final exam

-A student who misses class more than 20% of the class time in the semester, the lecturer can consider deciding not to let that student take the final exam.

- The final exam schedule planned and issued by the Department of Academic Affairs and Quality Assurance Office must ensure the average exam preparation time of at least 2/3 days for each credit.

- The final exam test must be in agreement with course learning outcomes (CLOs) specified in the syllabi. The preparation of exam questions or taking from the question bank is done following the current regulations of the University.

3. *Assessment methods*

Depending on the characteristics of each course, the lecturers can use the following assessment methods:

- Attendance checking
- Work assignment, homeworks
- Oral presentation
- Writing exam
- Multiple choice exam
- Debate/ Peer assessment
- Written reports, essay
- Teamwork assessment

3.1 **Assessment Strategies**

FRBE has developed and applied a variety of assessment methods. The strategy, teaching methods and requirements of standard outcomes of each course are the factors to select the appropriate assessment methods, ensure adequate information to assess the student learning progress, as well as the effectiveness of the teaching process.

The assessment methods used in FRBE education programs are divided into two main categories: On-going/Formative Assessment and Summative Assessment.

3.1.1 On-going/Formative Assessment

The purpose of the formative assessment is to timely provide feedback from teachers and students about progress and issues needed to fix during instruction.

Specific methods of formative assessment used by the CMET include Attendance Check, Work Assignment, and Oral Presentation.

1. Attendance Check

Beside independent study, regular attendance as well as contributions of student during the course also reflects their attitudes towards the course. Attendance checks are conducted by Rubric 1 or 2 depending on the theoretical or project course

2. Work Assignment

Students are required to do some content related to the lesson during class or after class. These exercises can be done by individual or groups and are evaluated according to the specific criteria in Rubric 3.

3. Oral Presentation

Some courses in the CMET curriculum ask students to work as a team to solve a problem, situation or content related to the lesson and present their results to other groups. This activity not only helps students gain specialized knowledge but also helps students develop skills such as communication, negotiation, teamwork skills. To assess the level of achieving these skills, Rubric 4 may be used.

3.1.2. Summative Assessment

The purpose of this type of assessment is to give conclusions, categorize the level of achievement and quality of the output, the progress of the students at a certain point of teaching time. It includes end of learning assessment, midterm assessment, and final assessment.

The methods used by CMET in this assessment include Written Exam, Multiple Choice Exam, Oral Exam, Written Examination, Written Exam, Report, Oral Presentation, Teamwork Assessment and Peer Assessment.

4. Written Exam

According to this method, students are asked to answer several questions, exercises or personal opinions about issues related to the knowledge requirements of the course and the assessment is based on designed answers. The rating scale used in this assessment is the scale of one to ten. The number of questions in the assessment is designed according to the content requirements of the course.

5. Multiple Choice Exam

This method is similar to the written exam, in which students are asked to answer questions based on the designed answer. The different point is that in multiple choice exam, the student answers are based on the suggested answers designed and printed in the test.

6. Oral Exam

In this method, students are assessed through interviews, directly questions, and answers. Criteria of this method are described in Rubric 5.

7. Written Report

Students are assessed through their report, including the content presented in the report, the manner of presentation, the drawing/pictures in the report. Criteria of this method are according to Rubric 6.

8. Oral Presentation

This method is the same as the presentation assessment method in the Rubric 4. The assessment is performed periodically (mid-term, final exam, or end-of-course).

9. Peer Assessment

Peer assessments are used when applying teamwork activities to evaluate students' teamwork skills. Criteria are followed Rubric 7.

Table. Mapping between Assessment methods and the PLOs

Assessment methods		PLOs							
		1	2	3	4	5	6	7	8
I	On-going/Formative Assessment								
1	Attendance Check	X	X						X
2	Work Assignment	X	X		X			X	
3	Oral Presentation					X	X	X	
II	Summative assessment								
4	Written Exam	X	X	X	X			X	X
5	Multiple choice exam	X						X	
6	Oral Exam		X	X		X	X	X	
7	Report Written	X	X	X	X	X	X	X	X
8	Oral Presentation					X	X	X	
9	Peer Assessment					X	X	X	

3.2. Rubrics

Based on the assessment methods, FRBE has developed specific tools and criteria for conducting student assessments by rubrics. The reasonable assessment method and rubrics could be chosen depending on the requirements, the objectives, and characteristics of each subject. In the same assessment method, it is possible to apply different rubrics for different modules.

The Rubrics are elaborated in accordance with the assessment method in the CMET curriculum. The details of rubrics are presented as follow:

1. Attendance Check

Rubric 1: Class Attendance

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
Diligence	< 30%	<50%	<70%	<90%	100%	50%
Class activities	Never participate in any class activity	Rarely participate in any activity. Inefficiently contribution.	Occasionally participate in class activities. Inefficiently discussion.	Regularly discuss and exchange ideas related to the lesson. The contribution to the lesson is effective.	Always participate in class activities: speaking, exchanging ideas related to the lesson. The contributions are very effective.	50%

Rubric 2: Project Attendance

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
Group organization	Group is completely broken: The responsibilities and duties of the team members are not specifically assigned, no association, team coordination.	The responsibilities and tasks of each team member are unclear, not suitable to their abilities. There is no coordination between team members.	Each member has his / her own task but is unclear and incompatible with the member's ability. The teamwork is not good.	The task of each team member is clear and relevant to their abilities. Good coordination of the team.	The duties of the team members are clear and consistent with their abilities, promoting the strength of the members. The teamwork is very good.	20%
Diligence	< 30%	<50%	<70%	<90%	100%	10%
Discussion	Never participate in group discussions	Rarely participated in group discussions and comments	Occasionally participate in group discussions and comments	Regularly participate in group discussions and contribute to discussions among groups.	Always participate in group discussions and contribute effectively to group activities and groups.	20%
Content is as schedule	No calculated content.	Incomplete calculations (<50%), wrong calculation results, unsuitable calculation sequence.	Calculation content includes enough volume as listed in the schedule (100%). Calculated results are some errors, mistakes.	Calculation content includes enough volume as listed in the schedule (100%). Calculated results are correct, calculation softwares are used but not appropriate.	Calculation content includes enough volume as listed in the schedule (100%). The sequence of calculation steps is reasonable. The results are calculated correctly.	20%

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
					Calculation softwares are used reasonable	
Format of reports	No report or report are incomplete.	Messy display in report, incorrect order. Drawings, tables and symbols used in the report are inappropriate.	The display of report is appropriate. There are some spelling errors, some confusion about size, notes, explanation parameters, tables.	Content is suitable. Structure of report is clear, logical. Notes, explanations, drawings, tables are suitable. There are few errors.	Content is suitable. Structure of report is clear, logical. Notes, explanations, drawings, tables are suitable.	15%
Technical drawings	No drawings or drawings lacking parts or images as required. The content is not correct	Drawings are not complete, unclear and lack dimension. Composition details, the content on the drawing is as required but still contain many errors. Notes are not appropriate.	The drawings show the required images, but the layout does not fit, and some minor flaws in presentation. Content on the drawing is as required.	Drawings include full details, clear size. Content is expressed as required. Drawings are Arranged and present reasonable. Notes are clear, detailed.	Drawings include full details, clear size. Content is expressed as required. Drawings are Arranged and present reasonable. Notes are clear, detailed. Drawings can be implemented in reality	15%

2. Work Assignments

Rubric 3: Work Assignment

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
Submit assignments	Do not submit assignments	Submit 70% assignment. Incorrect time.	Submit full assignment (100% of the assignment). Some assignments are not in time.	Submit full assignment (100% of the assignment). Most assignments are submitted on time.	Submission of full assignments (100% of the assignment). At regulation time.	20%
Presentation of assignments	Do not do exercises	Messy display, not in accordance with presentation requirements (font, size, line). Figures and tables used in the exercise do not match.	The exercise meets the requirements (font, size, line). Drawings and tables used in the exercises are clear and appropriate. There are some minor defects in presentation (Misspelling, mistake, size)	The presentation is beautiful, and meets the requirements (font, size, line). Drawings and tables used in the exercises are clear and appropriate. Note, full explanation, reasonable.	The presentation is beautiful and meets the requirements (font, size, stream). Drawings and tables used in the exercises are clear and appropriate. Note, full explanation, reasonable.	30%

Content of the exercise	Do not do exercises	Inadequate content, some incorrect according to task requirements.	The content of the exercise is adequate, meets the requirements of the task but not reasonable. There are some errors in the calculation.	The content of the exercise is adequate, reasonable, and meets the requirements of the task. Correct calculation.	The content of the exercise is adequate, reasonable, and meets the requirements of the task. perfectly calculation.	50%
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3. Oral Presentation

Rubric 4: Oral Presentation

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
Content of presentation	No content or content is inappropriate for the request.	Content matching requirements, images, and explanations are not clear	Content meets requirements. Use simple and easy to understand terminology. The picture is clear and beautiful	Content meets requirements. Use simple and easy to understand terminology. Pictures are clear, and beautiful. Used video	Content meets requirements. Use simple and easy to understand terminology. Pictures are clear and beautiful. Use video and explain specific insights on video.	50%
Slide presentation	Slide presentation is too sketchy, not enough quantity as prescribed	Slides are presented in appropriate quantities, using the word and picture clearly	Slides are presented with a clear, layout (introduction, body and conclusion)	Slides are presented with clear, logical layout, consists of 3 parts, demonstrating proficiency in presentation.	Slides are presented with clear, logical layout, consists of 3 parts. The term is simple to understand, demonstrating proficiency in presentation and language.	25%
Presentation	The presentation is not logical, beyond the specified time, uses of incorrect terminology, unclear pronunciation, low voice. Listeners do not understand.	The presentation is full, but the voice is low, pronouns some words unclear, uses complex terminology, do not contact with the listener when presented.	The presentation has a clear three-part layout. The voice is reasonable, clear, easy to listen, time is properly presented, sometimes interact with the listener. Listeners can understand and keep track of the content presented.	The presentation is brief, easy to understand, uses simple and easy-to-understand terms. Clear layout. The voice is clear and fluent. Time to present correctly. Good interaction with the listener. Listeners can understand the content.	The presentation is brief with clear layout. The voice is clear and fluent. Attract the attention of the listener, interact well with the listener. Listeners can understand and keep up with all the content presented. Time to present correctly.	25%

4. **Written Exam:** In 10-scale and follow the designed rubrics

5. **Multiple Choice Exam:** In 10-scale and follow the designed rubrics

6. Oral Exam

Rubric 5: Oral Exam

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
Answering Attitude	Communicating and answering attitude is rude, not cooperated, lack of respect in communication. Use inappropriate terms. Voice is hard to listen.	Attitude is quite polite. Use complex terms, confusing answers, hard to understand. Small voice, lack of confidence.	Communicative attitude is, gentle. The voice is clear, easy to hear. The term used in the answer is appropriated, easy to understand.	Attitude in the answer is confident, calm, gentle. Use simple terms, easy to understand. Clear voice fluently speak.	Attitude is very confident. Voice is clear, fluent and attractive, well interact with the listener.	30%
Answer questions	The answers are completely unrelated to questions.	Answers are not clear, almost unconnected, not focus on the question.	Answers focus on questions. The lack of confidence in the answers.	The answers are concise, clear, completed, relevant to the question asked. Attitude in answering is confident, calm, gentle, calm.	Answer shortly, clearly, completely, directly related to the question asked, explain convincingly. Attitude in answering is confident, calm, persuasive.	70%

7. Written Report

Rubric 6: Written Report

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
Contents	No content or content is not matched with requirements	Content is fully represented in the report as requirements. The calculation is incorrect, is not specific, does not meet requirements	The report includes enough content as required. There are some mistakes in calculation. The calculation is still not reasonable.	The report includes enough content as required. The step of calculation is appropriate. The calculation is correct. There is not specific and reasonable explanation for the calculation results	The report, the calculation, the step of calculation is appropriate. There is specific and reasonable explanation for the calculation results	60%
Organization	No report or the content in report	The order presented in the report is incorrect. The content meets	The content, order and format of report is as	Suitable content. order and structure of projects is logic, clear	Same as level B. Show advanced IT skills in	

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
, format, language	does not meet requirements.	the requirements. Drawings and tables are contradictory to the content.	required. There are some spelling errors, sizes. Notes are not enough.	and meet requirements. Figures and tables are logic and clear. Writing skills are limited.	conducting projects.	20%
Drawings	There is no or lack of drawings or drawings are not in accordance with regulations.	Enough number of drawings with the content as prescribed. Dimensions, notes on the drawing is not expressed or not clear, some parts on the drawings.	Enough number of drawings. Size, notes on the drawings are clear. There are some errors in the display of drawings (misspelling, strokes).	Enough number of drawings with content in accordance with regulations. Size, notes on the drawing are clear	Same as level B. Show advanced IT skills in drawing projects. Drawings can be implemented	20%

8. Oral Presentation: The same as Rubric 4

9. Teamwork Assessment (Peer assessment)

Rubric 7: Teamwork Assessment

Assessment Criteria	Levels of achievement					Weight
	Level F (0-3.9)	Level D (4.0-5.4)	Level C (5.5-6.9)	Level B (7.0-8.4)	Level A (8.5-10)	
Group organization	There is no teamwork	The responsibilities and tasks of the team members are not specifically assigned.	Each member has his or her own job duties but is unclear and does not fit the abilities of the team members.	Job assignments are clear and relevant to the abilities of each team member.	The task of each member is clear, specific, appropriate. Promote the strength of the team members. Interaction, good coordination between members.	30%
Diligence	30%	<50%	<70%	<90%	100% (Participate in full meetings, groups discussion)	30%
Discussion	Never participate in group discussions.	Rarely participated in group discussions and comments.	Occasionally participate in group discussions and comments.	Have a good group discussion and good comments.	Always participate in group discussions and contribute good ideas for group activities.	20%
Group Co-ordination	Never coordinate, cooperate with groups.	Rarely collaborated, teamwork.	Collaborate, collaborate with the team. Occasionally respect and share experiences from other members of the group.	Collaborate, collaborate with the team. Respect and share experiences from other members of the group.	Collaborate with the team. Always respect and share experiences for other members of the group.	20%

4. Grading

4.1. Component scores include mid-term exam, homework, essay,...and final exam scores, which is graded in 10-point scale and to be rounded to one decimal place.

4.2. Final grade of the course is determined using the weighted average of all components. The final grade of the course is rounded to one decimal place, then converted to letter grade scale as follows:

Classification	10- point scale	4 - point scale	Letter scale
Passed	From 9,5 to 10,0	4,0	A+
	From 8,5 to less than 9,5	4,0	A
	From 8,0 to less than 8,5	3,5	B+
	From 7,0 to less than 8,0	3,0	B
	From 6,5 to less than 7,0	2,5	C+
	From 5,5 to less than 6,5	2,0	C
	From 5,0 to less than 5,5	1,5	D+
	From 4,0 to less than 5,0	1,0	D
Fail	< 4,0	0	F

F. COURSE DESCRIPTION

No	Course name	Course Learning Outcomes	Summary of the course
1. Natural Sciences and mathematics knowledge			
1	Calculus 1	<ul style="list-style-type: none"> - Explaining the meaning of concepts and theorems related to limits, continuity, discontinuity, differential and integral of functions. - Abilitying approximation or applying some computer software to calculate problems related to calculus. - Applying the theory of calculus of functions to do related mathematics exercises and practical problems in different disciplines. - Improving some important competencies and qualities such as mathematical thinking and reasoning, problem – solving and creativity, self-study; honesty, hard work, perseverance and discipline. 	Topics include basics knowledge about functions of one variable, limits, continuity, derivatives and differentials, integrals and applications.
2	General Chemistry	<ul style="list-style-type: none"> - Understand the knowledge of general chemistry related to the basic laws of chemistry; atomic structure, molecule, periodic table and the law of variation in the mathematical system; the principles of thermodynamics, stoichiometry and the principle of equilibrium displacement; reaction rate and rate constant; solution formation, 	This course belongs to the Math and Natural Science knowledge group of the training program. The course consists of 02 credits of theory and 01 credit of practice related to basic general knowledge of chemistry. Specifically: Concepts related to basic laws in chemistry; Atomic structure and the laws of changing properties of elements in the periodic table; Molecular structure and nature of chemical bonds; Basic concepts and knowledge of chemical thermodynamics, chemical

		<p>electrode potential and Nesnst equation.</p> <ul style="list-style-type: none"> - Apply knowledge of General Chemistry to explain the nature of atomic/molecular bonds; explain the meaning of specific thermodynamic quantities in chemistry, calculate thermodynamic and kinetic quantities in chemical reactions. - Implement some basic techniques in practical exercises related to General Chemistry knowledge; Processing and presenting experimental results. - Organize work in groups to make reports and discuss topics related to the knowledge of General Chemistry. 	<p>kinetics, equilibrium, solutions, and concepts related to chemistry and electric current. With 1 practical credit, this course also helps learners to have basic laboratory skills related to laboratory safety rules when dealing with tools and chemicals; as well as master the basic operations related to the recognition of chemical environments, solution phase, titration, and electrochemistry.</p>
3	Calculus 2	<ul style="list-style-type: none"> - Explaining the meaning of concepts and theorems related to multiple integrals, line integrals, surface integrals, differential equations, and series. - Applying some software to calculate problems related to multiple integrals, line integrals, surface integrals and differential equations. - Applying theory of multiple integrals, line integrals, surface integrals, differential equations, and series to solve problems and applied problems in other 	<p>This course includes concepts, formulas and applications of multiple integrals (double and triple integrals) , line integrals (type 1 and 2), surface integrals (type 1 and type 2), series (number and functional series) and ordinary differential equations.</p>

		<p>sciences and in the real life.</p> <ul style="list-style-type: none"> - Organizing groups to solve some learning projects and some big problems based on mathematical models. 	
4	Probability and Statistics	<ul style="list-style-type: none"> - Explaining the meaning of concepts, formulas and properties related to random events, probability, distribution laws, descriptive statistics, estimation and hypothesis testing problems. - Applying statistical software to create statistical graphs and performance basic data analysis. - Applying theory of probability and the distribution laws to solve the related problems. - Applying theory of parameter estimation and hypothesis testing to make decisions for statistical problems 	<p>The course introduces probability theory and statistical methods. The learners are introduced the basic contents of random events, probability; random variables and probability distribution rules; limit theorems; random vector, conditional expectation, covariance and correlation coefficient. Mathematical statistics includes the basic contents of sample theory, descriptive statistics, methods for estimating the parameters of random variables, testing statistical hypotheses and comparison problems.</p>
5	Physics 1	<ul style="list-style-type: none"> - Apply knowledge of dynamics and energy to solve problems in translational and rotational motion; - Apply knowledge of thermodynamics to solve problems related to energy conversion and efficiency of heat machines; - Apply knowledge of optics to solve problems related to interference and diffraction of light; - Explain common phenomena related to 	<p>Physics 1 provides learners with knowledge of Mechanics, Thermodynamics and Optics. The course helps learners to study important content such as:</p> <ul style="list-style-type: none"> - Properties and laws of motion of particles and rigid solids; - The relationship between characteristic quantities of motion, the laws of change and conservation of momentum, angular momentum, energy; - The relationship between work, heat and internal energy in thermodynamic processes and applications to study the

		<p>Mechanics, Thermodynamics and Optics;</p> <ul style="list-style-type: none"> - Think critically and creatively; - Work in a team and communicate (written and oral); - Demonstrate positive, proactive and responsible learning attitude. 	<p>operation of heat engines, refrigerator/heat pump;</p> <ul style="list-style-type: none"> - Properties and applications of light interference and diffraction. <p>In addition, the course also helps learners develop communication and teamwork skills.</p>
6	Experiment of Physics 1	<ul style="list-style-type: none"> - Analyze the theoretical basis of Mechanics and Thermodynamics experiments - Practice Mechanics and Thermodynamics experiments properly and safely - Analyze and interpret experimental results - Write reports and present experimental results - Develop communication and teamwork skills - Show a positive, responsible and honest learning attitude 	<p>This course includes 05 experiments in the Electricity - Magnetic - Optical modules:</p> <p>Practice 1: Become familiar with basic measuring tools</p> <p>Practice 2: Measuring resistance by Wheatstone's bridge method</p> <p>Practice 3: Magnetic fields in straight conductors</p> <p>Practice 4: Measuring the refractive index of the glass plate with a microscope</p> <p>Practice 5: Light interference and diffraction</p>
7	Physics 2	<ul style="list-style-type: none"> - Determine the electric field, electric potential and electric potential energy of charged materials - Determine the magnetic field, magnetic force and magnetic energy caused by moving charges and currents - Apply knowledge of quantum physics to solve problems related to thermal radiation, 	<p>Physics 2 provides learners with knowledge of Electricity, Magnetism, and Modern physics. The course helps learners to study important content such as:</p> <ul style="list-style-type: none"> - Properties of electric field, electric potential energy and electric potential; - Properties of magnetic field, sources of magnetic field; - Laws of conduction; - The basic concepts and laws in modern physics.

		<p>photon, potential wells and atoms;</p> <ul style="list-style-type: none"> - Explain common phenomena related to Electricity, Magnetism, and Modern physics; - Think critically and creatively; - Work in a team and communicate (written and oral); - Demonstrate positive, proactive and responsible learning attitude. 	<p>In addition, the course also helps learners develop communication and teamwork skills.</p>
8	Experiment of Physics 2	<ul style="list-style-type: none"> - Analyze the theoretical basis of Mechanics and Thermodynamics experiments - Practice Mechanics and Thermodynamics experiments properly and safely - Analyze and interpret experimental results - Write reports and present experimental results - Develop communication and teamwork skills - Show a positive, responsible and honest learning attitude 	<p>This course includes 05 experiments in the Mechanics and Thermodynamics modules:</p> <p>Practice 1: Become familiar with basic measuring tools</p> <p>Practice 2: Determining the coefficient of sliding friction using an inclined plane</p> <p>Practice 3: Measuring the moment of inertia of a solid using the oscillation method</p> <p>Practice 4: Measuring the viscosity coefficient of a liquid using the Stokes . method</p> <p>Practice 5: Measuring the thermal expansion coefficient of a solid</p>
9	Linear Algebra	<ul style="list-style-type: none"> - Understand the meaning of operations on matrices, vector spaces, and linear maps - Apply matrix theory to physics, chemistry and other sciences. - Prove the basic results of matrix content, vector space and linear maps. - Improve a number of important competencies 	<p>The Linear Algebra course is divided into 5 chapters. Chapter 1 introduces matrices and determinants. Chapter 2: introduces the system of linear equations students know in high school. Chapter 3: vector spaces. Chapter 4: linear maps and quadratic forms. Chapter 5: introduces Quadratic form. The knowledge presented in the module is fundamental to</p>

		<p>and qualities such as mathematical thinking and reasoning, problem-solving and creativity, and self-study; honesty, hard work, perseverance and discipline</p>	<p>helping students, and it is easy to access when starting to familiarize yourself with advanced math.</p>
10	Applied Mathematics	<ul style="list-style-type: none"> - Application statistical probability in synthesis, analyzing data, designing - - Applying regression models in the analysis and evaluation of experimental data, structural analysis 	<p>The course provides knowledge about the application of statistical probability in synthesis, experimental planning for the design, construction, experiment, and exploitation of construction. The course also provides students with knowledge about regression models using in the analysis of experimental results, analysis, and calculation of construction structures in general.</p>
11	Experimental Planning	<ul style="list-style-type: none"> - Presenting and explaining the meaning of statistical terms - Calculating the model representing the relationship between the dependent variable according to the independent variables from the experimental data table - Analyzing the influence of the independent variable on the dependent variable - Designing an orthogonal first-order experimental design, and quadratic rotation-orthogonal composite experimental design. 	<p>The course equips students with the ability to apply mathematical methods to find out the relationship rules between factors affecting the research process and optimize experimental processes. The course introduces some parameters of random quantities, methods of building regression models, experimental planning methods of level 1, level 2, and some optimization methods. Besides, the module introduces some application software for calculation and describes the process of experimental planning.</p>

		- Designing an experimental plan to find extremes	
2. Basis knowledge on technology and industry			
1	Descriptive Geometry – Engineering Drawing	<ul style="list-style-type: none"> - Applying Vietnamese and international standards to create technical drawings - Solving intersection problems as well as quantity problems of points, lines and planes, curves and surfaces - Applying learned-knowledge to represent 6 basic orthogonal projections, sub-projections, partial projections; draw sections and sectional view. - Selecting the appropriate type of isometric and oblique projection to represent a 3D objects. 	The course aims to equip students with Vietnamese and international standards to form technical drawings. Draw and read types of representations of the internal and external structure of an object.
2	Thermal Engineering	<ul style="list-style-type: none"> - Present the laws of thermodynamics; Describe and differentiate the basic heat exchangers - Explain common thermodynamics and heat transfer phenomena - Apply basic knowledge and laws of thermodynamics to investigate basic thermodynamic processes and cycles; Apply heat and temperature field calculations to simple heat transfer problems. 	The Thermal Engineering module consists of two parts: The Engineering Thermodynamics section provides students with basic knowledge about the conversion between heat and work, the actual thermodynamic cycles; The Heat Transfer section provides students with basic knowledge about the methods of heat exchange, the method of calculating the amount of heat exchanged between two media.
3	Engineering Mechanics	- Model the real mechanical system into an equivalent model, determine the components of the bonding reaction	1. To develop an understanding of the fundamentals and principles engineering mechanics: statics and dynamics of particles, and rigid bodies in two and three

		<ul style="list-style-type: none"> - Determine the characteristics of the reduced force system in the case of planar problem - Apply the force system balance equation to find the binding reaction for the solid body. - Modeling and determining the kinematic characteristics of solid bodies - Modeling and applying the general theorems of dynamics to establish the equations of motion and associated reactions of the system 	<p>dimensions including: kinematics and kinetics of particles and rigid bodies in 2D and 3D motion, Rotations, translations, oscillations.</p> <p>2. Learn to solve equilibrium of rigid bodies including the calculations of moment of force, inertia moments of solid bodies, and basic structural analysis, and be able to determine the requirement for the equilibrium of particles and solid bodies.</p> <p>3. To develop the ability to apply Newtonian mechanics to model and predict the responses of simple dynamical system (particle and rigid body) subjected to applied forces.</p>
4	Geodesy	<ul style="list-style-type: none"> - Present and explain: Structural principle, how to use some common geodetic equipment; methods of basic measurements and positioning; algorithm in calculation and processing of field measurements. - Use common geodetic equipment. Employ basic measurements and positioning for mapping and construction. Handling of measured data. Exploiting topographic data for planning and designing works. - Analyze and detect errors affecting the quality of cartographic surveying 	<p>The course belongs to the fundamental knowledge, equipping learners with general knowledge about mapping and construction geodesy in service of surveying, design, exploitation, construction and management of works in the Construction Material Engineering. The course consists the general knowledge of geodesy , mapping knowledge and a knowledge of construction geodesy.</p>

		<p>and the location of construction sites</p> <ul style="list-style-type: none"> - Evaluate and analyze the quality of topographic data, the accuracy of the location of construction sites 	
5	Structural Mechanics	<ul style="list-style-type: none"> - Understand the role and meaning of load-bearing structures in construction works and the concepts used to describe and calculate the bearing capacity of structures. - Identify some basic types of load-bearing structures and their applicability as load-bearing structures. - Analyze the geometrical structure of the structural system. - Apply theory to calculate quantities such as geometrical characteristics, internal forces, stresses, displacements used to evaluate the bearing capacity of the structure. - Analyze the specific working forms of the bearing member cross section. - Assess the bearing capacity of the structure. 	<p>The content of this course has 7 chapters. Chapter 1 introduces an overview of load-bearing structures in construction, helping students orient the tasks, roles and meaning of the module. Chapter 2 presents how to analyze the geometrical structure of a planar system. Chapter 3 shows how to determine the geometrical characteristics of the cross-section and the mechanical properties of the material. Chapter 4 introduces the basic concepts of stress, internal force, how to determine and quickly draw internal force diagrams. Chapter 5 presents the bearing forms of the member sections, helping learners to design or evaluate the bearing capacity of the section. Chapter 6 shows how to determine the displacement of a straight bar system. Chapter 7 introduces superstatic and superdynamic systems and the principle of determining internal forces in this type of system.</p>
6	Construction Machines	<ul style="list-style-type: none"> - Describe the structure and working principle of the machine - Classify, name and list construction machines 	<p>The course belongs to the compulsory knowledge block. The course teaches students to study construction machinery groups such as transport machines, lifting machines,</p>

		<ul style="list-style-type: none"> - Compare machines with the same construction function, compare machines in the same machine group - Calculate the basic parameters of the machine - Explain some phenomena when the machine interacts with the object under construction 	<p>earthmoving machines, foundation reinforcement machines, and building materials production machines. Train students in thinking ability when using machines and equipment in the production of building materials and construction works; calculating machine use, selecting and coordinating machines reasonably, using machines effectively.</p>
7	Engineering Geology	<ul style="list-style-type: none"> - Present basic knowledge of engineering geology, hydrogeology recognize engineering geological phenomena - Calculate physico-mechanical properties in ground & foundation works. Calculate the seepage of underground water in certain ground - Evaluation of elements of engineering geological conditions, methods and technologies in engineering geological survey - Analysis of engineering geological survey reports, borehole cylinders, engineering geological cross-sections, table of physical and mechanical indicators of soil and rock - Ability to work in groups: students can cooperate, divide work, listen to the opinions of 	<p>The Engineering Geology module provides learners with knowledge about engineering geology such as: rock-forming minerals, construction soils and rocks in the earth's crust, classification of construction soils and properties of construction soils. construction; Hydrogeological basis of works, calculating the infiltration flow of underground water in different cases, lowering the groundwater level and draining the foundation pit; The processes and phenomena geology dynamics works; Methods and technology of engineering geological survey, construction geological survey records.</p>

		others, participate actively...	
8	Soil Mechanics	<ul style="list-style-type: none"> - Present and explain the composition and structure of soil; calculate the normal physical and mechanical properties of the soil; soil status assessment and classification. - Calculate the stress in the ground, calculate the settlement for the building foundation and settlement over time; Calculation to determine the bearing capacity for the ground, the stability of the slope and calculate the earth pressure acting on the retaining wall. - Analyze the factors affecting the properties of construction soil and evaluate the properties of soil. - Understand the experimental procedures and operating laboratory instruments and equipment to determine the normal physical and mechanical parameters of soil in the laboratory. - Follow the principles and support teamwork 	<p>This unit provides students with theoretical knowledge of soil physical and mechanical properties, determine the stress and strain in soils under loading and self-weight of soils, estimate the foundation settlement over time, predict the soil bearing capacity, slope stability and earth pressure for retaining walls.</p>
9	Construction materials	<ul style="list-style-type: none"> - Present and explain the composition, structure, production principles, mechanical and mechanical properties, applications, testing methods of Construction materials. 	<p>Course of construction material introduces basic knowledge about the main materials used in construction: Natural stone Material, construction ceramic, Inorganic binder, Concrete using inorganic binder, Wooden, etc. This course equips students with</p>

		<ul style="list-style-type: none"> - Calculating the mechanical and physical parameters of Construction materials from experimental data - Analyze the factors affecting the quality of Construction materials - Evaluation of the quality of Construction materials - Demonstrate experimental procedures and operate basic laboratory instruments and equipment - Adhere to principles and support teamwork 	<p>knowledge of composition, structure, production principles, mechanical properties, applications, experimental methods to determine the mechanical and physical properties of materials; the basis of quality assessment and how to choose the appropriate type of construction materials for each project.</p> <p>This is the basis for subjects in the basic group of industries such as Foundations, Reinforced Concrete Structures, Introduction of materials in construction, Applied chemistry, Worker Internship; Mathematics majoring in construction materials; specialized subjects such as Architectural Engineering, Construction Ceramic Technology, Concrete Technology, Construction materials Inspection and Testing, Light weight Concrete Technology...</p>
10	Ground and Foundation	<ul style="list-style-type: none"> - Differentiate and compare the advantages and disadvantages, the scope of application of deep foundation and foundation. - Calculate and design shallow foundation on the natural ground, low embedment pile foundation and high embedment pile foundation - Analyze of the factors influencing and forecasting the bearing 	<p>Foundations is one of the important specialized subjects for all civil engineering students. This course provides the concepts, background and principle in designing and building the foundations of the constructions. Therefore, it helps students to be able to recognize, distinguish, select, analyze and evaluate the foundation solutions (shallow foundation and deep foundation) as well as soil improvement methods when building the construction on soft soil ground.</p>

		<p>capacity of reinforced concrete piles and bored piles according to the update standards</p> <ul style="list-style-type: none"> - Analyze and propose solutions when building construction on soft ground; Apply specialized software in design pile foundation and soft soil improvement. - Plan and complete tasks on schedule, Team work skills: cooperate, share work, listen to other people's ideas, participate actively ... 	<p>This module equippes an important knowledge about foundations so that students can apply and connect their knowledge with other subjects in the civil engineering program.</p>
11	Reinforced Concrete Structures	<ul style="list-style-type: none"> - Have good character, professional ethics, and social responsibility - Remember the pros and cons, application of reinforced concrete structures - Remember the mechanical, physical properties of concrete, steel, and reinforced concrete - Analyse, design, calculation of the basic reinforced concrete elements - Analyse the damage of reinforced concrete structures - Ability to work in a team efficiently 	<p>This subject consists of 7 chapters. Chapter 1 helps students to understand an overview of reinforced concrete materials. Chapter 2 presents the physical and mechanical properties of concrete steel and properties of reinforced concrete elements. Chapter 3 introduces the principles of calculation, design and perform the draws of reinforced concrete structure. Chapters 4, 5, 6, 7 analyze, calculation and design of basic reinforced concrete elements.</p>
12	Industrial Architecture	<ul style="list-style-type: none"> - Explain the principles of planning design, design and structure of various types of industrial architectural works. 	<p>This is a technical foundation subject of architecture to provide students with content related to the introduction of industrial architectural design principles,</p>

		<ul style="list-style-type: none"> - Synthesize and propose design solutions for an industrial project in practical conditions - Self-selecting and drawing solutions and architectural forms for industrial works. - Form in learners a spirit of cooperation and a market-oriented approach to solving design problems in industry through solution-oriented design. 	<p>serving the technical design of industrial works later. . The learning contents include: industrial zone planning, design and architectural structure of industrial houses.</p>
3. Specialized knowledge			
1	Applied chemistry Engineering 1	<ul style="list-style-type: none"> - Explain the physico-chemical nature that occurs during the production and application of materials. - Distinguish among silicate crystal structures and minerals related to their respective crystal structures. - Compare three basic colloidal systems in the field of building materials. - Evaluation of the relationship between thermodynamic parameters and the phase equilibrium process - Use phase diagrams and calculate phase components of a given system. 	<p>The course introduces basic knowledge about the crystalline structure of materials in general and the structure of silicates, polymers; characteristic parameters of thermodynamics; phase diagram of the system of one, two and three components; colloidal state of silicates, physicochemical processes occurring in the manufacture and application of building materials. Knowledge is the basis to explain production technology, to propose solutions in production, application and research of materials. The course provides basic knowledge for next subjects such as Applied Chemistry 2, Production Techniques for inorganic binder, Technology of Concrete, Technology of building ceramics, and Smart Building Materials.</p>
2	Occupational safety in construction	<ul style="list-style-type: none"> - Present the general issues of occupational safety in the design, construction 	<p>The module introduces scientific and technical measures, economic and social</p>

	materials production	<p>and production of building materials</p> <ul style="list-style-type: none"> - Calculating the problem of ensuring safety in design and construction, production of building materials - Apply safe techniques when using construction machinery, construction soil and working on scaffolding in the production of building materials. - Remember electrical safety techniques, fire prevention in the production of building materials 	<p>organization to limit and eliminate dangerous and toxic factors, create favorable working conditions for employees, to prevent occupational accidents protect health, contribute to the protection and development of the production force, and increase labor productivity. At the end of the course, students gain an overview of occupational safety, principles and methods of calculating safety in the process of designing, constructing and manufacturing building materials.</p>
3	Thermal equipments in the production of construction materials	<ul style="list-style-type: none"> - Present and explain: <ul style="list-style-type: none"> - Theoretical basis of drying, calcinating and curing processes - The principle of motion of the heat carriers in the thermal equipment - The principle of heat calculation in thermal equipment - Present and explain the feature of equipment, operating principles, their installation in process line, select suitable equipment for each technology of building materials production. - Analyze the factors affecting the efficiency of the use of thermal equipment - Calculate problems about: 	<p>The course introduces basic knowledge about the types of thermal equipment mainly used in the industry of manufacturing the building materials. The course provides students knowledge about technological processes using heat energy such as drying, heating, curing, melting processes; Principle of heat calculation for thermal equipments; feature of equipment, operating principles, purposes of using thermal equipment with different types of products; Calculation method to design the thermal equipment, selection of thermal equipments and supporting equipment.</p> <p>This is the basis for courses belonging to specialized module such as production technique for inorganic binder, Technology of building ceramics, Technology of Concrete..</p>

		<ul style="list-style-type: none"> - - Fuel combustion, mixing of heat carriers - - Material balance and heat balance - - Furnace shell design 	
4	Machinery for the production of construction materials	<ul style="list-style-type: none"> - Present the structure, operating principle of the machine and equipment - Classify, name and list types of construction machines and equipment - Compare machines with the same construction function, compare machines in the same machine group - Calculate and evaluate the basic parameters of the machine and equipment 	<p>The course Machinery for Production of Building Materials provides students with fundamental knowledge (application, kinematic diagrams, structure and operating principles, advantages and disadvantages, scope of use) of machines and equipment. The equipment is used to carry out the main processes in the production of building materials (threshing, crushing, sieving, sorting, cleaning, dosing, feeding, mixing, shaping, ...). The general formulas about the working basis features of equipment, calculating the main parameters to choose the right equipment in the line.</p>
5	Production technique for Inorganic binder 1	<ul style="list-style-type: none"> - Present and explain: <ul style="list-style-type: none"> - The composition, structures, physico-mechanical properties, technical requirements and scope of use of various types of inorganic binders (gypsum binders, lime binders, cement) - Present and explain: <ul style="list-style-type: none"> - The quality assessment method of different types of inorganic binders, the selection methods of inorganic binders in accordance with the requirements of the construction works - Present and explain: <ul style="list-style-type: none"> - The composition and production techniques of 	<p>The Production Technique for Inorganic Binders 1 Course introduces in-depth knowledge on the fundamental types of inorganic binders used in construction, the most important of which is cement. This course provides knowledge on the composition, structures, physico-mechanical properties, technical requirements and scope of use of various types of inorganic binders; raw materials and production techniques of gypsum binders, lime binders; as well as raw materials and production techniques of several types of cement from clinker.</p>

		<p>gypsum binders and lime binders</p> <ul style="list-style-type: none"> - - The composition and production techniques of cement from cement clinker - Analyze the technological factors affecting the quality of inorganic binders - Establish the production lines for gypsum binders, lime binders, and cement grinding plants 	
6	English for Construction Materials Engineering	<ul style="list-style-type: none"> - Read and understand specialized documents in English - Apply technical terms in English to present simple reports. - Presenting a simple specialized report in English - Adhere to the principles of teamwork and support group work 	<p>The course provides students with basic knowledge of English in the field of Construction Materials Engineering and Technology. Therefore, students can become familiar with specialized terms in English, and find and read specialized documents in English by themselves. In addition, the course also provides students with practical specialized knowledge through documents and videos that teachers provide during the learning process.</p>
7	Technology of Building Ceramic 1	<ul style="list-style-type: none"> - Present the properties, structure and application of building ceramics, products, stages of building ceramics production. - Analyze and evaluate the quality of raw materials and ingredients - Calculation and selection of ingredients for materials - Evaluation and selection of production methods - Design a technology line diagram 	<p>The course introduces the knowledge about ceramic materials used mainly in construction such as: properties, structure, raw materials, distribution and production methods. The module will provide knowledge for the PBL4, Graduation Project and server sections for bachelors working in field studies, design, production and testing.</p>
8	Technology of Concrete 1	<ul style="list-style-type: none"> - Explain the knowledge about the properties and rheological characteristics of the concrete mix as well 	<p>This course provides knowledge about the properties and rheological properties of concrete mixes, the</p>

		<p>as the solidification process, the formation of the structure of cement stone in concrete; properties of concrete and concrete mixtures.</p> <ul style="list-style-type: none"> - Select solutions to improve the technical performance of ordinary concrete and high-quality concrete in accordance with the requirements of structural and structural engineering technology. - Calculate the reasonable and optimal aggregate particle composition; composition of normal concrete and high strength concrete in accordance with the requirements in actual production. - Select the suitable technology and equipment for the production line of concrete mixes and the aggregate concrete building material factory 	<p>solidification process and the formation of structures in concrete. In addition, the course also focuses several topic including the methods of characterization; Measures to improve the performance of ordinary concrete, high strength concrete and other special concrete in accordance with forming technology. Methods of calculating concrete mix, Technology of manufacturing concrete mixes and production of aggregate concrete building materials.</p>
9	Construction Materials Testing & Inspections	<ul style="list-style-type: none"> - Present and explain the objectives, principles, methods and procedures of material inspection in the works. - Analyze and select suitable test methods for testing for each type of materials - Perform experiments on physical and mechanical criteria of materials - Calculate and collect experimental data - Evaluate the quality of materials and analyze the factors affecting the quality of materials used for construction work 	<p>The course on Construction Materials Testing & Inspections introduces comprehensive knowledge about the quality control of the main materials used in construction work: ceramic construction materials, concrete manufacturing materials, and concrete using inorganic binders, metal materials. The course provide students with knowledge about material inspection; destructive and non-destructive testing methods to evaluate the quality of materials used for construction work.</p> <p>This course also helps students have practical skills, teamwork</p>

		<p>and construction materials.</p> <ul style="list-style-type: none"> - Comply to principles and support teamwork activities 	<p>skills, communication skills; skills in self-research, analysis data and reporting in material inspection.</p>
10	Heat insulating and Heat resistant Materials	<ul style="list-style-type: none"> - Present the structure, operating principle of the machine and equipment - Classify, name and list types of construction machines and equipment - Present groups of methods to fabricate materials with large hollow structures - Organize the content presented, have presentation skills, self-study, synthesize and work in groups through exercises and thematic reports. 	<p>The course equips students with basic knowledge, properties of starting materials of each type of insulation and heat-resistant materials, technical properties and methods of evaluating the quality of such products. as well as manufacturing technology process and field of use. For students majoring in building materials, these contents will be developed into in-depth research topics on new materials.</p>
11	Building Glass	<ul style="list-style-type: none"> - Present the properties and roles of building glass products. - Describe production technology and fabrication method of construction glass products; Develop principles of production organization and production technology of products. - Evaluate the quality and use of glass products in construction works - Organize the content of the report, have oral presentation skill, self-study skill, teamwork skill through exercises and special topics 	<p>The course introduces the knowledge of raw materials and technology to manufacture construction glass products. The main properties and composition of raw materials, products and the selection of glass products for construction works are mentioned.</p>

12	Building Decorative and Complete Materials	<ul style="list-style-type: none"> - Presenting physical and mechanical properties, technical requirements and scope of use as well as production principles, origin, and the role of each material for each type of decorative and finishing materials. - Analysis and selection of materials suitable for the purpose of using the project. - Evaluation of the quality of decorative and finishing products - Organize the content presented, have presentation skills, self-study, synthesize and work in groups through exercises and thematic reports. 	<p>The course equips students with basic knowledge about decorative materials and interior and exterior finishing of construction works. Specifically, the module introduces the nature of the process of using decorative and finishing products, the properties of the input materials, the manufacturing technology process, the technical properties, the method of use and way of assessing the quality of decorative materials and finishes of a building.</p>
13	Construction Economics	<ul style="list-style-type: none"> - Understanding the basic issues of the form of establishment and organizational structure of the enterprise. - Applying knowledge to plan and organize the production process for enterprises - Applying knowledge of financial management in business - Evaluating the effectiveness of investment projects and use tools in project management 	<p>The course provides engineering students with basic knowledge related to economic and management in industrial enterprises, including basic knowledge of business organization, production management, financial management, efficient assessment and investment projects management, and develop plans to meet market demands. Through this course, students are able to identify, analyze, and solve relevant problems in production, operation, and production management as well as business activities in industrial fields effectively.</p>

4. Knowledge in conducting the project, internship and graduation

1	PBL Foundations Project	<ul style="list-style-type: none"> - Gather geological survey data, construction load, read and understand input data for foundations design. - Analyze and evaluate geological data, load to select and propose foundation and foundation options for the project. 1. - Calculate and design foundation and foundation plans for construction works according to current standards and presenting the results by product descriptions and drawings. - Organize work in groups to implement projects and present project results with a full range of products as required. 	<p>Module PBL1 - Foundations Project will system input data on Engineering Geology, load to design foundation for a construction project. Students collect data from the problem or from the actual work, evaluate the geotechnical conditions of the project and propose the design of the foundations. Calculation and design for shallow foundation and pile foundation options are required. The product is a description of design calculations and a set of drawings showing the results of PBL1 foundations in accordance with current standards and actual works. This is part of the core content for students to do Graduation Project related to calculation of foundation structure.</p>
2	PBL Reinforced Concrete Structures	<ul style="list-style-type: none"> - Select appropriate structural plan for the reinforced concrete slab system - 2. - Analyze and design appropriately basic cast-in-place reinforced concrete slabs and beams. - Apply structural analysis softwares into analyzing and design of structural elements - Cooperate to complete assigned team workload efficiently - Have good writing and presentation skills 	<p>In this course, students will work in groups to perform analysis and design of reinforced concrete slabs and beams. Project tasks include selecting appropriate structural plan for the reinforced concrete slab system, calculating dead and live loads, determining internal forces using both hand calculations and structural analysis softwares, calculating main and other reinforcement for slabs and beams. All design results are presented in the project report and technical drawings. Students defend their project at the end of the course</p>

3	<p>PBL 3. Production technique for Inorganic binder 1</p>	<ul style="list-style-type: none"> - Apply fundamental engineering knowledge and professional engineering knowledge to design production plant/workshop for gypsum binders, lime binders, or cement from cement clinker (Part 1) - Analyze, select and propose an effective production plan - Perform binder quality control according to the chosen experimental direction (Part 2) - Present the results of the group's PBL implementation: project description, drawings, reports - Organize effective small group work 	<p>Project of Production Technique for Inorganic Binders 1, which is an interdisciplinary course combining 03 modules: Production Technique for Inorganic Binders 1, Construction Materials, and Industrial Architecture, is organizationally placed in the 6th semester.</p> <p>The content of this course is to synthesize the fundamental engineering knowledge and professional engineering knowledge students have acquired in order for them to create an engineering design of a production plant/workshop for gypsum binders, lime binders, or cement from cement clinker, which shall include 02 parts:</p> <p>Part 1: Production Plant/Workshop Design</p> <ul style="list-style-type: none"> - Select raw materials & production methods - Establishing a production line - Calculate mass balance - Calculate and select equipment for the production line - Create production plant/workshop layout <p>Part 2: Choose 01 of the following experimental directions</p> <ul style="list-style-type: none"> - Experiment with product manufacturing and product quality control for gypsum binders and lime binders - Experiment to determine the mixing ratio of admixtures and perform cement quality control according to that ratio
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4	PBL 4. Technology of Building Ceramic 1	<ul style="list-style-type: none"> - Apply the method of calculation and selection of components for ceramic materials. Testing the properties of raw materials and mixtures. - Analyze, select and propose an effective production plan - Select suitable production equipment and machinery - Present the results of the group's PBL implementation: project description, drawings, reports - Organize effective small group work 	<p>Project of Technology of building ceramics 1, which is an interdisciplinary course combining 03 modules: Technology of building ceramics 1, Construction Materials, and Machinery for the production of construction materials. The module helps students design the production line of basic building ceramic materials as well as the production workshop. With content from raw material selection, mix calculation and experiment; analysis and selection of production methods; technology design and calculation; selection of machines and production equipment. The course will provide knowledge for the Graduation Project and server sections for bachelors working in field studies, design, production and testing.</p>
5	PBL5. Technology of Concrete 1	<ul style="list-style-type: none"> - Carry out experiments to determine the optimal particle distribution of 	<p>PBL5 belongs to the project knowledge module combined with Machines and equipment</p>

		<p>aggregates, material properties, properties of concrete mixes and hardened concrete, the influence of additives, environment and time on properties of fresh concrete</p> <ul style="list-style-type: none"> - Apply computational methods combined with experiments to design the composition of ordinary concrete and high-strength concrete - Analysis and select the technology and equipment to design a commercial concrete batching plant and production line of aggregate concrete materials - Present the principle of operation, perform the calculation of basic parameters and show it on the explanations and drawings of some machinery and equipment in the technological line 	<p>for the production of construction materials. The course provides practical knowledge to evaluate the quality of concrete materials. Component design of normal concrete and high strength concrete. Determination of properties of concrete and concrete mixtures. Determine the influence of additives, environment and time on the properties of concrete during production. Design technology, machinery and equipment for concrete mix production and aggregate concrete production technology.</p>
6	Worker Practice	<ul style="list-style-type: none"> - Present structures of construction items, construction technologies (methods, orders, materials) at the practical sites. - Capable of using a number of equipment for surveying and constructing in construction sites, and performable some works on the site such as 	<p>This course purposes are helping students involve construction work on the site, understand structure and order of construction items, and important points during construction processes to achieve the highest quality. Students will have an opportunity to combine between theoretical issues and practical works, as well as having professional training for ethics and responsibilities on the construction site.</p>

		<p>steelwork, concrete work, etc.</p> <ul style="list-style-type: none"> - Combine between theoretical learning and political issues - Working group and team communication skills - Working with reports and drawings - Presentation skills and defend skills - Ethical and professional responsibility. 	
7	Construction materials fieldtrip	<ul style="list-style-type: none"> - Describe the basic technological line, production scale of a factory or production facility of construction materials. - Compare the production and use of materials in practice with theoretical knowledge learned. - Realize reality for career orientation. - Organize group activities and increase communication skills. - Show discipline and professional ethics. 	<p>The course provides students with the awareness and the development orientation of the training major. Visiting production facilities, construction sites, making students understand the process of production and use of materials at the agency receiving the internship. The course also adds practical knowledge to the content already in university.</p>
8	Gradiation Internship	<ul style="list-style-type: none"> - Present the production technology diagram of a factory producing building materials and concrete structures - Develop communication skills - Compare between theory in class and actual production - Apply the theory to each stage in the production 	<p>The course offers students opportunities to be familiar with the jobs of a bachelor in Construction Materials Engineering and Technology in areas such as binder manufacturing technology, concrete structure production, building ceramic technology, Construction, Design; materials Research. The students can collect documents and data for</p>

		<p>and operation of the factory</p> <ul style="list-style-type: none"> - Use foreign languages, softwares, tools and machines to serve the production process of building materials - Analyze the actual situation to propose solutions to improve production technology - Determine the position and roles of a bachelor for a project or in the manufacturing plant - - Develop teamwork skills - Collect data for professional work 	<p>graduation projects. Students can apply the knowledge to be able to solve problems in real production, know how to handle situations that occur in the field and factory.</p>
9	Graduation Project - Binders	<ul style="list-style-type: none"> - Establish production targets: 02 products (types, physico-mechanical properties, technical requirements, scope of use, domestic & global production and consumption) - Analyze & select construction sites; raw material sources; production methods - Conduct empirical experiments on batch mixing by using 2÷3 types of admixtures with different ratios to manufacture products in accordance with the set targets - Create a technical design of production workshop/plant: establish production line; calculate mass balance; calculate & select 	<p>The Graduation Project for the Undergraduate/Bachelor level of the Construction Materials Engineering and Technology major is a compulsory elective course included in the Professional Engineering Knowledge module. This course synthesizes the knowledge of fundamental engineering subjects and professional engineering subjects. The course content shows the volume of either engineering design projects of manufacturing workshops or plants, research and manufacture of construction materials; or testing of raw materials and products properties. After completing the course, students are equipped to create a technical design of a workshop or a plant for construction material production, or research and</p>

		<p>equipment; calculate economy.</p> <ul style="list-style-type: none"> - Present reports (project description, drawings, slides) - Present & defense project 	<p>manufacture different construction material products.</p>
10	Graduation Project - Ceramics	<ul style="list-style-type: none"> - Establish production targets: 02 products (types, physico-mechanical properties, technical requirements, scope of use, domestic & global production and consumption) - Analyze & select construction sites; raw material sources; production methods - Conduct batch mixing in accordance with the set targets - Create a technical design of production workshop/plant: establish production line; calculate mass balance; calculate & select equipment; calculate economy. - Present reports (project description, drawings, slides) - Present & defense project 	<p>The Graduation Project for the Undergraduate/Bachelor level of the Construction Materials Engineering and Technology major is a compulsory elective course included in the Professional Engineering Knowledge module. This course synthesizes the knowledge of fundamental engineering subjects and professional engineering subjects. The course content shows the volume of either engineering design projects of manufacturing workshops or plants, research and manufacture of construction materials; or testing of raw materials and products properties. After completing the course, students are equipped to create a technical design of a workshop or a plant for construction material production, or research and manufacture different construction material products.</p>
To11	Graduation Project - Concrete	<ul style="list-style-type: none"> - Selecting the product aims to implement the design (Basic properties of the products and consumption ability; Choosing the types of raw materials, origin, and technical requirements of 	<p>The graduation project in concrete is a compulsory elective course of undergraduate program of Construction Materials Engineering and Technology . Its contents belong to the specialized knowledge module or the professional Engineering module, including</p>

		<p>manufacturing materials).</p> <ul style="list-style-type: none"> - Evaluating technical factors of raw materials. Carrying out experiments to design and mix concrete types according to the product's aims. - Analyzing and selecting construction sites, Production planning; Selecting the technology line diagram and calculating material balance. - Designing the concrete production s: calculating and selecting machinery and equipment; quality control process; architectural design; calculating economic efficiency of investment. - Report presentation (reports, drawings, slides). - Oral presentation and defense. 	<p>cement (binder), construction ceramics, and concrete. The course provides students with skills in the inspection and evaluation in properties of raw materials and concrete products; the skills in designing the engineering technology of a concrete factory or researching and fabricating concrete products used in the construction industry.</p>
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5. General knowledge

1	Marxism Leninism's Philosophy	<ul style="list-style-type: none"> - Present general knowledge about Marxist-Leninist philosophy - Identify the role of philosophy in social life - Analyze the basic contents of dialectical materialism - Appreciate the contributions of dialectical materialism in creating worldview for learners 	<p>The course provides basic knowledge of Marxist-Leninist Philosophy: matter and consciousness; categories of dialectical materialism; the role of production and the nature of the production relations of a society explained by the level of development of its productive forces; infrastructure and superstructure; class and class struggle; humanism and the historical creative role of the masses.</p>
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		<ul style="list-style-type: none"> - Explain the basic contents of the materialist dialectic - Describe the methodological significance of each content of the materialist dialectic - Present the basic contents of historical materialism - Describe the value of historical materialism to society 	
2	General Law	<ul style="list-style-type: none"> - Analyse the basis issues about the State and the Law. - Compare state agencies in the State apparatus of Vietnam. - Analyse legal issues, legal relations, legal violations, implement laws and legal responsibilities. - Present issues of legal system, legal awareness and legislation - Evaluate corruption prevention issues 	<p>This course aims to equip learners with the most basic knowledge about the State and the Law.</p> <p>The basic content of the course includes: General issues on the State and the Law such as the State apparatus, the legal norm and legal relations, law violations. In addition, this course also provides learners some basic knowledge about anti-corruption.</p>
3	Political economics of Marxism Leninism	<ul style="list-style-type: none"> - Analysis of the characteristics, nature and laws of movement of the market economy; capitalist market economy - Analysis of the characteristics and nature of the socialist-oriented market economy and economic benefit relations in Vietnam - Analyze the process of industrialization, 	<p>The course is comprised of two main parts:</p> <ul style="list-style-type: none"> - The first part studies the political-economic issues of the capitalist mode of production in both the free competition and the monopoly stage. - The second studies the issues of the socialist-oriented market economy and the relations among economic interests in Vietnam; Vietnam's industrialization, modernization

		modernization and international economic integration of Vietnam.	and international economic integration.
4	History of Vietnamese Communist Party	<ul style="list-style-type: none"> - Get an understanding of the foundation process of the Communist Party of Vietnam, the way of revolution, national liberation, and national reunification. - Analyze some primary contents in the historical significance of the foundation of the Communist Party of Vietnam, the process of implementing the revolutionary policies, national liberation, and national reunification. - Be aware of the policies of industrialization, economics, politics, building political system and new culture, etc. - Practice some fundamental contents in the process of the Party's leadership in implementing the industrialization, economic, and foreign policy guidelines, building a new political system and culture, etc. - Train learners in a theoretical thinking way, research ability, lifelong learning, presentation, communication, group work, etc., to comply with the Party's policies, State laws and are aware 	Besides to introduction and conclusion chapters, the course consists of 3 chapters related to scientific acknowledgement about the subjects, purposes, tasks, research and learning methods of the History of the Communist Party of Vietnam; The Communist Party of Vietnam was established and led the revolution for founding nation (1930-1945); Leading two resistance wars, completing national liberation and reunification (1945-1975); Leading the country in the transition to socialism and conducting the innovation (1975-2018); Some great lessons under Party leadership. Thereby, it is possible to affirm the successes and advantages, highlighting the limitations and experiences in the revolutionary leadership process of the Party.

		of the responsibility of citizens for society.	
5	Environment	<ul style="list-style-type: none"> - Explain the concepts of environment, resources, environmental pollution due to development activities, climate change, the importance of environmental protection and rational exploitation and use of resources - Explain the causes of environmental pollution and its impacts on people and resources due to development activities. - Assess human impacts on the environment and solutions to minimize those negative impacts - Apply relevant knowledge to come up with suitable ideas and solutions to minimize negative impacts on the environment. 	<p>This course provides students with the basic knowledge of environment, resources and ecosystems, the knowledge of environmental pollution of air, water, soil, solid waste and some other types of pollution such as noise, heat, radiation; solutions to minimize environmental pollution to take appropriate actions in everyday life and the Concepts, principles and solutions for achieving environmental harmony and sustainable development, Vietnamese environmental law..</p>
6	Scientific socialism	<ul style="list-style-type: none"> - Understand the birth process of the Party, the way of struggle for power, national liberation, and national reunification - Clarifying the meaning of the birth of the Party, the process of implementing the line of struggle for power and the line of national liberation and unification of the mangroves. - Analyze the guidelines on industrialization, building a socialist- 	<p>The course is comprised of two main parts:</p> <ul style="list-style-type: none"> - The first part studies the core issues of Scientific Socialism, one of the three components of Marxism-Leninism. - The second part studies Vietnam's socio-political issues related to socialism and the path to socialism in Vietnam.

		<p>oriented market economy and international economic integration; build a new political system and culture.</p> <ul style="list-style-type: none"> - Clarifying the results, meanings and causes of the process of implementing the renovation policy on industrialization, building a market economy, and integrating into the international economy; build a new political system and culture. - Train learners in theoretical thinking style, research ability, lifelong learning, presentation, communication, teamwork; abide by the Party's guidelines, the State's laws and the sense of civic responsibility before society. 	
7	Ho Chi Minh's ideology	<ul style="list-style-type: none"> - Be aware of the basic knowledge of Ho Chi Minh's ideology and morality as well as identify wrong views on Ho Chi Minh's ideology - Present some primary contents about Ho Chi Minh's ideology and morality. - Apply some primary contents of Ho Chi Minh's ideology and morality in studying, working and self-training. 	<p>Ho Chi Minh ideology is a science that provides basic knowledge of President Ho Chi Minh's ideology with the meaning of creative application of Marxist-Leninist theory to specific conditions in Vietnam. It has also been the direct theoretical basis in planning the direction of the Vietnamese revolutionary from 1930 to the present. This course helps students understand in a relatively complete and systematic way the historical - social context, the basis of formation and development of</p>

		<ul style="list-style-type: none"> - Analyze some primary contents about Ho Chi Minh's ideology and morality, especially his creations in theory and practical direction of the Vietnamese revolution. 	<p>Ho Chi Minh ideology; The primary contents of Ho Chi Minh ideology on National issues and national liberation revolution; on socialism; On that basis, it contributes to helping students establish a scientific and revolutionary viewpoint, steadfastly following the path chosen by President Ho Chi Minh and our Party.</p>
6. Additional knowledge			
1	Informatics Certificate		Based on general request
2	Certificate of English proficiency		Based on general request
3	Physical Education		Based on general request
4	National Defense Education		Based on general request
5	Introduction to Construction Materials Engineering and Technology	<ul style="list-style-type: none"> - Describe profession in the field of CMET and discuss the education program of CMET, systematically approach the subjects of the education program - Explain the benefits brought in applying the knowledge of CMET in the context of business and society - Recognize the importance of morality and responsibilities of bachelors. - Explain the main components of project management; apply communication, teamwork, and presentation skills 	<p>The course introduces an overview of the profession and structure of education program of the construction materials engineering and technology (CMET); help students form personal skills, communication skills; familiarize the design thinking experiences on engineering projects to prepare them for learning in the following semesters.</p>
6	English A2.1	<ul style="list-style-type: none"> - Understand and demonstrate basic knowledge related to 	<p>The course is designed to integrate four language skills of</p>

		<p>English vocabulary, pronunciation, and grammar at the first stage of the elementary level.</p> <ul style="list-style-type: none"> - Apply knowledge to comprehensively listen and read the main ideas of a description, a conversation on topics related to daily life and work. - Communicate, describe issues, briefly express personal opinions on familiar topics related to personal interests, study, work or daily life. - Write notes, simple instructions and short emails related to familiar topics. - Develop a sense of self-study, self-training to complete learning goals, and a sense of responsibility for the assigned work. 	<p>Listening, Speaking, Reading and Writing. The course includes 5 units with lessons, providing the students with knowledge of grammar, vocabulary, pronunciation to practice language skills at the first stage of the elementary level. After each lesson at school, students can practice intensively with references and online resources.</p>
7	English A2.2	<ul style="list-style-type: none"> - Understand and demonstrate basic knowledge related to English vocabulary, pronunciation, and grammar at the elementary level. - Apply knowledge to comprehensively listen and read the main ideas of a description, a conversation on topics related to daily life or past events. - Communicate, describe issues, briefly express personal opinions on familiar topics related to study, job, tourism or past events. - Write messages, thank-you letters, and short emails related to familiar topics. 	<p>The course integrates four language skills of Listening, Speaking, Reading and Writing, for learners to develop and perfect their English skills at elementary level. The course includes 5 units with lessons, providing the students with knowledge of grammar, vocabulary, pronunciation to practice language skills on familiar topics. After each lesson at school, students can practice intensively with references and online resources.</p>

		<ul style="list-style-type: none"> - Develop a sense of self-study, self-training to complete learning goals, and a sense of responsibility for the assigned work. 	
8	Economics and Management for Industrial Enterprise	<ul style="list-style-type: none"> - Understanding the basic issues of the form of establishment and organizational structure of the enterprise. - Applying knowledge to plan and organize the production process for enterprises - Applying knowledge of financial management in business - Evaluating the effectiveness of investment projects and use tools in project management 	The course provides engineering students with basic knowledge related to economic and management in industrial enterprises, including basic knowledge of business organization, production management, financial management, efficient assessment and investment projects management, and develop plans to meet market demands. Through this course, students are able to identify, analyze, and solve relevant problems in production, operation, and production management as well as business activities in industrial fields effectively.
9	Managerial Economics for Engineering	<ul style="list-style-type: none"> - Understanding the basic issues of the form of establishment and organizational structure of the enterprise. - Applying knowledge to plan and organize the production process for enterprises - Applying knowledge of financial management in business - Evaluating the effectiveness of investment projects and use tools in project management 	The course provides engineering students with basic knowledge related to economic and management in industrial enterprises, including basic knowledge of business organization, production management, financial management, efficient assessment and investment projects management, and develop plans to meet market demands. Through this course, students are able to identify, analyze, and solve relevant problems in production, operation, and production management as well as business

			activities in industrial fields effectively.
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G. COURSE SYLLABUS

The course syllabus based on the learning outcomes is designed according to the prescribed form, which is fully shown in Appendix 1.

H. GUIDELINES FOR IMPLEMENTATION OF THE PROGRAM

The program complies with the current regulations of the Ministry of Education and Training and the University of Science and Technology - the University of Danang on bachelor training in the form of credits. This program is reviewed, revised, and adjusted annually to meet the CMET program's development and society's needs.

I. EVALUATING, UPDATING, AND IMPROVING THE TRAINING PROGRAM

I. Updating the training Program

The head of the construction materials division and lecturer staff in the division shall periodically organize to review and update the training program no more than every two years in accordance with the current regulations of the University of Science and Technology and Circular 07/2015/ TT-BGDDT issued by the Ministry of Education and Training on April 16, 2015.

The Rector decides to issue the updated training program after it is adjusted and updated based on recommendations of the Science and Training Council.

II. Evaluating the training Program

The head of the construction materials division and lecturer staff in the division shall periodically must organize the evaluation and improvement of the training program at least every 5 years, in accordance with the current regulations of the University of Science and Technology and Circular 04/2016/TT-BGDDT of the Ministry of Education and Training issued on March 14, 2016.

The Rector decides to issue an improved and revised training program after it is evaluated based on recommendations of the Science and Training Council.

Dean of the faculty

The Rector

APPENDIX 1: SYLLABUS DESCRIPTION

The syllabus description is based on the learning outcomes of the program designed according to the prescribed form. Described in detail in the attached Syllabus description.

APPENDIX 2: LIST OF STAFFS IN THE PROGRAM

2.1. List of organic lecturers of the program (*)

No.	Full name	Title	Professorship	Email	Affiliations	Course in charge
1	Huynh Phuong Nam	Doctor of Engineering		hpnam@dut.udn.vn	The University of Danang	Experimental Planning, English for Construction Materials Engineering
2	Do Thi Phuong	Master of Engineering		dtphuong@dut.udn.vn	Faculty of Bridge and Road Engineering	Technology of Building Ceramic; Construction Materials; chemical application engineering 2
3	Nguyen Tien Dung	Master of Engineering		ntdung@dut.udn.vn	Faculty of Bridge and Road Engineering	Machinery for the production of construction materials; Technology of Concrete
4	Nguyen Van Quang	Doctor of Engineering		nvquang@dut.udn.vn	Faculty of Bridge and Road Engineering	Thermal equipments in the production of construction materials; Applied chemistry Engineering; Building Glass
5	Vu Hoang Tri	Master of Engineering		vhtri@dut.udn.vn	Faculty of Bridge and Road Engineering	Experiment of Construction Materials
6	Nguyen Minh Hai	Doctor of Engineering		nmhai@dut.udn.vn	Faculty of Bridge and	Construction Materials; Building

					Road Engineering	Decorative and Complete Materials; smart construction materials
7	Bach Quoc Tien	Doctor of Engineering		bqtien@dut.udn.vn	Faculty of Bridge and Road Engineering	Engineering Geology; Soil Mechanics
8	Le Van Dinh	Master of Engineering		lvdinh@dut.udn.vn	Faculty of Bridge and Road Engineering	Geodesy
9	Pham Van Ngoc	Master of Engineering		pvngoc@dut.udn.vn	Faculty of Bridge and Road Engineering	Soil Mechanics; Ground and Foundation
10	Tran Khac Vi	Master of Engineering		tkvi@dut.udn.vn	Faculty of Bridge and Road Engineering	Engineering Geology
11	Phan Duc Tam	Master of Engineering		pdtam@dut.udn.vn	Faculty of Bridge and Road Engineering	Geodesy
12	Vo Duy Hung	Doctor of Engineering		vdhung@dut.udn.vn	Faculty of Bridge and Road Engineering	Occupational safety in construction materials production; Specialized informatics

Organic technicians and experiment instructors

No.	Full name	Tittle	Professorship	Email	Affiliations	Course in charge
1	Vu Hoang Tri	Master of Engineering		vhtri@dut.udn.vn	Faculty of Bridge and Road Engineering	Experiment of Construction Materials
2	Nguyen Thi Phuong Khue	Master of Engineering		ntpkhue@dut.udn.vn	Faculty of Bridge and Road Engineering	Experiment of Soil Mechanics

2.2. List of participating lecturers in the program

No.	Full name	Tittle	Professorship	Email	Affiliations	Course in charge
1	Tran Trung Viet	Doctor of Engineering		ttviet@dut.udn.vn	Faculty of Bridge and Road Engineering	Applied Mathematics Engineering
2	Cao Van Lam	Doctor of Engineering		cvlam@dut.udn.vn	Faculty of Bridge and Road Engineering	Project management Construction Materials Testing & Inspections
3	Vuong Le Thang	Doctor of Engineering		vlthang@dut.udn.vn	Khoa XDDD&CN	Reinforced Concrete Structures
4	Nguyen Quang Trung	Master of Engineering		nqtrung@dut.udn.vn	Faculty of Project Management	Construction Economics;
5	Huynh Nhat To	Doctor of Engineering		hnto@dut.udn.vn	Faculty of Project Management	Economics for Business
6	Nguyen Van Chinh	Doctor of Engineering		nvchinh@dut.udn.vn	Faculty of Civil Engineering	Reinforced Concrete Structures; PBL2;
7	Nguyen Van Huong	Doctor of Engineering	Associate professor	nvhuong@dut.udn.vn	Faculty of water engineering construction	Materials for hydraulic structures
8	Nguyen Khanh Linh	Master of Engineering		nklinh@dut.udn.vn	Faculty of Civil Engineering	Construction Machines
9	Nguyen Anh Tuan	Doctor of Engineering	Associate professor	<u>natuan1@dut.udn.vn</u>	Faculty of Architecture	Industrial Architecture

10	Nguyen Duc Tuan	Bachelor of Engineering		ndtuan@dut.udn.vn	Faculty of Bridge and Road Engineering	Technology of Concrete; Applied Mathematics Engineering; Experimental Planning
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2.3. List of visiting lecturers in the program

No.	Full name	Title	Professorship	Email	Affiliations	Experience	Course in charge
1	Le Xuan Chuong	Master of Engineering		lxchuong@dut.udn.vn	Faculty of Bridge and Road Engineering	14 years experience as a lecturer in The University of Danang, University of Sciecne and Technology	Technology of Concrete 1; Heat insulating and Heat resistant Materials
2	Nguyen Thi Tuyet An	Master of Engineering		nttan@dut.udn.vn	Faculty of Bridge and Road Engineering	14 years experience as a lecturer in The University of Danang, University of Sciecne and Technology	Production technique for Inorganic binder; asphalt concrete technology

APPENDIX 3: COMPARISON TABLE WITH DOMESTIC AND INTERNATIONAL PROGRAMS

No.	Items	Curent program			Program of Civil Engineering Bachelor of Science-Northen Arizona University		Program of Construction materials engineering and technology in Ho Chi Minh City University of Technology (HCMUT)			
		Credit number	Percentage (%)		Credit number	Percentage (%)	Credit number	Percentage (%)		
0	Knowledge modules									
	1. Natural Sciences and mathematics knowledge	30	23.1%		35.0	26.7%		30	22.9%	
	2. Basis knowledge on technology and industry	30.5	23.5%		40	30.5%		39	29.8%	
	3. Specialized knowledge	25	19.2%		43	32.8%		27	20.6%	
	4. Knowledge in conducting the project, internship and graduation	18.5	14.2%		0	0.0%		8	6.1%	
	5. General knowledge	15	11.5%		6	4.6%		16	12.2%	
	6. Additional knowledge	11	8.4%		7	5.3%		11	8.4%	
	Total	130	100%		131	100%		131	100%	
1	Natural Sciences and mathematics knowledge (Number of credits):	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)
	Calculus 1	4			4			4		
	Calculus 2	4			4			4		
	Linear Algebra	3						3		
	Probability and Statistics	3						4		
	Applied Mathematics 1	2								

	Experimental Planning	3								
	Physics 1	3			4			4		
	Physics 2	3			3					
	Experiment of Physics 1,2	2						1		
	General Chemistry	3			4			3		
	Calculus III				4					
	Experiment of General Chemistry				1					
	Differential Equation 3				3					
	Elective Science 1					3				
	Elective Science 3									
	Earth science					1		4		
	Calculation method							3		
	Total	30			27	4		30		
2	Basis knowledge on technology and industry (Number of credits):	Requir ed (R)	Requir ed electiv es (SE)	Elective (E)	Requir ed (R)	Requir ed electiv es (SE)	Elective (E)	Requir ed (R)	Requir ed electiv es (SE)	Elective (E)
	Descriptive Geometry - Engineering Drawing	3			3			3		
	Construction Machines	2								
	Thermal Engineering	2								
	Engineering Mechanics	3			3					
	Structural Mechanics	3								
	Industrial Architecture	2						4		
	Geodesy	2			3			3		
	Geodesy Practice	1								

Engineering Geology	2.5						3		
Construction materials	2						3		
Experiment of Construction materials	0.5								
Soil Mechanics	2						3		
Experiment of Soil Mechanics	0.5								
Reinforced Concrete Structures	3								
Ground and Foundation	2						4		
Liberal and/or Diversity Studies				3					
Resource water 1				3					
Structural analysis 1				3					
Thermodynamics 1				3					
Geotechnical 1				3					
Experiment of Geotechnical 1				1					
Experiment of Resource water 2				1					
Resource water 2				3					
Applied mechanical dynamics				3					
Experiment of Resource water				1					
Technical analysis				3					
Steel structures 1							3		
Fluid mechanics							3		
Structural engineering							3		
Reinforced concrete structures							3		
Construction experiment							1		
Construction Economic							3		

	Total	30.5			40			39		
3	Specialized knowledge (Number of credits):	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)
	Applied chemistry Engineering 1	2								
	Occupational safety in construction materials production	2								
	Machinery for the production of construction materials	2								
	Thermal equipments in the production of construction materials	2								
	Production technique for Inorganic binder 1	2								
	Technology of Concrete 1	3								
	Technology of Building Ceramic 1	2								
	Construction Materials Testing & Inspections	2								
	Construction Economic	2								
	English for construction materials Engineering	2								
	Decorative and Complete Materials		4							
	Building Glass									
	Heat insulating and Heat resistant Materials									
	Urban Engineering					3				
	Highway engineering 3				3					
	Design of Reinforce concrete 3				3					
	Geotechnical 2				3					
	Civil engineering elective Egr 3					3				

	Liberal and/or Diversity Studies 2				3					
	CENE 476				1					
	CENE 486C				3					
	Liberal and/or Diversity Studies 3				3					
	Signal and traffic studies				3					
	Engineering Design: Methods				3					
	Required electives course – Optional major								12	
	Concrete Engineering							3		
	Binder Engineering							3		
	Design technology for production and installation of precast concrete components							3		
	Special concrete for construction							3		
	Corrosion of concrete and reinforced concrete							3		
	Total	21	4	11	31	6		15	12	
4	Knowledge in conducting the project, internship and graduation (Number of credits):	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)
	PBL 1: Ground and Foundation	1								
	PBL2: Reinforced Concrete Structural	2								
	PBL3. Production technique for inorganic binder 1	2								
	PBL4: Technology of building ceramics	2.5								
	PBL 5: Technology of Concrete 1	2.5								

	Worker Practice	1								
	Construction materials fieldtrip	1								
	Graduation Internship	2								
	Internships outside of university								2	
	Specialized projects								2	
	Graduation Project		6						4	
	Total	14	6						8	
5	General knowledge (Number of credits):	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)
	- Political theory	11			3			11		
	- General Law	2						2		
	- Environment	2			3			3		
	Total	15			6			16		
6	Additional knowledge (Number of credits):	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)	Required (R)	Required electives (SE)	Elective (E)
	Basis of information technology				3					
	Practice of basis of information technology									
	Introduction to Construction Materials Engineering and Technology	2						3		
	Technology business Start-up		2							
	Economics for Business									
	- Physical Education	10								

	- National Defense Education	165 period s								
	Foreign Language	7			4			8		
	Total	9	2		7			11		
	Total of Credits	118	12		121	10		131		
		130			131			131		

APPENDIX 4: ARRANGEMENT OF THE COURSES BASED ON THE LEARNING OUTCOMES

4.1. Learning outcome 1: 1. Having the ability to apply the knowledge of mathematics, basic science, technology and engineering for analyzing, designing, constructing, evaluating and researching the issues related to the field of construction materials engineering technology;

No.	Learning outcome of the program Knowledge, skills, attitudes	The Sub-learning outcomes	Performance Indicators	Detailed content
1	1. Having the ability to apply the knowledge of mathematics, basic science, technology and engineering for analyzing, designing, constructing, evaluating and researching the issues related to the field of construction materials engineering technology;	1.1. NATURAL SCIENCE AND MATHEMATICS KNOWLEDGE	1.1.1. Calculus	- Derivative, differential, integral, integral...
			1.1.2. Algorithm	- Linear algebra
			1.1.3. Probability statistics	- Probability and probability distribution rules, 'statistics, limit theorems, ...
			1.1.4. Physics	- Mechanical, thermal, photoelectric, magnetic...
			1.1.5. Chemistry	- Elements and chemical bonds, reaction energy, redox PU, solutions and colloidal systems, ...
			1.1.6. Information Technology	- Basic programming
			1.1.7. Applied Mathematics 1 (Mathematics for applied engineering)	-Number method, calculation method, finite element method
			1.1.8. Applied Mathematics 2 (Mathematics for applied engineering)	- Experimental planning 1,2 components
		1.2. BASIS KNOWLEDGE ON TECHNOLOGY AND INDUSTRY	1.2.1. Mechanical theory	- Solve problems of balancing forces in 2-dimensional and 3-dimensional axes.
			1.2.2. Mechanical properties of Materials	- Calculation of structural resistance
			1.2.3. Engineering mechanics	- Applying theory to calculate internal force, stress, displacement used to evaluate the resistance of structure
			1.2.4. Soil mechanics	'- Calculating the behavior of groundwater in different cases
			1.2.5. Geology of structures	- Calculate the stress in the ground, calculate the settlement for the building foundation and the settlement over time

		1.2.6. Graphics	- Representation of spatial shapes of objects by measuring axis projection
		1.2.7. Technical drawing	- Have the skills to draw cross-sections and sections, and be able to use combinations to represent objects
		1.2.8. Construction materials	- Calculating the mechanical and physical parameters of building materials from experimental data
		1.2.9. Construction machine	- Calculate the basic parameters of the machine
		1.2.10. Geodetic	- Capable of simple processing of measured data. Capable of exploiting topographic data for construction.
		1.2.11. Concrete structure 1 – Basic part	- Understand the principle of calculation and structure of basic reinforced concrete components
		1.2.12. Industrial architecture	- Know how to choose structures and construction materials in public works:
		1.2.13. Ground and foundation	- Calculate and design shallow foundation on natural foundation, low pile foundation, and high pile foundation
		1.2.14. Heat engineering	- Apply the calculation of heat quantity and temperature field in simple heat transfer problems.
	1.3. SPECIALIZED KNOWLEDGE	1.3.1. Physicochemical Engineering	- Calculations in phase diagrams
		1.3.2. Machines and equipment for the production of construction materials	- Calculation of basic parameters of crushers in construction
		1.3.3. Thermal equipment for production of construction materials	- Calculation of fuel used in the production of building materials
		1.3.4. Production technology of inorganic binders	- Calculation of simple cement mix
		1.3.5. Construction ceramic technology 1	- Calculation of simple construction ceramic mix
		1.3.6. 1 . Concrete technology	- Calculation of concrete distribution
		1.3.7. Inspection and testing of construction materials	- Calculating and controlling the parameters of materials in the works

		1.3.8. Construction Economic	- Calculation of payback time
		1.3.10. Basic of construction materials	- Calculation of heat processing
		1.3.11. Occupational safety in the production of construction materials	
	1.4. KNOWLEDGE IN CONDUCTING THE PROJECT, INTERNSHIP AND GRADUATION	1.4.1. PBL 2. Reinforced concrete structure	- Design the components in the reinforced concrete floor such as slabs, sub-beams and main beams.
		1.4.2. PBL 1. Ground and Foundations	- Calculate and select the size of shallow foundation, pile foundation, check according to limit states, design the structure for the foundation
		1.4.3. PBL 3. Production technique of inorganic binder 1	- Calculation, design and selection of equipment in the cement factory
		1.4.4. PBL 4. Construction Ceramic Technology 1	- Calculation of heat and design of heating equipment
		1.4.5. PBL5. Concrete Technology	- Calculation of equipment used and product quality inspection
		1.4.6. Worker practice	- Using equipment used for surveying and construction works
		1.4.7. Fieldtrip of Construction materials Engineering	
		1.4.8. Graduation internship	- Able to use software, tools and machines for design and construction
		1.4.9. Graduation project	- Calculating, checking and analyzing project data
		1.5. GENERAL KNOWLEDGE	1.5.1. Environment
	1.5.2. Political theory		
	1.5.3. Basic law		
	1.6. ADDITIONAL KNOWLEDGE	1.6.1. Basic IT Applications	
		1.6.2. Foreign Language	
		1.6.3. Physical education	

			1.6.4. Defense and security education	
			1.6.5. Management/Start-up	
			1.6.6. Knowledge and skills	
			1.6.7. Introduction of Construction material industry	

4.2. Learning outcome 2: Having skills in practice, experiment, analysis, and processing the basic data in the field of construction materials engineering technology;

No.	Learning outcome of the program Knowledge, skills, attitudes	The Sub-learning outcomes	Performance Indicators	Detailed content	Corresponding course
2	2. Having skills in practice, experiment, analysis, and processing the basic data in the field of construction materials engineering technology;	2.1. Practical skills and experiments	2.1.1. Practice and experiment	<ul style="list-style-type: none"> - Formulate the experimental concepts and strategies - Discuss the safety precautions in the experiment - Conduct and organize the experiments - Record the experiment and procedures - Conduct the experimental measurements - Analyze and report the experimental data - Compare the experimental data with the available models 	General Chemistry; Experiment of Physics 1,2;
			2.1.2. Calculation, check results and conclusions	<ul style="list-style-type: none"> - Calculate the data collected from the experiment - Verify the reliability of the results, the application scope of the results - Prepare substantiated conclusions based on the experimental results, - Propose improvements if any and demonstrate improvements 	Construction Materials Testing & Inspections
		2.2. Data analysis and processing in the construction industry	2.2.1. Defining the problem and purpose	<ul style="list-style-type: none"> - Synthesize and determine the reliability of references - Evaluate the problem, analyze assumptions and prioritize issues based on the technical background - The characteristics of the data affect the problem - Formulate a resolution plan (coordinated modeling, analytical and numerical solutions, qualitative analysis, testing and consideration of uncertainties) 	Engineering Geology
			2.2.2. Data design and collection	<ul style="list-style-type: none"> - Collect required information and data - Methods of data collection, reliability of methods - Complexity, cost, time of data collection - Conduct data collection methods 	Geodesy; Soil Mechanics; Construction materials

			2.2.3. Data preparation and compilation	<ul style="list-style-type: none"> - Estimation of amplitudes, limits and trends - Analysis in the presence of uncertainty of the data - Apply consistency and error checks (limits, integers, cross-checks, etc.) - Eliminate error data or collect the instead data 	PBL 1. Ground and Foundation
			2.2.4. Data analysis and result verification	<ul style="list-style-type: none"> - Apply mathematical equations used to calculate the problem to be analyzed - Analyze and evaluate the difference in results and check the results against several criteria (analysis of variance, estimation according to normal distribution, ...) - Determine the applicability of the results 	PBL 2. Reinforced Concrete Structures
			2.2.5. Interpretation and presentation	<ul style="list-style-type: none"> - Interpret the results, present the applicability of the results of the analysis - Synthesis solutions to problems - Improve and build solution solutions - Presenting summary and conclusion 	PBL 3. Production technique for Inorganic binder 1; PBL 4. Technology of Building Ceramic 1; PBL 5. Technology of Concrete 1; Graduation Project – Binders; Graduation Project – Ceramics; Graduation Project – Concrete;

4.3. Learning outcome 3: Having critical thinking, creative thinking, entrepreneurial thinking, professional behavior;

No.	Learning outcome of the program Knowledge, skills, attitudes	The Sub-learning outcomes	Performance Indicators	Detailed content	Corresponding course
3	3. Having critical thinking, creative thinking, entrepreneurial thinking, professional behavior;	3.1. Creative thinking skills and independent perspective	3.1.1. Critical thinking ability	<ul style="list-style-type: none"> - Analyze the presentation of the problem - Select logical arguments and solutions - Evaluate supporting evidence - Identify opposing views, theories, and facts - Identify logical confusions - Test hypotheses and conclusions 	Marxism Leninism's Philosophy
			3.1.2. Creative thinking ability	<ul style="list-style-type: none"> - Demonstrate the ability to conceptualize and abstract - Demonstrate the ability to synthesize and generalize - Execute the invention process - Discuss the role of creativity in the arts, sciences, humanities and technology 	General Law
			3.1.3. Proposing and anticipating risks	<ul style="list-style-type: none"> - Identify needs and opportunities for initiatives - Discuss the potential benefits and risks of an action - Explain methods and schedule planning for project initiation - Performace the leadership in novel initiatives, with a bias towards the right actions - Take decisive action, reveice and report the action results 	Political economics of Marxism Leninism; Scientific socialism General Environment
		3.2. Professional skills and attitude	3.2.1. Professional behavior	<ul style="list-style-type: none"> -- Professionally discuss - Professionally and politeness explanation - Identify international customs and practices in communication 	Ho Chi Minh's ideology Construction materials fieldtrip Gradiation Internship Worker Practice

			3.2.2. Ethics, integrity and social responsibility	<ul style="list-style-type: none"> - Demonstrate your ethical standards and principles - Performance the courage to act according to principle despite unfavorable circumstances - Identify potential conflicts between professional ethical imperatives - Understanding that mistakes are acceptable, but that we have to take responsibility for them - Practice properly recognizing the merits of collaborators - Performance a commitment to service 	PBL 1. Ground and Foundation Machinery for the production of construction materials PBL 3. Production technique for Inorganic binder 1 Occupational safety in construction materials production PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1 Graduation Project
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4.4. Learning outcome 4: Having ethics and professional responsibility;

No.	Learning outcome of the program Knowledge, skills, attitudes	The Sub-learning outcomes	Performance Indicators	Detailed content	Corresponding course
4	4. Having ethics and professional responsibility;	4.1. Ethics, professionalism, honesty, duty and responsibility	4.1.1. Ethics, professionalism, honesty, duty and responsibility	<ul style="list-style-type: none"> - Demonstrate your ethical standards and principles - Performance the courage to act according to principle despite unfavorable circumstances - Identify potential conflicts between professional ethical imperatives - Understanding that mistakes are acceptable, but that we have to take responsibility for them - Practice properly recognizing the merits of collaborators - Performance a commitment to service 	Introduction to Construction Materials Engineering and Technology General Law General Environment Worker Practice History of Vietnamese Communist Party Construction materials fieldtrip Graduation Internship Graduation Project

4.5. Learning outcome 5: Having effective skills for teamwork and communication;

No.	Learning outcome of the program Knowledge, skills, attitudes	The Sub-learning outcomes	Performance Indicators	Detailed content	Corresponding course
5	5. Having effective skills for teamwork and communication;	5.1. Effective skills for teamwork	5.1.1. Team forming	<ul style="list-style-type: none"> - Group tasks - Roles and Responsibilities of team members - Explain the goals, needs and characteristics of each team member - Clarifying the team's strengths and weaknesses 	Introduction to Construction Materials Engineering and Technology Calculus 1
			5.1.2. Organize team activities	<ul style="list-style-type: none"> - Outline the goals and work to be done - Plan for meetings of the team - Determine the principles of teamwork 	Introduction to Construction Materials Engineering and Technology General Chemistry
			5.1.3. Team development	<ul style="list-style-type: none"> - Organize large project teams over one or more semesters, with an emphasis on deliverables - Teaching on leadership, negotiation, team assessment and complex problem-solving skills 	Introduction to Construction Materials Engineering and Technology Experiment of Physics 1
			5.1.4. Team leader	<ul style="list-style-type: none"> - Clarify the team's goals - Give an example of teamwork process management - Describe the ability to guide and mentor 	Introduction to Construction Materials Engineering and Technology Geodesy
			5.1.5. Teamwork techniques	<ul style="list-style-type: none"> - Describe working in different types of teams: interdisciplinary, small and large teams - Clarify technical cooperation with team members 	Introduction to Construction Materials Engineering and Technology Engineering Geology
		5.2. Effective skills for communication	5.2.1. Communication strategy	<ul style="list-style-type: none"> - Analyze communication situations - Choose communication strategy 	Graduation Project PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1

			<p>5.2.2. Communication structure</p> <ul style="list-style-type: none"> - Form a logical and persuasive argument - Form the appropriate structures and relationships between ideas - Select relevant, reliable, and accurate supporting evidence - Use language in a concise, assertive, precise, clear manner - Analyze elements of hype (e.g. presentation depending on the listener) - Identify ways to interdisciplinary and intercultural communication 	<p>Graduation Project PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			<p>5.2.3. Written communication</p> <ul style="list-style-type: none"> - Write coherently and fluently - Correct spelling, punctuation, and grammar - Format the text - Write the technical documents - Different types of documents (formal and informal, reports, resumes, etc.) 	<p>Graduation Project PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			<p>5.2.4. Multimedia communication</p> <ul style="list-style-type: none"> - Prepare presentations - Create a habit using the E-mail, instant messaging, and video conferencing - Various electronic forms (charts, web pages, etc.) 	<p>Graduation Project PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			<p>5.2.5. Graphical communication</p> <ul style="list-style-type: none"> - Show sketches and technical drawings - Demonstrate the creation of tables, graphs, charts - Interpreting technical drawings and drawing formal perspective 	<p>Graduation Project PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			<p>5.2.6. Presentation and communication</p> <ul style="list-style-type: none"> - Practice presentations and communication tools with appropriate language, style, timing, and structure - Use non-verbal means of communication (gestures, eye contact, posture) - Present the answers effectively 	<p>Graduation Project PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1</p>

				PBL 5. Technology of Concrete 1
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4.6. Learning outcome 6: Having skills to use the foreign languages in the professional field; Having foreign language proficiency equivalent to TOEIC 450 level;

No.	Learning outcome of the program Knowledge, skills, attitudes	The Sub-learning outcomes	Performance Indicators	Detailed content	Corresponding course
6	6. Having skills to use the foreign languages in the professional field; Having foreign language proficiency equivalent to TOEIC 450 level;	6.1. Having skills to use the foreign languages in the professional field;	6.1.1. Having skills to use the foreign languages in the professional field;	<ul style="list-style-type: none"> - Ability to understand and express clearly and accurately on issues in the area of expertise. - Ability to write content related to topics in the field of expertise. - Ability to describe experiences and events, interpret opinions and plans in the area of expertise - Ability to understand the main points expressed in a standard and clear manner on familiar issues commonly encountered in work and life. - Able to deal with most situations that may arise when arriving in a place where English is spoken. - Ability to write simple, connected content on familiar topics or personal interests. - Ability to describe experiences and events, dreams, hopes and ambitions and give reasons and brief explanations for ideas and plans. 	English A2.1 English A2.2 English for Construction Materials Engineering
		6.2. Having foreign language proficiency equivalent to TOEIC 450 level;	6.2.1. Having foreign language proficiency equivalent to TOEIC 450 level;		English A2.1 English A2.2 English for Construction Materials Engineering

4.7. Learning outcome 7: Having skills in using basic Information Technology as prescribed in Circular No. 03/2014/TT-BTTTT and being able to use several basic softwares in the field of construction materials;

No.	Learning outcome of the program Knowledge, skills, attitudes	The Sub-learning outcomes	Performance Indicators	Detailed content	Corresponding course

7	7. Having skills in using basic Information Technology as prescribed in Circular No. 03/2014/TT-BTTTT and being able to use several basic softwares in the field of construction materials;	7.1. Having skills in using basic Information Technology as prescribed in Circular No. 03/2014/TT-BTTTT	7.1.1. Basic knowledge of information technology	<ul style="list-style-type: none"> - Basic knowledge of computers and networks - Applications of information and communication technology - Occupational safety and environmental protection in the use of information and communication technology - Basic information security issues when working with computers - Basic issues related to the law in the use of IT 	General Chemistry
			7.1.2. Basic computer application	<ul style="list-style-type: none"> - Basic understanding to start working with computers - Working with Operating System - Manage folders and files - Some utility software - Use Vietnamese language - Use the printer 	Linear Algebra
			7.1.3. Basic word processing	<ul style="list-style-type: none"> - Basic knowledge of writing, editing and word processing - Use a specific word processing software - Text format - Embed different objects in the text - Rendering and delivering text - Compose messages and administrative documents 	Reinforced Concrete Structures PBL 2. Reinforced Concrete Structures PBL 1. Ground and Foundation PBL 3. Production technique for Inorganic binder 1
			7.1.4. Basic calculation table application	<ul style="list-style-type: none"> - Basic knowledge of calculation tables - Use spreadsheet software - Operations for cells (cells) - Work on the sheet - Expressions and functions - Format a cell, a range of cells - Chart - Render and distribute sheets, calculation tables 	PBL 2. Reinforced Concrete Structures PBL 1. Ground and Foundation PBL 3. Production technique for Inorganic binder 1 PBL 5. Technology of Concrete 1

			7.1.5. Basic slideshow application	<ul style="list-style-type: none"> - Basic knowledge of presentations and slideshows - Use presentation software - Create the content for presentations - Put charts, organizational charts into the presentation slide - Prepare, present and print presentations 	PBL 2. Reinforced Concrete Structures PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1
			7.1.6. Basic internet usage application	<ul style="list-style-type: none"> - Basic knowledge of the Internet - Use a website browser - Use the Website - Use email - Several tools of digital communication 	PBL 2. Reinforced Concrete Structures PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1
		7.2. Having skills to use several basic softwares in the field of construction materials;	7.2.1. Ability to use some basic software in the field of construction materials;	<ul style="list-style-type: none"> - AutoCad design software - Autodesk Revit design software - SAP2000 design software - Sketchup 3D design software 	Descriptive Geometry – Engineering Drawing Reinforced Concrete Structures PBL 2. Reinforced Concrete Structures PBL 1. Ground and Foundation PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 Graduation Internship Graduation Project

4.8. Learning outcome 8: Having the ability to propose concept for design, construction, planning, and to participate in management and operation of technology lines in construction materials production units or construction projects suitable to the conditions of economic and social society and environment;

No.	Learning outcome of the program Knowledge, skills, attitudes	The Sub-learning outcomes	Performance Indicators	Detailed content	Corresponding course
9	8. Having the ability to propose concept for design,	8.1. Ability to propose concept, system	8.1.1. Understand needs and set goals	<ul style="list-style-type: none"> - Needs and opportunities - Factors that establish the target context of the system - System goals and requirements 	Construction Machines

<p>construction, planning, and to participate in management and operation of technology lines in construction materials production units or construction projects suitable to the conditions of economic and social society and environment;</p>	<p>techniques and management</p>	<p>8.1.2. Defining functionality, principles and architecture</p>	<ul style="list-style-type: none"> - Necessary system functions (and operational characteristics) - Principles of the system - The sustainable level of technology - The balance between the principles and their recombination - High level of organization and structure - Separate the organization into components, assigning responsibilities to components, and defining interfaces 	<p>Construction materials Construction Economic</p>
		<p>8.1.3. Systems engineering, modeling and presenting</p>	<ul style="list-style-type: none"> - Suitable models in terms of technical performance and other attributes - Review on the implementation and operation - Lifecycle value and costs (design, implementation, operations, opportunities, etc.) - Balance between the different goals, functions, principles and structures, and iteratively until a consistent final result - Plan to manage the interface 	<p>PBL 2. Reinforced Concrete Structures</p>
		<p>8.1.4. Project development management</p>	<ul style="list-style-type: none"> - Project control ensuring cost, performance, and schedule - Acknowledge the value achieved - Estimate and allocate the resources - Risks and alternatives - Possible improvements for the development process 	<p>Industrial Architecture Worker Practice</p>
	<p>8.2. Design</p>	<p>8.2.1. Design process</p>	<ul style="list-style-type: none"> - Select the request for each component, which is being removed from the goals and requirements of the level of system - Analysis of alternatives in design - Select the original design - Use samples during design development - Optimize the execution process with the detail conditions - Repetite the result is achieved - Synthetic the final design - Demonstrate the response after the requested changes 	<p>Thermal equipments in the production of construction materials</p>

			<p>8.2.2. Design Process Stages and Approaches</p> <ul style="list-style-type: none"> - Explain the principle operation in the stages of system design (concept, preliminary design, and detail design) - Discuss suitable process models for specific development projects (waterfall model, spiral model, concurrency model) - Discuss the process for single products, background products, or edited products 	Machinery for the production of construction materials
			<p>8.2.3. Applying knowledge in design</p> <ul style="list-style-type: none"> - Apply technical and scientific knowledge - Practice creative and critical thinking, and problem solving - Discuss priority work in the field, standardization and reuse of designs (including reverse engineering and re-engineering) - Discuss the collection of design knowledge 	Production technique for Inorganic binder 1
			<p>8.2.4. Specialized Design</p> <ul style="list-style-type: none"> - Select the suitable techniques, tools, and processes - Explain the calibration and approval design tools - Conduct the quantitative analysis for other alternatives - Practice modeling, simulation, and testing - Discuss analytical distillation of design 	<p>PBL 3. Production technique for Inorganic binder 1</p> <p>PBL 4. Technology of Building Ceramic 1</p> <p>PBL 5. Technology of Concrete 1</p>
			<p>8.2.5. Multidisciplinary design</p> <ul style="list-style-type: none"> - Identify the interactions between disciplines - Identify the different conventions and assumptions - Explain the difference in the perfection of specialized models - Explain the multidisciplinary design environments - Explain the multidisciplinary design 	<p>PBL 3. Production technique for Inorganic binder 1</p> <p>PBL 4. Technology of Building Ceramic 1</p> <p>PBL 5. Technology of Concrete 1</p>
			<p>8.2.6. Multi-Purpose Design</p> <ul style="list-style-type: none"> - Design based on the performance, cost and value of life cycle - Design based on the aesthetics and human factors - Design based on the responsive to deployment validation, testing, and environmental sustainability - Design based on the operation - Design based on the maintainability, reliability, and safety - Design based on the stability, evolution, improvement, and elimination of the product 	'Graduation Internship Graduation Project

		8.3. Performing	8.3.1. Design the implementation process	<ul style="list-style-type: none"> - Present the goals, the measure methods of the performance, cost, and quality of the implementation - Recognize the implementation of the design system 	<p>PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			8.3.5. Testing, validating and certifying	<ul style="list-style-type: none"> - Discuss testing and analytical procedures (acceptable level) - Discuss performance of testing based on the requirements - Discuss effectiveness of the performance to the customer requirements - Explanation of the satisfaction to standards 	<p>PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			8.3.6. Process Management, Deployment	<ul style="list-style-type: none"> - Describe the organization and structure for the implementation - Describe the sourcing, partnerships, and supply chains - Realize the cost control for deployment, implementation and timeline - Description of the quality assurance and safety - Describe the possible improvements during implementation 	<p>'Graduation Internship Graduation Project</p>
		8.4. Operation	8.4.1. Design and optimize safe and sustainable operation	<ul style="list-style-type: none"> - Explain the performance goals and the measure method for performance, cost, and value - Explain structure and develop operating procedures - Explain operational analysis and modeling (and mission) 	<p>PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			8.4.2. Training and Operation	<ul style="list-style-type: none"> - Description of training to operate professionally - Simulation - Instructions and programs - Procedures - Realize the education for the customer operation - Description of operating procedures - Be aware of operational process interactions 	<p>PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>

			8.4.3. System lifecycle support	<ul style="list-style-type: none"> - Explain maintenance and logistics - Description of the performance and reliability of the life cycle - Describe the value and costs of the life cycle - Explain feedback to facilitate system improvement 	<p>PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1 'Graduation Internship Graduation Project</p>
			8.4.4. System improvements and evolution	<ul style="list-style-type: none"> - Define pre-planned product improvement - Identify improvements based on the detected needs during the operation - Ability to aware of the progress in system upgrades - Identify improvements/solutions to handle unexpected situations occurring from operation 	<p>PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			8.4.5. Problems with waste and lifecycle	<ul style="list-style-type: none"> - Identify the problems at the end-of-life cycle - List options for elimination - Determine residual value at the end of life - List environmental considerations for disposal 	<p>PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1</p>
			8.4.6. Operational management	<ul style="list-style-type: none"> - Describe the organization and structure for the operation - Identify partnerships and allies - Realize the controlling of operating costs, performance, and timeline - Description of the quality assurance and safety - Define life cycle management - Identify possible improvements in the process of operation 	<p>PBL 3. Production technique for Inorganic binder 1 PBL 4. Technology of Building Ceramic 1 PBL 5. Technology of Concrete 1 'Graduation Internship Graduation Project</p>

APPENDIX 5. DISTRIBUTION OF THE COURSES BASED ON THE LEARNING OUTCOMES

No.	Course codes	Course name (Due to the knowledge modules)	Credit number	Course type			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
				Required (R)	Required electives (SE)	Elective (E)								
Maths and Natural Sciences (30 credits)														
1		Calculus 1	4	X			1.1.1.				5.1.1, 5.1.2. 5.2.3.		7.1.2	
2		General Chemistry	3	X			1.1.5.	2.1.1			5.1.1. 5.1.2.		7.1.2.	
3		Calculus 2	4	X			1.1.1.				5.1.1, 5.1.2. 5.2.3.		7.1.2	
4		Probability and Statistics	3	X			1.1.3.		3.1.1					
5		Physics 1	3	X			1.1.4.				5.1.1. 5.1.2. 5.2.3.	6.1.1		
6		Experiment of Physics 1	1	X			1.1.4.				5.1.1.,5.1.2. 5.2.3.	6.1.1		
7		Physics 2	3	X			1.1.4.				5.1.1. 5.1.2. 5.2.3.	6.1.1		
8		Experiment of Physics 2	1	X			1.1.4.				5.1.1. 5.1.2. 5.2.3.	6.1.1		
9		Linear Algebra	3	X			1.1.2.		3.1.1	4.1.1			7.1.2	
10		Applied Mathem	2	X			1.1.4;		3.1.3;	4.3.2				8.1.1

		atics Enginee ring											
11		Experim ental Plannin g	3	X		1.1.3 1.1.8	2.2.4					7.1.4	
Core module (30.5 credits)													
1		Descriptiv e Geometry – Engineeri ng Drawing	3			1.2.6. 1.2.7.		3.1.1				7.1.2.	
2		Thermal Engineeri ng	2			1.2.14.							
3		Engineeri ng Mechanic s	3			1.2.1.							
4		Geodesy	3			1.2.10.; 1.2.9	2.1.1			5.1.1			
5		Structural Mechanic s	3			1.2.3.							8.2.1;8.2. 3
6		Constructi on Machines	2			1.2.9.							8.1.1
7		Engineeri ng Geology	2.5			1.2.5	2.2.1, 2.2.2, 2.2.5			5.1.1, 5.1.2, 5.1.4, 5.1.5			

8		Soil Mechanics	2.5				1.2.4.	2.1.1			5.1.1;5.1.2;5.2.3			
9		Construction materials	2.5				1.2.8	2.1.1 2.2.1			5.1.2 5.2.3,5.2.6			8.1.1 8.5.1,8.5.4
10		Reinforced Concrete Structures	3				1.2.11 1.2.2; 1.2.3; 1.2.10;	2.1.2			5.1.1		7.1.2; 7.1.5;	
11		Ground and Foundation	2				1.2.13.							
12		Industrial Architecture	2				1.2.8							8.2.1. 8.2.2
Specialized module (25 credits)														
1		Applied chemistry Engineering 1	2	X			1.3.1.							8.5.1;8.5.4
2		Occupational safety in construction materials production	2	X			1.3.2 1.4.8. 1.3.2		3.1.1					
3		Thermal equipments in	2.5	X			1.3.3 1.2.1 1.3.1 1.3.2			4.1.1;4.1.2				8.2.3;8.2.1;8.4.1;

		the production of construction materials												
4		Machinery for the production of construction materials	2	X			1.3.2;	2.2.4	3.1.1					8.1.2;8.2.1;8.2.3;8.2.4
5		Production technique for Inorganic binder 1	2	X			1.2.8;1.2.9 1.3.4;							8.1.1;8.2.1
6		English for Construction Materials Engineering	2								5.1.1, 5.1.2, 5.1.5;5.2.6	6.1.1	7.1.5	
7		Technology of Building Ceramic 1	2	X			1.3.5.	2.2.1	3.1.3;3.1.2					8.1.1;8.2.1;8.2.2
8		Technology of Concrete 1	3	X			1.3.6		3.1.1					8.2.1;8.2.2;8.2.3;8.2.4

9	Construction Materials Testing & Inspections	2	X			1.2.8, 1.3.5,	2.1.1	3.1.1;3.1.2		5.1.1;5.2.1		7.1.1;7.2.1	8.2.1;8.2.4
	Electives (Choose 2 out of below 3 courses):	4											
10	<i>Heat insulating and Heat resistant Material</i>	2		X		1.3.5.;		3.1.1	4.1.1		6.1.1		8.2.1
11	<i>Building Glass</i>	2		X		1.3.10		3.1.1	4.1.1				8.2.1
12	<i>Building Decorative and Complete Materials</i>	2		X		1.3.10		3.1.1	4.1.1				8.2.1
13	Construction Economic	2	X			1.4.5 1.3.8		3.1.3					8.3.4
Module of project, internship, and thesis (18.5 credits)													
1	PBL 1. Ground and	1	X			1.2.8,1.2.7		3.1.4		5.1.1;5.1.2		7.1.2;7.1.5; 7.2.1	

		Foundatio n												
2		PBL 2. Reinforce d Concrete Structure	2	X			1.2.3 1.2.11;	2.1.4; 2.2.1 2.2.1			5.1.1; 5.1.2; 5.1.3; 5.1.4		7.1.2; 7.1.5; 7.2.1; 7.4.1;	8.1.1;
3		PBL 3. Producti on techniqu e for Inorgani c binder 1	2	X			1.4.3;	2.1.1	3.1.2;3 .1.1	4.2.1;4 .1.1	5.1.2;5.1.3		7.1.2	8.1.2;8.1. 1
4		PBL 4. Technolo gy of Building Ceramic 1	2	X			1.4.4.	2.2.1	3.1.1	4.1.1	5.2.1		7.1.1;7.2.1	8.1.1;8.2. 1;8.3.1
5		PBL5. Technolo gy of Concrete 1	2.5	X			2.2.1	2.2.1	3.1.1		5.1.1;5.1.2		7.1.1;7.2.1	8.1.1;8.2. 1;8.3.1
6		Worker Practic	1	X			1.4.9,		3.2.2;3 .1.3	4.1.1	5.2.3;5.2.6;5.1. 2			8.1.2;8.4. 2
7		Constructi on materials fieldtrip	1	X			1.4.9;		3.1.3;3 .2.2	4.1.1	5.1.2			8.1.2;8.4. 2
8		Gradiatio n Internship	2	X			1.4.8.		3.1.1 3.2.1	4.1. 1	5.1.1 5.2. 1			8.1. 1 8.4. 1

		Choose 1 out of below 3 graduation projects	6											
9		Graduation Project - Binders	6	X			1.4.9.	2.1.1 2.2.1	3.1.1 3.2.1	4.1.1	5.1.1 5.2.1	6.1.1	7.1.1 7.2.1.	8.1.1 8.2.1 8.3.1
10		Graduation Project – Ceramics	6	X			1.4.9.	2.1.1 2.2.1	3.1.1 3.2.1	4.1.1	5.1.1 5.2.1	6.1.1	7.1.1 7.2.1.	8.1.1 8.2.1 8.3.1
11		Graduation Project - Concrete	6	X			1.4.9.	2.1. 2.2.	3.1.1 3.2.1	4.1.1	5.1.1 5.2.1	6.1.1	7.1.1 7.2.1.	8.1.1 8.2.1 8.3.1
General education module (15 credits)														
1		Marxism Leninism's Philosophy	3	X			1.5.2.		3.2.1	4.1.1				
2		General Law	2	X			1.5.3		3.2.1	4.1.1				
3		Political economics of	2	X			1.5.2.		3.2.1	4.1.1				

		Marxism Leninism												
4		History of Vietnamese Communist Party	2	X			1.5.2.		3.2.1	4.1.1				
5		General Environment	2	X			1.5.1.		3.2.1;	4.1.1				
6		Scientific socialism	2	X			1.5.2.		3.2.1	4.1.1				
7		Ho Chi Minh's ideology	2	X			1.5.2.		3.2.1	4.1.1				
Supporting module (11 credits)														
1		Introduction to Construction Materials Engineering and Technology	2	X					3.1.1 3.2.2 3.2.2	4.1.1,	5.1.1 5.2.1			

2		English A2.1	3	X			1.6.2				5.2.3;5.2.6;5.1.1; 5.1.2	6.2.1		
3		English A2.2	4	X			1.6.2				5.2.3;5.2.6;5.1.1; 5.1.2	6.2.1		
		<i>Electives (Choose 1 out of below 2 courses):</i>	2											
4		<i>Technology business Start-up</i>	2		X		1.3.8 3.2.1							8.1.1 8.2.1
5		<i>Economics for Business</i>	2		X		1.3.8 3.2.1							8.1.1 8.2.1
6		Physical Education	10	X										
7		National Defense Education	165 tiết	X										
		TOTAL OF CREDITS	130											

APPENDIX 6. RELATIONSHIP BETWEEN THE STUDENT OUTCOMES OF THE PROGRAM AND THE VIETNAMESE QUALIFICATION FRAMEWORK FOR THE UNIVERSITY LEVEL

		The Vietnamese qualification 1982/2016 framework for the University level														
		Knowledge					Skills							Level of autonomy and responsibility		
No.	Student outcomes	Solid practical knowledge, deep and wide theoretical knowledge in the field of the training program	Basic knowledge of social sciences, political science and law.	Knowledge of information technology suitable for the work requirements.	Knowledge of planning, organizing and monitoring the processes of activities in a particular field	Basic knowledge of management, operating professional activities	Skills required to be able to solve complex problems	Skills to leading a business start-up for creating the self-job and for others	Skills to be critical, and use alternatives in uncertain or changing environmental conditions	Skills to evaluate the work quality after completion and to evaluate the performance of team members	Skills to communicate problems and solutions to others in the workplace; Skill to present and disseminate the knowledge and skills in specific or compl	Having foreign language ability at level 3/6 according to Vietnam's Foreign Language Competency Framework	Working independently or in a team according to the working conditions, take individual responsibility and responsibility towards the team	Mentoring and monitoring others performing defined tasks	Ability to self-orientate, conclude and defend the self-thinking in the professional field	Plan, coordinate, manage resources, evaluate and improve the performance of activities

											ex work						
1	1. Having the ability to apply the knowledge of mathematics, basic science, technology and engineering for analyzing, designing, constructing, evaluating and researching the issues related to the field of construction	X	X			X	X									X	

	materials engineering technology;															
2	2. Having skills in practice, experiment, analysis, and processing the basic data in the field of construction materials engineering technology;						X									X
3	3. Having critical thinking, creative thinking, entrepreneurial thinking, professional behavior;							X	X						X	
4	4. Having ethics and professional responsibility;												X			X
5	5. Having effective skills for teamwork								X	X	X		X			

	and communication;																
6	6. Having skills to use the foreign languages in the professional field; Having foreign language proficiency equivalent to TOEIC 450 level;											X					
7	7. Having skills in using basic Information Technology as prescribed in Circular No. 03/2014/TT-BTTTT and being able to use several basic softwares in the field of			X													

	construction materials;															
8	8. Having the ability to propose concept for design, construction, planning, and to participate in management and operation of technology lines in construction materials production units or construction projects suitable to the conditions of economic and social society and environment;		X		X	X				X				X	X	X

