MINISTRY OF EDUCATION & TRAINING
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

UNDERGRADUATE PROGRAM
Major of
MATERIALS TECHNOLOGY

(Issued under Decision No. 3744 /QĐ-ĐHSPKT dated 06 / 10 /2025 by the President of Ho Chi Minh City University of Technology and Education)

Education Name: Materials Technology
Level: Undergraduate
Major: Materials Technology
Major Code: 7510402A

Ho Chi Minh City, 2025

THE MINISTRY OF EDUCATION & TRANING
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

UNDERGRADUATE PROGRAM

Education Program: Materials Technology

Level: Undergraduate

Major: Materials Techonlogy

Major Code: 7510402A

Type of Program: FULL-TIME

Graduation Diploma: ENGINEER

(Issued under Decision No. 3744 /QĐ-ĐHSPKT dated 06 / 10 /2025 by the President of Ho Chi Minh City University of Technology and Education)

1. Duration of Study: 4 years

2. Student Enrollment: High-school Graduates

3. Grading Scale, Training Process, and Graduation Requirements

Grading Scale: 10

Training Process: According to Decision No. 3116/QD-ĐHSPKT dated 22/08/2025 of Ho Chi Minh City University of Technology and Education on promulgating the university-level training regulations

Graduation Requirements:

- General Requirements: According to Decision No. 3116/QD-ĐHSPKT dated 22/08/2025 of Ho Chi Minh City University of Technology and Education on promulgating the university-level training regulations.
- Specialized Requirements: According to the general regulations of Ho Chi Minh City University of Technology and Education.

4. Training Goals and Learning Outcomes

Goals:

Materials Technology program aims to train engineers with specialized knowledge in semiconductor materials and polymer composites, meeting the demand for high-quality human resources in various industries. Students are equipped with research, development, and application skills for advanced materials in electronics, energy, automotive, and construction fields. Graduates can pursue diverse career opportunities in manufacturing enterprises, high-tech parks, research institutes, and educational institutions.

Objectives

PO1. Have technical knowledge and reasoning skills

PO2. Develop self-learning abilities to explore knowledge, solve problems, think systematically, and master both professional and personal skills.

PO3. Enhance communication skills, teamwork, and professional attitude.

PO4. Develop the ability to generate ideas, design, implement, and operate systems.

Program outcomes

Expected Learning Outcomes

Code	Learning Outcome Code	Content	Performance Indicator (PI)	Level	Level of PI
	1	**Have technical knowledge and reasoning skills**			
1	**ELO1**	Recognize and apply fundamental principles of natural sciences in the field of materials technology.	Use physics and chemistry knowledge to explain phenomena in the material formation process.	3	2
			Utilize mathematical knowledge to calculate, estimate, and simulate the material formation process.		3
			Identify and analyze issues related to Materials Technology.		3
2	**ELO2**	Understand, apply, analyze, and evaluate material fabrication processes and/or components in fields related to materials technology.	Classify materials based on different classification methods; possess the ability to measure and analyze the properties of materials.	5	2
			Evaluate material fabrication processes.		5
			Evaluate and apply materials in fields such as chemistry, pharmaceuticals, biomedicine, telecommunications, transportation, and consumer electronics.		5
	2	**Develop self-learning abilities to explore knowledge, solve problems, think systematically, and master both professional and personal skills.**			

3	**ELO3**	Systematically think to apply materials technology in practical situations.	Have the ability to analyze and evaluate experimental material data using basic measurement instruments and equipment in the Materials Technology Laboratory.	5	5
			Have the ability to analyze and evaluate experimental material data using electrical measurement methods.		5
			Have the ability to analyze and evaluate experimental material data using optical measurement methods.		5
4	**ELO4**	Have a positive, friendly attitude, ethics, and responsibility in learning and working environments.	Analyze and calculate accurately according to the guidelines and current regulations, ensuring reliability and optimization.	4	4
			Behave appropriately based on professional ethics standards.		3
			Demonstrate a positive attitude and responsibility in learning.		3
	3	**Enhance communication skills, teamwork, and professional attitude**			
5	**ELO5**	Have leadership and teamwork skills in the field of materials technology	Have the ability to organize teamwork in the process of professional learning.	4	4
			Have the ability to lead, encourage, and motivate team members in the workplace.		4
			Have a team spirit, enhance work efficiency, and foster strong collaboration.		4
6	**ELO6**	Communicate effectively in both	Have the ability to present specialized knowledge in written form.	4	4

		Vietnamese and English.	Have the ability to comprehend technical documents in English.		4
			Possess the ability to oral specialized knowledge effectively.		4
	4	**Develop the ability to generate ideas, design, implement, and operate systems.**			
7	**ELO7**	Evaluate the importance of the materials technology field, the diversity of corporate culture, and business capabilities within the materials technology sector.	Have the ability to assess the potential of a specialized area related to materials technology.	3	3
			Evaluate the corporate culture model of the company where the student is interning or visiting.		3
			Evaluate the commercial potential of products related to the materials technology sector.		3
8	**ELO8**	Establish and manage projects related to materials technology across various fields effectively.	Develop and plan a project related to the materials technology field.	5	5
			Manage, monitor, and track progress, adjust, and reassess the project.		5
			Able to work and resolve issues with stakeholders in project operations.		5
9	**ELO9**	Design and implement manufacturing processes in the field of materials technology.	Design a material fabrication process	5	5
			Ability to use and operate machinery and equipment systems in the field of materials technology to implement a material manufacturing process.		5

			Evaluate the effectiveness of the material manufacturing process after implementation		5

Capacity scale

Competence level		Short description
0.0 ≤ Level ≤ 1.0	Basic	Remember: Students memorize / recognize / recall knowledge by actions such as definition, repetition, listing, identification, identification, ...
1.0 < Level ≤ 2.0	Satisfaction	Understand: Students create their own knowledge from documents, knowledge by actions such as explanation, classification, illustration, reasoning, ...
2.0 < Level ≤ 3.0		Application: Students implement / apply knowledge to create products such as models, real objects, simulation products, reports, ...
3.0 < Level ≤ 4.0	Proficiency	Analysis: Students analyze materials / knowledge into details / parts and indicate their relationships as a whole by actions such as analysis, classification, comparison, synthesis, ...
4.0 < Level ≤ 5.0		Assessment: Students make judgments, predictions about knowledge / information according to standards, criteria and measurement indicators which have been determined by actions such as comments, criticisms, recommendations, …
5.0 < Level ≤ 6.0	Excellent	Creation: Students create / organize / organize / design / generalize parts / parts in other / new ways to create new structures / models / products.

5. Total program credits: 158 credits

(without, Physical Education and National Defense Education)

Foreign Language Knowledge:

- Students with an IELTS >= 4.5 or equivalent (as per Decisions No. 3239/QĐ-ĐHSPKT dated 03/09/2025) will be exempted from the English placement test. Their scores will be converted for English courses in the program and English proficiency requirement (Outcome).
- English Placement Test for Level Classification: Students without IELTS certificate must participate in an English placement test to determine their proficiency level.
    - If a student achieves Level 1, they will study Communicative English 1,2.
    - If a student achieves Level 2, they will study Academic English 1,2.

- Sequence of English courses: Communicative English 1,2 → Academic English 1, 2.

Note:

- Communicative English 1 and 2 are supplementary courses designed to enhance English communication skills for students not accumulating credits in the program.
- Academic English 1 and 2 are academic courses that accumulate credits in the program.

6. Allocation of Knowledge Group

Name of Knowledge Group	**Credits**		
	Total	**Compulsion**	**Option**
General Knowledge	**63**	**47**	**16**
General Politics + Laws	14	14	-
Mathematics and Natural Sciences *Practices (included)*	27 *(2)*	22 *(1)*	5 *(1)*
Introduction to Materials Technology *Practices (included)*	3 *(1)*	3 *(1)*	-
Technical Computer Sciences *Practices (included)*	3 *(1)*	-	3 *(1)*
Social Sciences and Humanities	8	-	8
English	8	8	
Professional knowledge	**95**	**89**	**6**
Foundation of Major	41	41	-
Professional Major	21	21	-
Interdisciplinary	6	-	6
Practices	15	15	-
Internship	2	2	-
Thesis	10	10	-
Enterprise Seminar *(Non-accumulation)*	*1*	*1*	-
Physical and National Defense Education *(Non-accumulation)*			
National Defense Education 1	*1*	*1*	-
National Defense Education 2	*1*	*1*	-
National Defense Education 3	*1*	*1*	-
National Defense Education 4	*1*	*1*	-

Physical Education 1	*1*	*1*	-
Physical Education 2, 3	*2*	-	*2*
Comunicative English *(non-accumulation)*			
Communicative English 1	4		
Communicative English 2	4		

7. CONTENT OF PROGRAM

A – Compulsory Courses

7.1. General Knowledge

No.	Course's ID	Course name	Credits	Prerequisite
	General Politics and Laws			
1	LLCT130105E	Philosophy of Marxism and Leninism	3	None
2	LLCT120205E	Political economics of Marxism and Leninism	2	None
3	LLCT120405E	Scientific socialism	2	LLCT120205E, LLCT130105E
4	LLCT220514E	History of Vietnamese Communist Party	2	LLCT120405E
5	LLCT120314E	Ho Chi Minh' Ideology	2	LLCT220514E
6	GELA 236939E	General Law	3	None
	Mathematics and Natural Sciences			
7	MATH132401E	Calculus 1	3	None
8	MATH132501E	Calculus 2	3	MATH132401E
9	MATH132601E	Calculus 3	3	MATH132501E
10	MATH132901E	Mathematical Statistics for Engineers	3	MATH132501E
11	PHYS130902E	Physics 1	3	None
12	PHYS131002E	Physics 2	3	PHYS130902E
13	PHYS111202E	Physics - Laboratory 1	1	PHYS130902E
14	GCHE130603E	General Chemistry for Engineers	3	None
	Introduction to Material Technology			

15	INME130212E	Introduction to Material Technology	3(2+1)	None
	English			
16	ACEN340535E	Academic English 1	4	
17	ACEN340635E	Academic English 2	4	
18	COEN140135E	Communicative English 1 *(Non-accumulation)*	*4*	
19	COEN140235E	Communicative English 2 *(Non-accumulation)*	*4*	
	Physical Education			
21	*PHED110513*	*Physical Education 1*	*1*	*None*
	National Defence Education			
22	*GDQP008031*	*National Defence Education 1*	*1*	*None*
23	*GDQP008032*	*National Defence Education 2*	*1*	*None*
24	*GDQP008033*	*National Defence Education 3,4*	*2*	*None*
Total *(Credits for Physical Education and National Defence Education are excluded)*			**39**	

7.2. Professional Knowledge

7.2.1. Foundation of Major

No.	Course's ID	Course name	Credits	Prerequisite
1	TDMA230312E	Thermodynamics of Materials	3	PHYS130902E
2	QMAP234012E	Quantum mechanic and atomic physics	3	PHYS131002E, MATH132501E, MATH143301E
3	SLSP230512E	Solid State Physics	3	PHYS131002E
4	PCMT228512E	Physical Chemistry 1	2	PHYS130902E, GCHE130603E
5	PCMT228612E	Physical Chemistry 2	2	PHYS130902E, GCHE130603E
6	EPCM218712E	Experiment of Physical Chemistry	1	PCMT228512E, PCMT228612E
7	ACMT228812E	Analytical Chemistry	2	GCHE130603E

8	EACM218912E	Experiment of Analytical Chemistry	1	ACMT228812E
9	ICMT229012E	Inorganic Chemistry	2	GCHE130603E
10	EICM219112E	Experiment of Inorganic Chemistry	1	ICMT229012E
11	OCMT229212E	Organic Chemistry	2	GCHE130603E
12	EOCM219312E	Experiment of Organic Chemistry	1	OCMT229212E
13	MATE234112E	Materials science and technology	3	GCHE130603E PHYS131002E
14	PCMA230812E	Polymer and composite materials	3	MATE220612E
15	MMSU220912E	Magnetic materials and superconducting	2	SLSP230512E
16	CEMA221012E	Ceramic materials	2	MATE220612E
17	PPPC335412E	Physical Chemistry and Polymer Chemistry	3	GCHE130603E
18	VATE331112E	Vacuum Engineering	3(2+1)	PHYS131002E
19	MATE336912E	Materials analysis techniques	3(2+1)	TDMA230312E, QMAP234012E MATE220612E
20	SEMA320712E	Semiconductor materials	2	SLSP230512E
21	MFTE338312E	Micro fabrication technology	3(2+1)	MATE220612E
22	TFFT328212E	Thin film fabrication technology	2(1+1)	MATE220612E
23	NATE331712E	Nanotechnology	3	QMAP234012E
24	FEMT336812E	Fundamental Experiments in Materials Technology	3	VATE331112E
25	SEMI310026E	Enterprise Seminar	*1*	None
26	OCSH115612E	Occupational safety and health	1	None
Total			**56**	

	(11 credits for experiment)	

7.2.2.a Professional Major Courses (Theory and Practice courses)

No.	Course's ID	Course name	Credits	Prerequisite
Major *Semiconductor Electronic Materials*				
1	MEMS332212E	Micro Electro-Mechanical System (MEMS)	3(2+1)	MIFT324312E
2	OPDE327712E	Optoelectronic and Photonic Components	2	MATE234112E
3	SMDE337112E	Semiconductor devices	3	SEMA320712E, QMAP234012E
4	SEDS337212E	Semiconductor Device Simulation	3	SEMA320712E
5	MESC327812E	Materials for energy storage and energy conversion	2	MIFT324312E
6	SMMA327312E	Spectroscopic Methods for Material Analysis	2	MIFT324312E
7	SMTE338112E	Semiconductor Manufacturing Technology	3	None
8	EXSE332312E	Experiment of Semiconductor materials	3	FEMT336812E
Total			**21** (4 credits for experiment)	
Major *Polymer Composite Materials*				
1	PPTE332412E	Polymer processing techniques	3	PPPC335412E
2	POFE321812E	Polymer manufacturing techniques	2	PPPC335412E
3	BBPO338012E	Biopolymers and their application	3	PPPC335412E
4	MEPO322712E	Measurement and characterization of Polymer and Rubber	2(1+1)	PPPC335412E

5	TPSC337912E	Technology of paint and surface coatings	3	PPPC335412E
6	RUTE337612E	Rubber Technology	3	MATE234112E
7	PWMA327512E	Plastic Waste Management	2	None
8	EXPO332812E	Experiment of Polymer Materials	3	FEMT336812E
Total			**21** (4 credits for experiment)	

7.2.2.b Internship

No.	Course's ID	Course name	Credits	Prerequisite
1	APMT326612	Graduation Internship	2	None
Total			**2**	

7.2.3. Capstone project

No.	Course's ID	Course name	Credits	Prerequisite
1	GRAT403812	Graduation Thesis	10	
Total			10	

B – Elective Courses

Knowledge of Social Sciences and Humanities: 8 Credits

No.	Course's ID	Course name	Credits	Prerequisite
1	GEFC220105E	General Economics	2	None
2	INMA220305E	Introduction to Management	2	None
3	IQMA220205E	Introduction to Quality Management	2	None
4	INSO321005E	Introduction to Sociology	2	LLCT150105E
5	ENPS220591E	Engineering Psychology	2	None
6	SYTH220491E	Systems Thinking	2	None
7	LESK120190E	Learning Skills	2	None
8	PLSK120290E	Planning Skills	2	None
9	WOPS120390E	Workplace Skills	2	None
10	REME320690E	Research Methods	2	None
11	INLO220405E	Introduction to Logic	2	None

12	IVNC320905E	Vietnamese Culture	2	None

Mathematics and Natural Sciences: 5 credits

No.	Course's ID	Course name	Credits	Prerequisite
1	PHYS111302E	Physics - Laboratory 2	1	PHYS111202E PHYS131002E
2	MATH143301E	Mathematics for Engineers	4	MATH132401E

Technical Computer Sciences: 3 credits

No.	Course's ID	Course name	Credits	Prerequisite
1	INEP130112E	Introduction to Engineering Programming	3(2+1)	None

Physical Education 2, 3: 2 credits

No.	Course's ID	Course name	Credits	Prerequisite
1	FOOT112330	Bóng đá (*Football)*	1	Choose 2
2	VOLL112330	Bóng chuyền (*Volleyball)*	1	
3	BASK112330	Bóng rổ (*Basketball)*	1	
4	BADM112330	Cầu lông (*Badminton)*	1	
5	TENN112330	Quần vợt (*Tennis)*	1	
6	KARA112330	Không thủ đạo (*Karate)*	1	
7	CHES112330	Cờ vua (*Chess)*	1	
	PICK112330	Pickleball	1	Non-accumulation

Professional Major Courses *(not counted in the 150-credit curriculum)*

No.	Course's ID	Course name	Credits	Prerequisite
1	SPAA337412E	Smart Polymers and Applications	3	PPPC335412E
2	SOCE331612E	Solar Cell	3	MIFT354312E
3	ENMT327012E	English for Materials Technology	2	None
4	INPY131685E	Introduction to Python Programming	3(2+1)	None

C – Interdisciplinary: 6 credits

No.	Course's ID	Course name	Credits	Prerequisite
1	EEEN234062E	Electrical and Electronics Engineering	3	Choose 6 credits

2	EEEN234162E	Basic Electronics	3	
3	TEDG130120E	Technical drawing – Basic course	3	
4	DIGI330163E	Digital Technology	3(2+1)	
5	MICR330363E	Microprocessor	3	
6	ENEC220410E	Environmental Engineering Chemistry	2	
7	ENAC220310E	Environmental Chemical Analysis	2	
8	FIMA430807E	Financial Management	3	

D – MOOC Course (Massive Open Online Cources):

No.	Course's ID	Course name	Credits	Link
1	TDMA235012E	Thermodynamics	3	https://www.edx.org/course/thermodynamics-iitbombayx-me209-1x-1
2	TRPH235112E	Basic transmission phenomena	3	https://courses.edx.org/courses/course-v1:DelftX+TP101x+3T_2017/course/
3	QUME235212E	Quantum Mechanics	3	https://www.edx.org/course/quantum-mechanics-everyone-georgetownx-phyx-008-01x
4	SOCE335312E	Solar cell	3	https://www.edx.org/course/solar-energy-delftx-et3034x-0
5	NATR335412E	Nano transistor	3	https://courses.edx.org/courses/course-v1:PurdueX+nano530x+T12016/course/

8. TEACHING PLAN

Courses that are not included in the teaching plan must be self-registered by students from the second semester onwards.

No.	Course's ID	Course name	Credits	Prerequisite
1	LLCT120205E	Political economics of Marxism and Leninism	2	LLCT130105E
2	LLCT120405E	Scientific socialism	2	LLCT120205E, LLCT130105E
3	LLCT220514E	History of Vietnamese Communist Party	2	LLCT120405E

4	LLCT120314E	Ho Chi Minh' Ideology	2	LLCT220514E
	GDQP110131	Giáo dục quốc phòng 1 (*National Defence Education 1)*	1	Non-accumulation
	GDQP110231	Giáo dục quốc phòng 2 (*National Defence Education 2)*	1	Non-accumulation
	GDQP110331	Giáo dục quốc phòng (*National Defence Education 3)*	1	Non-accumulation
	GDQP110431	Giáo dục quốc phòng 4 (*National Defence Education 4)*	1	Non-accumulation
	PHED110130	Giáo dục thể chất 1 (*Physical Education 1)*	1	Non-accumulation
	Giáo dục thể chất 2,3 (*Physical Education 2,3)*		**2**	**Choose 2**
	FOOT112330	Bóng đá (*Football)*	1	Non-accumulation
	VOLL112330	Bóng chuyền (*Volleyball)*	1	Non-accumulation
	BASK112330	Bóng rổ (*Basketball)*	1	Non-accumulation
	BADM112330	Cầu lông (*Badminton)*	1	Non-accumulation
	TENN112330	Quần vợt (*Tennis)*	1	Non-accumulation
	KARA112330	Không thủ đạo (*Karate)*	1	Non-accumulation
	CHES112330	Cờ vua (*Chess)*	1	Non-accumulation
	CHIN112330	Cờ tướng (Chinese Chess)	1	Non-accumulation
	YOGA112330	Yoga (Yoga)	1	Non-accumulation
5	PICK112330	Pickleball	1	Non-accumulation
Total			**8**	

(Credits for Physical Education and National Defence Education are excluded)		

Semester 1:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	INME130212E	Introduction to Material Technology	3(2+1)	None	1
2	MATH132401E	Calculus 1	3	None	2
3	GCHE130603E	General Chemistry for Engineers	3	None	2
4	GELA236939E	General law	3	None	2
5	GEFC220105E	Social Sciences and Humanities *(Elective 1 - General economics)*	2	None	1
6		Social Sciences and Humanities *(Elective 1)*	2	None	2
	ACEN340535E	Academic English 1	4		1
	ACEN340635E	Academic English 2	4		1
7	PHED110130	Giáo dục thể chất 1 (*Physical Education 1)*	*1*	None	1
Total *(Physical Education 1 are excluded)*			**24**		

Semester 2:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	PHYS130902E	Physics 1	3	None	2
2	MATH132501E	Calculus 2	3	MATH132401E	1
3	MATH143301E	Mathematics for Engineers	4	MATH132401E	1
4	ICMT229012E	Inorganic Chemistry	2	GCHE130603E	2
5	OCMT229212E	Organic Chemistry	2	GCHE130603E	1
6	LLCT130105E	Philosophy of Marxism and Leninism	3	None	2
7	OCSH115612E	Occupational safety and health	1	None	1

8		Social Science Courses *(Elective 1)*	2	None	2
Total			**20**		

Semester 3:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	PHYS111202E	Physics - Laboratory 1	1	PHYS130902E	1
2	PHYS131002E	Physics 2	3	PHYS130902E	1
3	MATH132601E	Calculus 3	3	MATH132501E	1
4	MATH132901E	Mathematical Statistics for Engineers	3	MATH132501E	2
5	PHYS111302E	Physics - Laboratory 2	1	PHYS111202E PHYS131002E	2
6	PCMT228512E	Physical Chemistry 1	2	PHYS130902E, GCHE130603E	1
7	EICM219112E	Experiment of Inorganic Chemistry	1	ICMT229012E	1
8	EOCM219312E	Experiment of Organic Chemistry	1	OCMT229212E	2
9	INEP130112E	Introduction to Engineering Programming	3(2+1)	None	1
10	QMAP234012E	Quantum mechanic and atomic physics	3	PHYS131002E, MATH132501E, MATH143301E	2
11	MATE234112E	Materials science and Technology	3	GCHE130603E PHYS131002E	2
Total			**24**		

Semester 4:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	PCMT228612E	Physical Chemistry 2	2	PHYS130902E, GCHE130603E	2
2	ACMT228812E	Analytical Chemistry	2	GCHE130603E	1
3	TDMA230312E	Thermodynamics of Materials	3	PHYS130902E	1

4	SLSP230512E	Solid State Physics	3	PHYS131002E	1
5	VATE331112E	Vacuum Technology	3 (2+1)	PHYS131002E	2
6	INMA220305E	Humanities and Social Sciences Course *(Elective 1: Introduction to Management)*	2	None	1
7		Interdisciplinary *(Elective 2)*	6		2
Total			**21**		

Semester 5:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	EPCM218712E	Experiment of Physical Chemistry	1	PCMT228512E, PCMT228612E	1
2	EACM218912E	Experiment of Analytical Chemistry	1	ACMT228812E	2
3	MMSU220912E	Magnetic materials and superconducting	2	SLSP230512E	1
4	CEMA221012E	Ceramic Materials	2	MATE220612E	2
5	SEMA320712E	Semiconductor Materials	2	SLSP230512E	1
6	PPPC335412E	Physical Chemistry and Polymer Chemistry	3	GCHE130603E	2
7	PCMA230812E	Polymer and Composite Materials	3	MATE220612	1
8	SEMI310026E	Enterprise Seminar	*1*	None	2
Total			**14**		

Semester 6:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	MATE336912E	Materials Analysis Techniques	3(2+1)	TDMA230312E, QMAP234012E MATE220612E	1
2	MIFT334312E	Micro Fabrication Technology	3(2+1)	MATE220612E	2

3	TFFT328212E	Thin Film Fabrication Technology	2(1+1)	MATE220612E	1
4	NATE331712E	Nanotechnology	3	QMAP234012E,	1
5	FEMT336812E	Fundamental Experiments in Materials Technology	3	VATE331112E	2
Total			**14**		

Major: Semiconductor Electronic Materials

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	SMDE337112E	Semiconductor Devices	3	SEMA320712E, QMAP234012E	2
Total			**3**		

Major: Polymer Composite Materials

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	POFE321812E	Polymer Manufacturing Techniques	2	PPPC335412E	2
Total			**2**		

Semester 7:

Major: Semiconductor Electronic Materials

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	MEMS332212E	Micro Electro-Mechanical System (MEMS)	3(2+1)	MFTE338312E	2
2	OPDE327712E	Optoelectronic and Photonic Components	2	MATE234112E	1
3	SEDS337212E	Semiconductor Device Simulation	3	SMDE337112E	2
4	MESC327812E	Materials for energy storage and energy conversion	2	MIFT324312E	1
5	SMMA327312E	Spectroscopic Methods for Material Analysis	2	MIFT354312E	1
6	SMTE338112E	Semiconductor Manufacturing Technology	3	None	1

7	EXSE332312E	Experiment of Semiconductor Materials	3	FEMT336812E	2
8	APMT326612	Graduation Internship	2		1
Total			**20**		

Major: Polymer Composite Materials

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	PPTE332412E	Polymer Processing Techniques	3	PPPC335412E	2
2	BBPO338012E	Biopolymers and their application	3	PPPC335412E	1
3	MCPR325912E	Measurement and Characterization of Polymer and Rubber	2(1+1)	PPPC335412E	1
4	TPSC337912E	Technology of Paint and Surface Coatings	3	PPPC335412E	2
5	RUTE337612E	Rubber Technology	3	MATE234112E	1
6	PWMA327512E	Plastic Waste Management	2	None	1
7	EXPO332812E	Polymer Materials Laboratory	3	FEMT336812E	2
8	APMT326612	Graduation Internship	2		1
Total			**21**		

Semester 8:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1	GRAT403812	Graduation Thesis	10		1
Total			**10**		

9. COURSE DESCRIPTIONS

English:

1. **Academic English 1** **Credits: 4**
   Prerequisite course(s): Communicative English 1
   Corequisite course(s): Academic English 2
   Previous course(s): N/A

Course Description:

This is the first course of the Academic English series designed for students majoring in the areas other than English to achieve the intermediate level of English language proficiency (equivalent to B2.1 level of CEFR) in Speaking and Listening skills. The series aims to enhance students' English competence to deal with complex matters of everyday life in other countries, to exchange specific information and personal ideas with young people and adults who speak English, and to achieve a wider understanding of thoughts from people of other cultures. This course particularly provides students with the opportunities to understand the main ideas of complex oral English on quite abstract topics, including basic technical discussions in their fields of specialization. Students are asked to orally interact with a degree of fluency that makes regular interactions with native English speakers quite possible with some strain. They are also prepared to orally produce clear, detailed texts on a limited range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of a few options. In addition, this course promotes students' development of presentation skills, teamwork ability, and learner autonomy by engaging them in various interactive activities.

Textbooks:

Kisslinger, E., & Baker, L. (2024). *Skillful 3 Listening and Speaking* (3rd ed.). Macmillan Education.

2. Academic English 2 **Credits: 4**

Prerequisite course(s): Communicative English 2

Corequisite course(s): Academic English 1

Previous course(s): N/A

Course Description:

This is the second course of the Academic English series designed for students majoring in the areas other than English to achieve the intermediate level of English language proficiency (equivalent to B2.1 level of CEFR) in Reading and Writing skills. The series aims to enhance students' English competence to deal with complex matters of everyday life in other countries, to exchange specific information and personal ideas with young people and adults who speak English, and to achieve a wider understanding of thoughts from people of other cultures. This course particularly provides students with the opportunities to understand the main ideas of complex English texts on quite abstract topics, including basic technical discussions in their fields of specialization. Students are asked to interact in written English with a degree of fluency that makes regular interactions with native English speakers quite possible with some strain. They are also prepared to produce clear, detailed written texts on a limited range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of a few options. In addition, this course promotes students' development of presentation skills, teamwork ability, and learner autonomy by engaging them in various interactive activities.

Textbooks:

Rogers, L., & Zemach, D. E. (2024). *Skillful 3 Reading and Writing* (3rd ed.). Macmillan Education.

9.1. General Knowledge

Philosophy of Marxism-Leninism **Credits: 3**

Learning Time Allocation: 3/0/6

Prerequisite Courses: None

Prior Courses: None

Course Summary:

This course provides a brief introduction to Marxism-Leninism and general concepts related to the subject. It covers the fundamental principles of the Marxist-Leninist worldview and philosophical methodology.

Political economics of Marxism and Leninism **Credits: 2**

Learning Time Allocation: 2/0/4

Prerequisite Courses: None

Prior Courses: None

Course Summary:

This course focuses on the economic theories of Marxism-Leninism, particularly on the capitalist mode of production.

Scientific Socialism **Credits: 2**

Learning Time Allocation: 2/0/4

Prerequisite Courses: Political economics of Marxism and Leninism, Philosophy of Marxism-Leninism

Prior Courses: None

Course Summary:

This course covers fundamental theoretical aspects of Marxism-Leninism on socialism, including the concept of scientific socialism, real-world socialism, and its future prospects.

History of Vietnamese Communist Party **Credits: 2**

Learning Time Allocation: 2/0/4

Prerequisite Courses: Scientific Socialism

Prior Courses: None

Course Summary:

This course provides fundamental knowledge of the formation and development of the Communist Party of Vietnam. It systematically covers the Party's policies, especially during the renovation period, across key areas of society. Topics include the establishment of the Communist Party of Vietnam, its first political platform, policies during the struggle for independence (1930-1945), resistance wars against French colonialists and American imperialists (1945-1975), industrialization strategies, socialist-oriented market economy development, political system building, cultural policies, social issues, and foreign relations.

Ho Chi Minh’s Ideology **Credits: 2**

Learning Time Allocation: 2/0/4

Prerequisite Courses: History of Vietnamese Communist Party

Prior Courses: None

Course Summary:

In addition to the introductory chapter, the course consists of 7 chapters. Chapter I discusses the foundations, formation process, and development of Ho Chi Minh Thought. From Chapter II to Chapter VII, the course covers the core contents of Ho Chi Minh Thought in line with the objectives of the course.

General Law **Credits: 3**

Learning Time Allocation: 3/0/6

Prerequisite Courses: None

Prior Courses: None

Course Summary:

This course provides basic concepts of fundamental theoretical knowledge about the state and law in general, and socialist law and state in particular. It helps students gain a correct understanding and perspective on the policies of the Party and the laws of the state. Additionally, it equips students with basic knowledge of the legal system in Vietnam and specific branches of law, enhancing their understanding of law to apply in practical life.

Calculus 1 **Credits: 3**

Learning Time Allocation: 3/0/6

Prerequisite Courses: None

Prior Courses: None

Course Summary:

This course covers basic and advanced mathematics knowledge, including set theory: rational numbers, real numbers, complex numbers. Limits: functions, limits of functions, continuous functions. Differential calculus for single-variable functions: derivatives, differentials, Taylor-Maclaurin series, function analysis, curves in polar coordinates. Integral calculus for single-variable functions: indefinite integrals, definite integrals, improper integrals. Series: number series, function series, power series, Taylor-Maclaurin series, Fourier series, Fourier expansion, trigonometric series.

Calculus 2 **Credits: 3**

Learning Time Allocation: 3/0/6

Prerequisite Courses: None

Prior Courses: Calculus 1

Course Summary:

Matrices and determinants: matrices, types of matrices, inverse matrices, determinants, rank of matrices.

Linear systems: linear systems, Cramer's rule, Gaussian elimination, homogeneous systems.

Vector spaces: vector spaces, subspaces, linear independence, linear dependence, bases, dimension, Euclidean spaces.

Diagonalization of matrices and quadratic forms: eigenvalues, eigenvectors, eigenspaces, matrix diagonalization, quadratic forms, canonical form, quadratic surfaces.

Differential calculus for multivariable functions: multivariable functions, partial derivatives, differentials, extrema of multivariable functions, applications of differential calculus in geometry in space.

Calculus 3 **Credits: 3**

Learning Time Allocation: 3/0/6

Prerequisite Courses: None

Prior Courses: Calculus 1

Course Summary:

Multiple integrals: double integrals, applications for calculating areas of flat regions, surface areas, volumes of solids, triple integrals, applications for calculating volumes of solids.

Line integrals: line integrals of type one, applications, line integrals of type two, applications, Green's theorem, conditions for path independence in line integrals.

Surface integrals: surface integrals of type one and type two, Ostrogradsky's theorem, vector fields, flux and divergence, vector form of Ostrogradsky's theorem, Stokes' theorem, circulation and vorticity, vector form of Stokes' theorem.

Mathematical Statistics for Engineers **Credits: 3**

Learning Time Allocation: 3/0/6

Prerequisite Courses: None

Prior Courses: Calculus 1, Calculus 2

Course Summary:

Basic concepts in probability theory: Counting rules, combinations, permutations, binomial theorem, trials, events, probability, conditional probability.

Random variables: Random variables, probability distributions of random variables, numerical characteristics of random variables: expectation, variance, mode, median.

Common probability distributions: Binomial distribution, Poisson distribution, normal distribution, Student's t-distribution.

Sampling theory: Concepts of population, random sampling, statistics on samples, sampling methods, sample characteristics, distribution of sample statistics, calculating sample statistics.

Estimation theory: Concepts of estimation, point estimation, interval estimation.

Hypothesis testing: Type I and Type II errors, significance level, hypothesis testing for means, hypothesis testing for proportions, testing equality of two means or two proportions, testing for independence.

Correlation and regression: Two-dimensional random variables, correlation coefficient, sample correlation coefficient, experimental correlation table, experimental regression line.

Physics 1 **Credits: 3**

Learning Time Allocation: 3/0/6

Prerequisite Courses: None

Prior Courses: None

Course Summary:

Mechanics: Kinematics of particles, dynamics of particles, laws of conservation, rigid body motion. Thermodynamics: Molecular kinetic theory, First Law of Thermodynamics, Second Law of Thermodynamics. Electromagnetism: Electric fields, magnetic fields, varying electromagnetic fields.

Physics 2 **Credits: 3**

Learning Time Allocation: 3/0/6

Prerequisite Courses: Physics 1

Prior Courses: Physics 1

Course Summary:

Einstein's Theory of Relativity: Special relativity, general relativity. Optics: Wave optics and phenomena like interference, diffraction of light, quantum optics and photoelectric, Compton effects. Quantum Physics: de Broglie and Heisenberg hypotheses, Schrödinger's equation and particle motion, quantization of physical quantities.

The course includes practical experiments to help students visualize theoretical phenomena. Experiments include: error calculation theory, determining the moment of inertia of a wheel and frictional force of a bearing, determining the gravitational acceleration using a physical pendulum, determining the molecular heat capacity ratio of a gas, investigating the RLC resonance circuit-measuring RLC with an electronic oscilloscope, studying the properties of diodes and transistors, determining the electron charge-to-mass ratio using the magnetron method, studying laser diffraction through a flat diffraction grating, determining the wavelength of a laser, studying thermal radiation-verifying the Stefan-Boltzmann law, studying the photoelectric effect - determining Planck's constant.

Physics - Laboratory 1 **Credits: 1**

Learning Time Allocation: 1 (0, 1, 4)

Prerequisite Courses: Physics 1

Prior Courses: Physics 1

Course Summary:

This course consists of 9 experiments covering principles of mechanics, particle dynamics, and rigid body dynamics. It supplements knowledge for students in the technology field at both the associate and undergraduate levels, providing insight into the nature of physical phenomena in nature and validating physical theories learned in the curriculum. It helps future engineers develop skills in observation, conducting experiments, measuring, calculating, analyzing, and processing data.

Physics - Laboratory 2 **Credits: 1**

Learning Time Allocation: 1 (0, 1, 4)

Prerequisite Courses: Physics 2

Prior Courses: Physics 2

Course Summary:

This course includes 9 experiments on electromagnetism and optics. It supplements knowledge for students in the technology field at both the associate and undergraduate levels, providing insight into the nature of physical phenomena in nature and validating physical theories learned in the curriculum. It helps future engineers develop skills in observation, conducting experiments, measuring, calculating, analyzing, and processing data.

General Chemistry for Engineers **Credits: 3**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisite Courses: None

Course Summary:

This course equips students with basic chemistry knowledge, laying the foundation for understanding related scientific and technical fields. It enables students to (i) understand the nature of atoms and molecules, thereby explaining the properties of matter; (ii) develop the ability to solve basic quantitative problems related to thermodynamics, reaction kinetics, chemical equilibrium, solution properties, and electrochemical processes.

This course serves as the foundation for students to acquire essential knowledge of the physical world around them and recognize the connections between chemistry and engineering disciplines. Additionally, this course prepares students for higher education or second-degree university programs.

Introduction to Materials Technology **Credits: 03 (2+1)**

Learning Time Allocation: 2/1/6

Prerequisites: None

Course Summary:

This course provides students with fundamental knowledge in the field of materials technology, career orientation, and essential soft skills necessary for advanced studies in subsequent foundational and specialized courses.

Introduction to Engineering Programming **Credits: 03 (2+1)**

Learning Time Allocation: 2/1/6

Prerequisites: None

Course Summary:

This course equips students in materials technology with basic knowledge of technical programming. It consists of two main parts: Introduction to MATLAB Programming and Problem-Solving Using MATLAB. The first part covers expressions, operators, variables, assignments, scalars, vectors, built-in functions, algorithms, user-defined functions, conditional statements, loops, vectorization, string processing, arrays, and file I/O. The second part includes plotting techniques, matrix representation for linear algebra, basic statistics, sets, sorting, indexing, curve fitting, complex numbers, integration, and differentiation. Additionally, the course emphasizes MATLAB programming mindset and style.

Mathematics for Engineers **Credits: 04**

Learning Time Allocation: 4/0/8

Prerequisites: Calculus 1, 2, 3

Course Summary:

This course covers fundamental knowledge of first-order differential equations, modeling with first-order differential equations, higher-order differential equations, Laplace transforms, series solutions to linear differential equations, linear algebra, systems of differential equations, Fourier series, and boundary value problems for partial differential equations.

General Economics **Credits: 02**

Learning Time Allocation: 2/0/4

Prerequisites: None

Course Summary:

This course provides non-economics majors with basic economic knowledge, covering real-world phenomena from both microeconomic and macroeconomic perspectives.

Introduction to Quality Management **Credits: 02**

Learning Time Allocation: 2/0/4

Prerequisites: None

Course Summary:

This course introduces fundamental concepts of quality and quality management. It presents key quality indicators and evaluation methods in organizations while guiding students in applying techniques and tools for quality control. The course also covers the implementation of quality management systems based on industry standards.

Introduction to Management **Credits: 02**

Learning Time Allocation: 2/0/4

Prerequisites: None

Course Summary:

This course provides foundational knowledge of management, including general environmental factors affecting businesses and core management functions such as planning, organizing, leading, and controlling. Class activities are designed to enhance students' information-seeking, public speaking, and critical thinking skills.

Introduction to Logic **Credits: 02**

Learning Time Allocation: 2/0/4

Prerequisites: None

Course Summary:

This course introduces the cognitive process and nature of human reasoning. Students learn the fundamental laws of thought and logical structures, improving their ability to articulate ideas clearly, construct persuasive arguments, and avoid fallacies in communication.

Vietnamese Culture **Credits: 02**

Learning Time Allocation: 2/0/4

Prerequisites: None

Course Summary:

Designed for second-year undergraduates, this course provides basic knowledge of culture in general and Vietnamese culture in particular. Students learn key characteristics of Vietnamese culture from tradition to modernity, enabling them to critically engage with global information while preserving national values. The course also enhances skills such as research, public speaking, and teamwork.

Introduction to Sociology **Credits: 02**

Learning Time Allocation: 2 (2, 0, 2)

Prerequisites: None

Course Summary:

This course introduces non-sociology majors to fundamental sociological theories, the discipline's historical development, key concepts, research areas, and methodologies in social science.

Engineering Psychology **Credits: 02**

Learning Time Allocation: 1/1/4

Prerequisites: None

Course Summary:

This course provides engineering students with knowledge of human psychology and its applications in designing user-friendly technical systems.

Systems Thinking **Credits: 02**

Learning Time Allocation: 1/1/4

Prerequisites: None

Course Summary:

This course covers fundamental concepts of systems, systems thinking methodology, and creative problem-solving techniques, fostering students' ability to approach issues logically and innovatively.

Learning Skills **Credits: 02**

Learning Time Allocation: 2/0/4

Prerequisites: None

Course Summary:

This course equips students with effective learning strategies for higher education, enhancing their ability to study systematically and scientifically.

Planning Skills **Credits: 02**

Time Allocation: 2/0/4

Prerequisites: None

Course Summary:

This course introduces basic planning methodologies, guiding students in developing short- and long-term academic, personal, and professional plans. It also covers time management and task organization techniques.

Research Method **Credits: 02**

Time Allocation: 2/0/4

Prerequisites: None

Course Summary:

This course for engineering students develops essential workplace skills in a multicultural, fast-evolving technical environment, including technical communication, creative thinking, problem-solving, project planning, teamwork, technical presentation, report writing, IT utilization, and self-management.

9.2. Core Major Knowledge

Quantum Mechanics and Atomic Physics **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Physics 1, Physics 2, Calculus 1, Calculus 2, Calculus 3

Course Summary:

This course guides students from the limitations of classical physics to the development and principles of quantum physics, along with the essential properties of matter covered in atomic physics. The Quantum Mechanics section equips students with fundamental knowledge of the mechanics governing microscopic systems.

Solid State Physics **Credits**: **03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Physics 1, Physics 2

Course Summary:

Solid State Physics course equips students with fundamental knowledge of crystalline solids, including: crystal lattice structures; interatomic bonding in solids; lattice vibrations and thermal properties of solids; free electron theory and electrical conductivity of solids; energy band theory of solids; semiconductor properties, dielectric properties, magnetic properties, optical properties, and superconductivity of solids.

Physical Chemistry 1 **Credits**: **02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Physics 1, Physics 2, Chemistry for Engineers

Course Summary:

This course provides students with knowledge of:

+ Fundamentals of chemical thermodynamics: thermal effects, feasibility, direction of chemical reactions, physicochemical processes. Chemical equilibrium and factors affecting chemical equilibrium.

+ Basic knowledge of phase equilibria in single-component and multi-component systems, molecular solutions. Basic theories of reaction kinetics, homogeneous catalysis, biocatalysis, and heterogeneous catalysis.

Physical Chemistry 2 **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Physics 1, Physics 2, Chemistry for Engineers

Course Summary:

This course provides students with fundamental knowledge of:

+ Electrolyte solutions and their properties.
+ Electrodes and chemical cells, electrochemical processes.
+ Surface phenomena and adsorption.
+ Dispersion systems and their properties.
+ Coarse dispersions, colloidal dispersions, and polymer solutions.

Experiment of Physical Chemistry **Credits: 01**

Learning Time Allocation: 1 (0, 1, 4)

Prerequisites: Physical Chemistry 1, Physical Chemistry 2

Course Summary:

This laboratory course provides students with physical chemistry experiments related to the application of chemical thermodynamics principles to chemical systems. Chemical equilibrium and phase equilibrium are also extensively investigated. Furthermore, topics concerning reaction rates, reaction orders, electrochemical cells, electrical conductivity, ion transport numbers, and surface phenomena are also emphasized.

Analytical Chemistry **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Chemistry for Engineers

Course Summary:

This course aims to equip students with the theoretical foundations of chemical methods used in quantitative analysis.

Experiment of Analytical Chemistry **Credits: 01**

Learning Time Allocation: 1 (0, 1, 4)

Prerequisites: Chemistry for Engineers

Course Summary:

This laboratory course equips students with practical skills, including: chemical preparation, proficient execution of titration techniques, accurate determination of titration endpoints through color change detection. Calculation of analytical result errors. Development of analytical result calculation formulas. Understanding of analytical process handling and adjustment to suit laboratory conditions. Awareness and implementation of environmental protection and improvement within and around the laboratory. Knowledge of laboratory safety incident handling...This course also establishes a foundation for professional practical courses and graduation theses. It helps students develop analytical approach and titration skills, providing clear career development directions.

Inorganic Chemistry **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Chemistry for Engineers

Course Summary:

This course equips students with the following fundamental concepts:

+ The solid state of inorganic substances.

+ Acid-base properties.

+ Oxidation-reduction properties.

+ Classification of inorganic substances.

+ Non-transition elements.

+ Transition elements.

Experiment of Inorganic Chemistry **Credits: 01**

Learning Time Allocation: 1 (0, 2, 4)

Prerequisites: Inorganic Chemistry

Course Summary:

This laboratory course involves Inorganic Chemistry experiments related to the characteristic physical and chemical properties of elements in the periodic table.

Organic Chemistry **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Chemistry for Engineers

Course Summary:

This course provides students with the following topics:

+ General Organic Chemistry

+ Hydrocarbon Compounds

+ Halogen Derivatives

+ Oxygen-Containing Hydrocarbon Compounds

+ Amines

+ Some Heterofunctional Compounds

Experiment of Organic Chemistry **Credits: 01**

Learning Time Allocation: 1 (0, 2, 4)

Prerequisites: Organic Chemistry

Course Summary:

This laboratory course provides students with fundamental knowledge and skills in:

+ Methods for the preparation and synthesis of basic organic compounds, fostering organic research and experimental techniques.

+ Fundamental theoretical and experimental knowledge of Organic Chemistry.

+ Initial training in methods for the preparation and synthesis of basic organic compounds, cultivating organic research and experimental skills.

Materials Science and Technology **Credits: 03**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: None

Course Summary:

This course aims to equip students with the following fundamental knowledge:

+ Basic knowledge of the structure and properties of fundamental material groups, including metals, ceramics, polymers, and composites.

+ Knowledge of various material properties, including mechanical-thermal, electrical-electronic, magnetic, chemical, and optical properties.

+ The course also provides students with knowledge related to the basic kinetics of material groups.

+ Students are equipped with knowledge of methods and fabrication technologies, as well as the applications of fundamental materials in various fields, from conventional applications to advanced technology applications such as telecommunications electronics, mechatronics, and biomedicine.

Polymer and Composite Materials **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Chemistry for Engineers, Materials Science and Technology

Course Summary:

The Polymer and Composite Materials course provides students with the following fundamental topics:

+Basic polymers: structural formulas, nomenclature, classification, and general properties.

+ Polymer molecular weight: definition, significance, determination methods, and their influence on polymer properties.

+ Polymer fabrication methods.

+ Mechanical properties of polymers.

+ Functional polymers.

+ Common raw materials used in composite material fabrication: matrix resins and fibers.

+ Composite material fabrication technologies.

+ Properties of composite materials.

Ceramic Materials **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Physical Chemistry 1, Physical Chemistry 2

Course Summary:

The Ceramic Materials course provides students with fundamental knowledge of ceramic materials, including fabrication methods, specific processes for each method, and the kinetics of ceramic material formation.

Semiconductor Materials **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: None

Course Summary:

This course provides students with:

+ Concepts in semiconductor materials: crystal lattices and energy band structures of semiconductors.

+ Knowledge of equilibrium and non-equilibrium carrier concentrations, and heterogeneous semiconductors.

+ The fundamental properties of semiconductor materials and their conduction mechanisms.

Physical Chemistry and Polymer Chemistry **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Physical Chemistry 1, Physical Chemistry 2, Organic Chemistry

Course Summary:

The undergraduate-level Physical Chemistry and Polymer Chemistry course provides students with fundamental knowledge of the structure and properties of polymer materials. Students are provided with knowledge of polymer material synthesis methods, characteristic physical and chemical properties, and polymer characterization methods.

Vacuum Technology **Credits: 03 (2+1)**

Learning Time Allocation: 3 (2, 1, 6)

Prerequisites: Physics 1, Physics 2

Course Summary:

This course equips students with fundamental knowledge of vacuum environments, vacuum generation techniques, and applications of vacuum environments in both everyday life and scientific and technical fields, particularly in Physical Vapor Deposition (PVD) thin film fabrication. It also orients students towards the necessary skills for operating vacuum machinery and equipment for their graduation theses and future scientific research.

Materials Analysis Techniques **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Quantum Mechanics and Atomic Physics

Course Summary:

Students will be equipped with knowledge of measurement methods for film parameters. They will study material structures through film parameters such as grain size, surface roughness, thickness, and crystal structure of films, using techniques like X-ray diffraction (XRD), scanning electron microscopy (SEM), atomic force microscopy (AFM), and scanning probe microscopy (SPM).

Micro fabrication Technology **Credits: 03 (2+1)**

Learning Time Allocation: 3 (2, 1, 6)

Prerequisites: Fundamentals of Materials Science and Engineering

Course Summary:

The undergraduate Microfabrication Technology course provides students with knowledge of fabrication methods and design principles for creating new materials at micro (10^{-6} m) and nano (10^{-9} m) scales, such as thin films, nanowires, nanorods, and nanoparticles. It covers

patterning and etching techniques for designing and fabricating electronic device structures, including:

+ Physical Vapor Deposition (PVD) and Chemical Vapor Deposition (CVD) thin film deposition methods.

+ Patterning technology, photolithography processes, and photoresist materials.

+ Wet and dry etching technologies.

+ Non-traditional microfabrication technologies.

Thin Film Fabrication Technology **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Vacuum Technology

Course Summary:

This course equips students with foundational and advanced knowledge of materials and innovative thin-film fabrication methods. Additionally, it helps students enhance their research skills and select experimental approaches that are best suited to the materials being studied.

Through the course, students can master thin-film fabrication techniques, consolidate essential knowledge, and apply specialized expertise to different mechanisms of thin-film creation

Nano Technology **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Quantum Mechanics and Atomic Physics, Micro fabrication Technology, Materials Analysis Techniques

Course Summary:

This course aims to provide students with fundamental knowledge of nanotechnology, including:

+ Nanomaterial fabrication methods.

+ Nanoscale observation techniques.

+ Nanomanipulation.

+ Concepts of nanoelectronics.

Semiconductor devices **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Solid-state Physics, Quantum Mechanics and Atomic Physics

Course Summary:

This course provides students with knowledge about semiconductor devices such as solar cells, optical detectors, light-emitting diodes (LEDs), semiconductor lasers, bipolar transistors, field-effect transistors, and metal-oxide-semiconductor transistors.

Microelectromechanical Systems (MEMS) **Credits: 03 (2+1)**

Learning Time Allocation: 3 (2, 1, 6)

Prerequisites: Microfabrication technology

Course Summary:

This course provides students with fundamental knowledge, including:

- What are Microelectromechanical Systems (MEMS)?

- What functions do they have and what components do they include? Key issues related to - - MEMS Design. Types of MEMS devices (mechanical, RF, electrical, optical, magnetic, bio-- MEMS, microfluidic).

- How is the MEMS fabrication process conducted?

- Clean Room Laboratory.

- Microfabrication processes:

+ Patterning processes: lithography.

+ Deposition processes.

+ Etching processes: wet and dry etching.

- LIGA technology and polymers in microfabrication.

- Techniques for MEMS bonding, integration, and packaging.

- Design and fabrication methods for various MEMS structures (mechanical, electrical, magnetic, thermal, optical, biological sensors, and microfluidic systems).

Semiconductor Device Simulation **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Semiconductor materials

Course Summary:

This course introduces students to various methods for simulating the fabrication processes and operational mechanisms of semiconductor devices. By utilizing Technology Computer-Aided Design (TCAD) tools, students will learn how to simulate the fabrication steps of electronic devices as well as their functional behavior after synthesis.

TCAD simulation is an advanced technique widely adopted by leading semiconductor companies and renowned universities around the world. The use of such simulation methods has significantly reduced the cost of developing new semiconductor devices. Moreover, TCAD has enabled the invention of new semiconductor device architectures that had never been experimentally fabricated before—for instance, FinFET, one of the core devices used to increase the number of transistors on a CPU, thus sustaining Moore's Law.

Key topics covered in this course include:

- Fundamental physics for semiconductor device simulation;
- Mesh generation techniques in device modeling;
- Investigation of the electrical characteristics of conventional silicon-based devices and compound semiconductor devices;
- Simulation of next-generation semiconductor devices.

Materials For Energy Storage And Energy Conversion **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Micro fabrication technology

Course Summary:

This course consists of two main components:

- Part 1: Energy Conversion Mechanisms
  This section provides students with knowledge of the mechanisms involved in energy conversion processes, including:
  - Conversion of solar energy to electricity in photovoltaic (solar cell) systems.
  - Conversion of thermal energy to electricity using thermoelectric materials.
  - Conversion of mechanical energy to electricity through piezoelectric materials.
  - Conversion of chemical energy to electricity in fuel cell systems.
- Part 2: Energy Storage Mechanisms
  This section introduces students to the materials and principles related to energy storage, including:
  - Materials and mechanisms for energy storage in batteries.
  - Environmentally friendly materials and mechanisms in supercapacitors.
  - Hydrogen storage technologies.

Spectroscopic Methods for Material Analysis **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Micro fabrication technology

Prior Courses: Micro fabrication technology, Solid State Physics, Semiconductor materials

Course Summary:

This course provides students with fundamental knowledge of various spectroscopic techniques, including X-ray Diffraction (XRD), X-ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-ray Spectroscopy (EDX), Ultraviolet–Visible Spectroscopy (UV-Vis), Photoluminescence (PL) Spectroscopy, Raman Spectroscopy, and Fourier-transform Infrared Spectroscopy (FTIR).

Students will gain understanding of the principles, instrumentation, and practical applications of these spectroscopic methods in the analysis of different types of materials.

Experiment of Semiconductor materials **Credits: 03**

Learning Time Allocation: 3 (0, 3, 6)

Prerequisites: Thin film fabrication technology, Micro fabrication technology

Course Summary:

This course consists of seven experiments designed to provide students with the knowledge and skills necessary for thin-film fabrication using equipment in the Materials Technology Laboratory. Techniques covered include sputtering, thermal evaporation, chemical vapor deposition (CVD), sol-gel processing, and others.

Through hands-on training and foundational knowledge in laboratory techniques, students will be able to design and develop fabrication processes for various materials, semiconductor devices, and microelectromechanical systems (MEMS). The course also equips students to conduct measurements, characterizations, and apply these devices in practical applications.

Polymer Manufacturing Techniques **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisites: Polymer Chemistry, Polymer Physical Chemistry

Course Summary:

This course provides students with knowledge about the raw materials for synthesizing polymers, synthesis reactions, synthesis technologies, and industrial equipment used in polymer production. It also equips students with an understanding of the properties and applications of polymers. Additionally, the course introduces devices and technologies for manufacturing products made from polymers.

Polymer Processing Techniques **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Physical Chemistry 1, Physical Chemistry 2, Organic Chemistry, Polymer Chemistry

Course Summary:

This course aims to provide students with fundamental concepts of polymer materials, plastic additives, and the main technologies used in plastic processing.

Biopolymers and their application **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisites: Physical Chemistry 1, Physical Chemistry 2, Organic Chemistry, Polymer Chemistry

Course Summary:

This course equips students with fundamental knowledge about the structure and functions of natural polymers (proteins, enzymes, polysaccharides) and biodegradable synthetic polymers. Students will also gain insights into the applications of biological polymers in modern medicine and environmentally friendly materials. Through this course, learners will recognize the relationship between the structure and role of certain types of polymers in life. These theories provide foundational knowledge and skills for applications in modern medicine as well as contribute to raising awareness about environmental protection.

Measurement and Characterization of Polymer and Rubber **Credits: 02(1+1)**

Learning Time Allocation: 2 (1, 1, 4)

Prerequisite Courses: None

Prior Courses: Physical Chemistry and Polymer Chemistry

Course Summary:

This course provides students with fundamental knowledge of methods used to evaluate the structure and properties of polymer materials. The detailed content includes:

- Methods for evaluating morphology and microstructure;
- Spectroscopic analysis techniques;
- Thermal and mechanical property analysis methods;
- Methods for determining molecular weight;
- Guidance on interpreting analytical results for each method.

Rubber Technology **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisite Courses: None

Prior Courses: Physical Chemistry and Polymer Chemistry

Course Summary:

This course provides knowledge of the processing of natural rubber, important types of synthetic rubbers, and the main fillers and additives used in the rubber industry. It also introduces methods for formulating rubber compounds for specific products.

Additionally, students will learn about techniques for rubber mixing, shaping, and vulcanization. The course further covers processing procedures of various real-life rubber products and the technical properties of different rubber materials.

Technology Of Paint And Surface Coatings **Credits: 03**

Learning Time Allocation: 3 (3, 0, 6)

Prerequisite Courses: None

Prior Courses: Physical Chemistry and Polymer Chemistry, Polymer and Composites Materials

Course Summary:

This course provides students with fundamental knowledge of paints and various types of surface coatings for materials. It also covers the components of paint and coating systems, including polymers, solvents, pigments, and additives.

In addition, students will gain knowledge of commonly used coating systems in practice, such as water-based paints, oil-based paints, emulsion paints, and powder coatings. Upon completion of the course, students will be able to apply the acquired knowledge to evaluate the properties of paints and surface coatings, as well as to identify and troubleshoot product defects in both practical applications and research contexts.

Plastic Waste Management **Credits: 02**

Learning Time Allocation: 2 (2, 0, 4)

Prerequisite Courses: None

Prior Courses: Physical Chemistry and Polymer Chemistry

Course Summary:

This course provides students with knowledge of various types of plastic waste, plastic recycling processes, and the development of effective recycling techniques for each type of plastic waste. It also introduces environmentally friendly plastic recycling methods.

Experiment of Polymer Materials **Credits: 03**

Learning Time Allocation: 3 (0, 3, 6)

Prerequisites: Physical Chemistry and Polymer Chemistry

Prior Courses: Polymer Processing Techniques, Polymer Manufacturing Techniques, Measurement And Characterization of Polymer And Rubber

Course Summary:

This course consists of nine experiments designed to equip students with essential knowledge and practical skills, including:

- Polymer processing techniques using laboratory equipment in the Materials Technology Laboratory;
- Techniques for synthesizing thermoplastic and thermosetting polymers through polymerization and polycondensation reactions;
- Composite fabrication techniques;
- Methods for evaluating the mechanical and physical properties of polymer and composite products.

Based on the foundational knowledge and hands-on experience gained in the laboratory, students will be capable of designing production and processing procedures for polymer and composite products, assessing material properties, and applying their skills in both industrial and research contexts.

10. Facilities for Learning

10.1. Workshops, Laboratories, and Key Experimental Equipment Systems

❖ Materials Technology Laboratory

Group 1: Basic Equipment and Tools

No.	Equipment Name	Supplier	Notes
1	Distilled Water Supply System (DI water)	Bibby (Stuart, UK)	Purity and capacity: 8 liters/hour. Model A8000/220
2	Nitrogen Gas Supply System (Nitrogen cylinder + gun)	VN	
3	Wall-mounted Laboratory Bench with Sink	Phuong Hai Company – Vietnam	Model: ELWS-12
4	Fume Hood (Chemical Vapor) + Sink + Chemical Storage Cabinet	Phuong Hai Company (VN)	Dimensions: 1500 x 900 x 2350 mm (L x W x H). Model: F.H16

Group 2: Equipment and Tools for Specimen Preparation

No.	Equipment Name	Function	Supplier	Quantity	Notes
1	Ultrasonic Cleaner	Ultrasonic cleaning of specimens	Elma (Germany)	1	Water volume 10 liters. Model: S 100 H
2	Drying Oven	Drying specimens	Memmert - Germany		Volume: 53 liters, Temperature range: Ambient to 300 °C

3	Furnace	Annealing specimens up to 1000 °C	Nabertherm - Germany	1	Volume: 40 liters
4	Hot Plate Stirrer	Heating specimens up to 200 °C	C-MAG HS 7 (IKA – Germany)	2	

Group 3: Equipment and Tools for Material Processing

No.	Equipment Name	Function	Supplier	Quantity	Notes
1	Spin Coater	Thin film deposition by spin coating	Model: Spin-1200D Manufacturer: Midas - Korea	1	Speed: 8000 rpm
2	Thermal Evaporator (Small)	Thin film deposition in vacuum	Model: GSL-1700X-SPC-2 MTI (USA)	1	
3	Sputtering System	Thin film deposition in vacuum	Dada2000 (Korea)	1	
4	CVD System	Graphene film deposition	MTI (USA)	1	
5	Rolling Mill	Polymer material rolling and mixing	China	1	

Group 4: Equipment and Tools for Material Property Measurement and Characterization

No.	Equipment Name	Function	Supplier	Quantity	Notes
1	Optical Microscope with Camera	Specimen observation	Olympus (Japan)	1	Model MX51
2	UV-VIS Spectrophotometer	Measurement of light absorption of thin films or liquid solutions	Jasco (Japan)	1	Model V730
3	Mechanical Testing Machine	Measurement of tensile and compressive strength of polymer materials	Shimadzu	1	

10.2. Library, Website

HCMUT Library: http://lib.hcmute.edu.vn/

11. Program Implementation Guidelines: The training program is implemented in accordance with the current regulations for full-time university-level credit-based training, as stipulated by the Ministry of Education and Training and Ho Chi Minh City University of Technology and Education.

The specified hours are calculated as follows:

- 1 credit = 15 hours of theoretical lectures or in-class discussions
- 1 credit = 30 - 45 hours of laboratory work or practical exercises
- 1 credit = 30 hours of self-study
- 1 credit = 45 - 90 hours of on-site internship
- 1 credit = 45 - 60 hours for project work or graduation thesis

The total hours for a course must be a multiple of 15.

Political Theory Knowledge: Implemented according to the regulations of the Ministry of Education and Training.

Foreign Language Knowledge: The foreign language output standard is determined by the university's Science and Training Council at the beginning of each admission cohort. Throughout their studies, the university will monitor the students' foreign language proficiency development each academic year to decide the number of credits for courses that students are allowed to register for in a semester. Students can self-study or register for the foreign language proficiency development program according to the university's plan.

Physical Education Knowledge: Implemented according to the regulations of the Ministry of Education and Training. For Physical Education 2 and 3, students can select from the course catalog when registering for modules.

National Defense Education Knowledge: Implemented according to the regulations of the Ministry of Education and Training. Students accumulate credits and are granted a certificate after completing the requirements of the module.

Elective Social Sciences and Humanities Knowledge: Students select 2 courses, equivalent to 4 credits, from the course catalog when registering for modules.

Elective Foundational Major Knowledge: Students select 2 courses, equivalent to 6 credits, from the course catalog when registering for modules.

Elective Specialized Major Knowledge: Students select 2 courses, equivalent to 6 credits, from the course catalog when registering for modules.

The remaining knowledge blocks are arranged into 8 semesters as presented in section 8.

VICE PRESIDENT	**DEAN OF FACULTY OF INTERNATIONAL EDUCATION**
Dr. Quach Thanh Hai	**Assoc. Prof. Dr. Truong Dinh Nhon**