VINUNIVERSITY

CURRICULUM FRAMEWORK

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

PROGRAM CODE: **7520203**

Applicable from Cohort 2025-2029, Academic Year 2025-2026

(Decision No. 476/2025/QĐ-VUNI dated August 15, 2025 by Provost of VinUniversity)

This curriculum framework has been reviewed and validated by Cornell University

Records of changes

Version	Published date	Effective Date	Approved by	Description of changes
1	15/8/2025	15/8/2025	Developed by Curriculum Review Taskforce Reviewed by College Academic Committee; Scientific and Educational Committee Approved by: Provost (Decision No. 476/2025/QĐ-VUNI dated August 15, 2025 by Provost of VinUniversity).	First release for Cohort 2025-2029

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1. PROGRAM OVERVIEW

1.1.Program Profile

Name of the degree	Bachelor of Science in Mechanical Engineering
Name of the program	
Program Code	7520203
Vietnam Qualifications Framework Level	6
Length of Program	4 years
Mode of Delivery	Full-time
Language of Delivery	English
Total credits	*Single major:* 122 credits
	Major + minor in Robotics or Product Design or Artificial Intelligence or another minor: 137 credits
Home College	College of Engineering and Computer Science

1.2.Program Purpose

The overall aim of the program is to nurture and develop young leaders in mechanical engineering with clear direction and vision, creativity and sound personal values; who pave the way for the development of science and technology, to increase labor productivity and to benefit society.

2. PROGRAM EDUCATIONAL OBJECTIVES AND PROGRAM LEARNING OUTCOMES

2.1.Program Educational Objectives

The educational objectives of the Bachelor of Science in Mechanical Engineering program are that within a few years of graduation, a majority of our graduates will demonstrate excellence in top graduate programs; or in technical and managerial leadership tracks in technology-based industries or other sectors; or pursuing entrepreneurial ventures. In these roles they will:

PEO1: Apply basic knowledge of electrical and computer engineering principles and in-depth knowledge of one area of concentration to solve a full range of technical and societal problems in professional engineering practice, industry, or advanced academic study

PEO2: Conceive, design, and realize products, systems, and services, while properly respecting economic, environmental, cultural, safety, and ethical standards or constraints encountered in professional or research environments.

PEO3: Be leaders with an entrepreneurial mindset, capable of critical thinking and creativity, effective communication, and informed decision-making as members of multidisciplinary teams, supporting collaborative and inclusive environments;

PEO4: Discover and apply new knowledge, and engage in life-long learning for the profession of electrical and computer engineering;

PEO5: Engage with their communities, profession, the nation, and the world.

2.2.Program Learning Outcomes (Student Outcomes)

After successful completion of the program, students are able to:

PROGRAM LEARNING OUTCOMES (PLOs)	PERFORMANCE INDICATORS (PIs)
PLO 1: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	**PI 1.1:** Students identify the components of a complex problem and formulate approaches to solve it.
	PI 1.2: Students apply principles and/or knowledge from relevant disciplines to solve a complex problem.
PLO 2: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	**PI 2.1:** Students identify critical stakeholder needs, constraints and societal factors that must be considered in an engineering solution.
	PI 2.2: Students apply principles of engineering design to propose a holistic solution that meets stakeholder needs and technical as well as societal constraints.
PLO 3: An ability to communicate effectively with a range of audiences.	**PI 3.1:** Students compose content that is factually accurate, supported with evidence, explained with sufficient detail, and presented with consideration to standards such as spelling, grammar, usage and clarity.
	PI 3.2: Students effectively communicate with their intended audience through appropriate modes (e.g. oral, written, visual).
PLO 4: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	**PI 4.1:** Students make informed engineering judgements by recognizing ethical and societal issues in engineering as well as consider the implications of engineering solutions in global, environmental, and societal contexts, including Vietnam-specific context.
	PI 4.2: Students identify, interpret and/or apply standards, regulations, and laws to engineering decisions.

PLO 5: An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	**PI 5.1:** Students create an effective team environment that is respectful, supportive, and inclusive.
	PI 5.2: Students follow a structured approach to establish goals, plan tasks, and meet objectives.
PLO 6: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	**PI 6.1:** Students develop and conduct an appropriate experiment.
	PI 6.2: Students analyze and evaluate experimental results using engineering judgment to draw conclusions.
PLO 7: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	**PI 7.1:** Students identify knowledge gaps and independently acquire new knowledge using appropriate learning strategies (e.g., research, tutorials, experimentation, consultation).
	PI 7.2: Students apply newly acquired knowledge to solve engineering problems, make design decisions, or improve technical work.

3. CURRICULUM STRUCTURE

3.1.Curriculum Composition

No.	Curriculum Components	Number of Credits	Credit Distribution (%/Total Credits)
I	**VINCORE**	**35**	**28.7%**
I.1	*Enterprise and Innovation*	4	3.3%
I.2	*Leadership Mindset*	2	1.6%
I.3	*Civic Responsibility*	2	1.6%
I.4	*Ethics*	2	1.6%
I.5	*Community Service Learning*	45 hours	
I.6	*Working with the Brain*	2	1.6%
I.7	*Working with Technology*	4	3.3%
I.8	*Working with Others*	4	3.3%
I.9	*Working with the Self*	90 hours	
I.10	*Integrated Vietnam Studies*	11	9.0%
I.11	*Sustainability and Global Citizenship*	2	1.6%
I.12	*Creative Arts*	2	1.6%
II	**PROFESSIONAL EDUCATION**	**87**	**71.3%**
II.1	*College Core Requirement*	37	30.3%
II.2	*Major Core Requirement*	17	13.9%
II.3	*Major Foundation Requirement*	15	12.3%
II.4	*Area of Concentration (Elective)*	12	9.8%
II.5	*Minor**	15*	
II.6	*Internship/Co-op*	640 hours	
II.7	*Capstone Design*	6	4.9%
	TOTAL (Without minor)	**122**	**100%**
	TOTAL (With minor)	**137**	

Important Note:

- *The Vincore Program has been isssued along with the Decision No. 342a/2025/QĐ-VUNI dated June 20, 2025.*
- *Students have the option to obtain a minor in a different area of study.* ***A minor needs to have at least 15 credits that are not already counted towards the major program****.*
  Information about the available minors is provided here: LINK.
- *International students are exempted from National Defense Education. However, they are still required to take ideology courses, including: History of the Communist Party, Ho Chi Minh Ideology, Scientific Socialism, Marxism-Leninism Political Economy, Marxism-Leninism Philosophy (In line with Decision No. 494/QĐ-TTg, issued on June 24, 2002, by the Prime Minister).*

3.2. Courses and Credit Distribution by Courses

No	Course code	Name of Courses	Credit	Credit Hour Allocation		Pre-requisite(s)	Grading System (Letter Grade or Pass/Fail)
				Theory	Practice		
I	**VINCORE**						
I.1	**Enterprise and Innovation**		**4**				
1	ENTR1022	Agile Innovation and Entrepreneurship	2	2			P/F
2	IDEA1010/11/12/X	Big Ideas: X *(The IDEA1010/11/12 series, titled 'Big Ideas (X)' will have its course code and title defined each semester, allowing the course content to align with the key themes and innovative design concepts)*	2	2			L
I.2	**Leadership Mindset**		**2**				
	LEAD1031	Leadership and Teambuilding Bootcamp	2	2			P/F
I.3	**Civic Responsibility**		**2**				
1	VCOR1030	National Defense Education	165 hrs				P/F
2	LAW1010	Introduction to Law	2	2			L
I.4	**Ethics**		**2**				
	TECH1010	Technology Ethics	2	2			L
I.5	**Community Service Learning**						
	COSL1010	Community Service Learning	45 hrs				P/F
I.6	**Working with the Brain**		**2**				
	THINK1010	Critical and Creative Thinking	2	2			L
I.7	**Working with Technology**		**4**				
1	CECS1040	Introduction to AI Literacy	2	2			L
2	*Students select 1 course from the list below*						
2.1	CECS1050	Introduction to Data Literacy	2	2			L
2.2	CECS1031	Computational Thinking	2	2			L
I.8	**Working with Others**		**4**				
1	ENGL1030	Academic and Professional Writing	2	2			L

No	Course code	Name of Courses	Credit	Credit Hour Allocation		Pre-requisite(s)	Grading System (Letter Grade or Pass/Fail)
				Theory	Practice		
2	*Students select 1 course from the list below*						
2.1	ENGL1040	Interpersonal and Multimedia Communication	2	2			
2.2	MANA1011	Introduction to Managing Skills	2	2			
I.9	**Working with the Self**						
1	VCOR1012A /B	OASIS *(Orientation, Advising, Skills, Identity & Diversity and Spirit of Pay-it-Forward)*	45 hrs				P/F
2	VCOR1021	Healthy Lifestyle 1	45 hrs				P/F
	VCOR1022	Healthy Lifestyle 2					
I.10	**Integrated Vietnam Studies**		**11**				
1	HASS1010	Marxism-Leninism Political Economy (Philosophy, Science and Society)	3	3			L
2	HASS1020	Marxism-Leninism Philosophy (Global Political Economy)	2	2			L
3	HASS1030	Scientific Socialism (Politics and Social Change)	2	2			L
4	HASS1041	Ho Chi Minh Ideology (Vietnam: History and Cultures II)	2	2			L
5	HASS1050	History of the Communist Party (Vietnam: History and Cultures I)	2	2			L
I.11	**Sustainability and Global Citizenship** *(students may select 1 course from the list below)*						
1	HASS1070	Cross-Cultural Navigation	2	2			L
2	HASS1100	Introduction to International Relations	2	2			L
3	SUST1010	Humans and Environmental Intelligence	2	2			L
4	UROP1010/ 20/30/40	UROP (Undergraduate Research Opportunity Program) - *Students are required to complete 2*	2		2		L

No	Course code	Name of Courses	Credit	Credit Hour Allocation		Pre-requisite(s)	Grading System (Letter Grade or Pass/Fail)
				Theory	Practice		
		courses, each carrying 1 credit					
I.12	**Creative Arts** *(students may select 1 course from the list below)*						
1	ARTS1030	Arts Appreciation and Application	2	2			
2	PERF1010	Artistic Performance and Application	2	2			
II	**PROFESSIONAL EDUCATION**						
II.1	**College Core Requirement**		***39***				
1	MATH1010	Calculus I	4	3	1		L
2	MATH1020	Calculus II	4	3	1	MATH1010	L
3	MATH2010	Probability and Statistics	4	3	1	MATH1020	L
4	MATH2030	Differential Equations	3	2	1	MATH1020	L
5	MATH2050	Linear Algebra	4	3	1		L
6	PHYS1010	Physics I	4	3	1	MATH1010	L
7	PHYS2020	Physics II	3	2	1	PHYS1010	L
8	PHYS2030	Physics III	2	2	0	MATH1020, PHYS2020	L
9	CHEM2010	Chemistry	3	2	1		L
10	CECS1011	Introduction to Engineering and Computer Science	2	1	1		L
11	COMP1010	Introduction to Programming	4	2	2		L
II.2	**Major Core requirement**		***17***				
12	MECE3010	Statics and Mechanics of Solids	4	3	1	PHYS1010, MATH1020, MATH2050	L
13	MECE3020	Thermodynamics	3	3	0	PHYS1010, MATH1020	L
14	MECE3030	Dynamics	3	3	0	MECE3010, MATH2030	L
15	MECE3040	Mechanical Synthesis	4	3	1	MECE3010	L
16	MECE3050	Introductory Fluid Mechanics	3	2	1	MECE3010, MECE3030	L
II.3	**Major Foundation requirement**		***15***				
17	MECE4010	Heat Transfer	3	3	0	MECE3050	L

No	Course code	Name of Courses	Credit	Credit Hour Allocation		Pre-requisite(s)	Grading System (Letter Grade or Pass/Fail)
				Theory	Practice		
18	MECE3060	Mechatronics	3	2	1	PHYS2020, MATH2030	L
19	MECE4020	System Dynamics and Control	3	2	1	MATH2030, MATH2050, MECE3030	L
20	MECE3070	Mechanics of Engineering Materials	3	2	1	MECE3010	L
21	ELEC3030	Intelligent Physical Systems (Interdisciplinary Engineering Design Project)	3	2	1 (lab + project)	CECS1011, COMP1010	L
II.4	**Area of Concentration (Elective)** *(Students may select one concentration below or design own concentration)*						
II.4.1	***Automotive Engineering***		***12***				
1	MECE3090	Automotive Engineering	3	2	1	MECE3030	L
2	MECE4030	Hybrid Electric Vehicles	3	2	1	MECE3030	L
3	MECE4040	Vehicle Dynamics and Control	3	2	1	MECE3030	L
4	MECE4050	Internal Combustion Engines	3	2	1	MECE3020	
II.4.2	***Systems and Manufacturing***		***12***				
1	MECE3100	Introduction to Manufacturing Systems	3	2	1		L
2	MECE4060	Innovative Product Design via Digital Manufacturing	3	2	1		L
3	MECE4070	Additive Manufacturing	3	2	1	MECE3050	L
4	MECE4080	Feedback Control Systems	3	2	1	MECE4020	
II.4.3	***Energy and Sustainability***		***12***				
1	MECE3110	Wind Power	3	3		MECE3050	L
2	MECE4090	Sustainable Energy Systems	3	3		MECE3050, MECE4010	L
3	MECE4100	Combustion Processes	3	3		MECE3050, MECE4010	L
4	MECE4110	Design of Sustainable Systems	3	3			L
II.4.4	***Computer Engineering***		***12***				
1	MECE4120	Sensors and Actuators	4	3	1	MECE3080	L
2	ELEC4020	Embedded Systems	4	3	1	ELEC3010/ MECE3060	L

No	Course code	Name of Courses	Credit	Credit Hour Allocation		Pre-requisite(s)	Grading System (Letter Grade or Pass/Fail)
				Theory	Practice		
3	ELEC4060	Robotics and Automation	4	3	1	ELEC3050/ MECE3060	L
II.5	**Minor** *(students may take a minor in Robotics or Product Design or Artificial Intelligence or another minor offered by other colleges)*		***15***				
II.6	**Internship**						
1	MECE3870	Internship	*640 hrs*			Sophomore Standing	P/F
2	CECS1090	Experiential Learning – Company Field Trips *(student must participate in at least 3 trips)*	*Non-credit*				P/F
II.7	**Capstone Design**		***6***				
	MECE4890	Capstone Design Project	*6*		*6*		L

3.3.Curriculum Block

VINCORE (35 credits)
I.1. CHARACTER (10 credits)
I.1.1. Enterprise and Innovation (4 credits)
- Agile Innovation and Entrepreneurship (2)
- Big Ideas: X (2)

I.1.2. Leadership Mindset (2 credits)
- Leadership and Teambuilding Boot Camp (2)

I.1.3. Civic Responsibility (2 credits)
- Introduction to Law (2)
- National Defense Education (165 hrs)

I.1.4. Ethics (2 credits)
- Technology Ethics (2)

I.1.5. Community Service Learning (45 hrs)
- Community Service Learning (45 hrs)

I2. CAREER (10 credits)
I.2.1. Working with the Brain (2 credits)
- Critical and Creative Thinking (2)

I.2.2. Working with Technology (4 credits)
- Introduction to AI Literacy (2)
- Introduction to Data Literacy/ Computational Thinking (2)

I.2.3. Working with Others (4 credits)
- Academic and Professional Writing (2)
- Interpersonal and Multimedia Communication/Introduction to Managing Skills (2)

I.2.4. Working with the Self
- OASIS (45 hrs)
- Healthy Lifestyle (45 hrs)

I.3. CONNECTIONS (15 credits)
I.3.1. Integrated Vietnam Studies (11 credits)
- Marxism-Leninism Philosophy (Philosophy, Science and Society) (3)
- Marxism-Leninism Political Economy (Global Political Economy) (2)
- Scientific Socialism (Politics and Social Change) (2)
- History of the Communist Party (Vietnam: History and Cultures I) (2)
- Ho Chi Minh Ideology (Vietnam: History and Cultures II) (2)

I.3.2. Sustainability and Global Citizenship (2 credits)
- Cross-Cultural Navigation/Introduction to International Relations/Humans and Environmental Intelligence/UROP ((2)

I.3.3. Creative Arts (2 credits)
- Arts Appreciation and Application/Artistic Performance and Application (2)

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING (122 credits)

II.1. COLLEGE CORE (37 credits)
- Calculus I (4)
- Calculus II (4)
- Linear Algebra (4)
- Probability and Statistics (4)
- Differential Equations
- Physics I (4)
- Physics II (3)
- Physics III (2)
- Chemistry (3)
- Introduction to Engineering and Computer Science (2)
- Introduction to Programming (4)

II.2. MAJOR CORE (17 credits)
- Statics and Mechanics of Solids (4)
- Thermodynamics (3)
- Dynamics (3)
- Mechanical Synthesis (4)
- Introductory Fluid Mechanics (3)

II.2. MAJOR FOUNDATION (15 credits)
- Heat Transfer (3)
- Mechatronics (3)
- System Dynamics and Control (3)
- Mechanics of Engineering Materials (3)
- Intelligent Physical Systems (Interdisciplinary Engineering Design Project) (3)

II.3. AREA OF CONCENTRATION (12 credits)
Students may select one concentration below or design own concentration

1. Automotive Engineering (12 credits)
- Automotive Engineering (3)
- Hybrid Electric Vehicles (3)
- Vehicle Dynamics and Control (3)
- Internal Combustion Engines (3)

2. Systems and Manufacturing (12 credits)
- Introduction to Manufacturing Systems (3)
- Innovative Product Design via Digital Manufacturing (3)
- Additive Manufacturing (3)
- Feedback Control Systems (3)

3. Energy and Sustainability (12 credits)
- Wind Power (3)
- Sustainable Energy Systems (3)
- Combustion Processes (3)
- Design of Sustainable Systems (3)

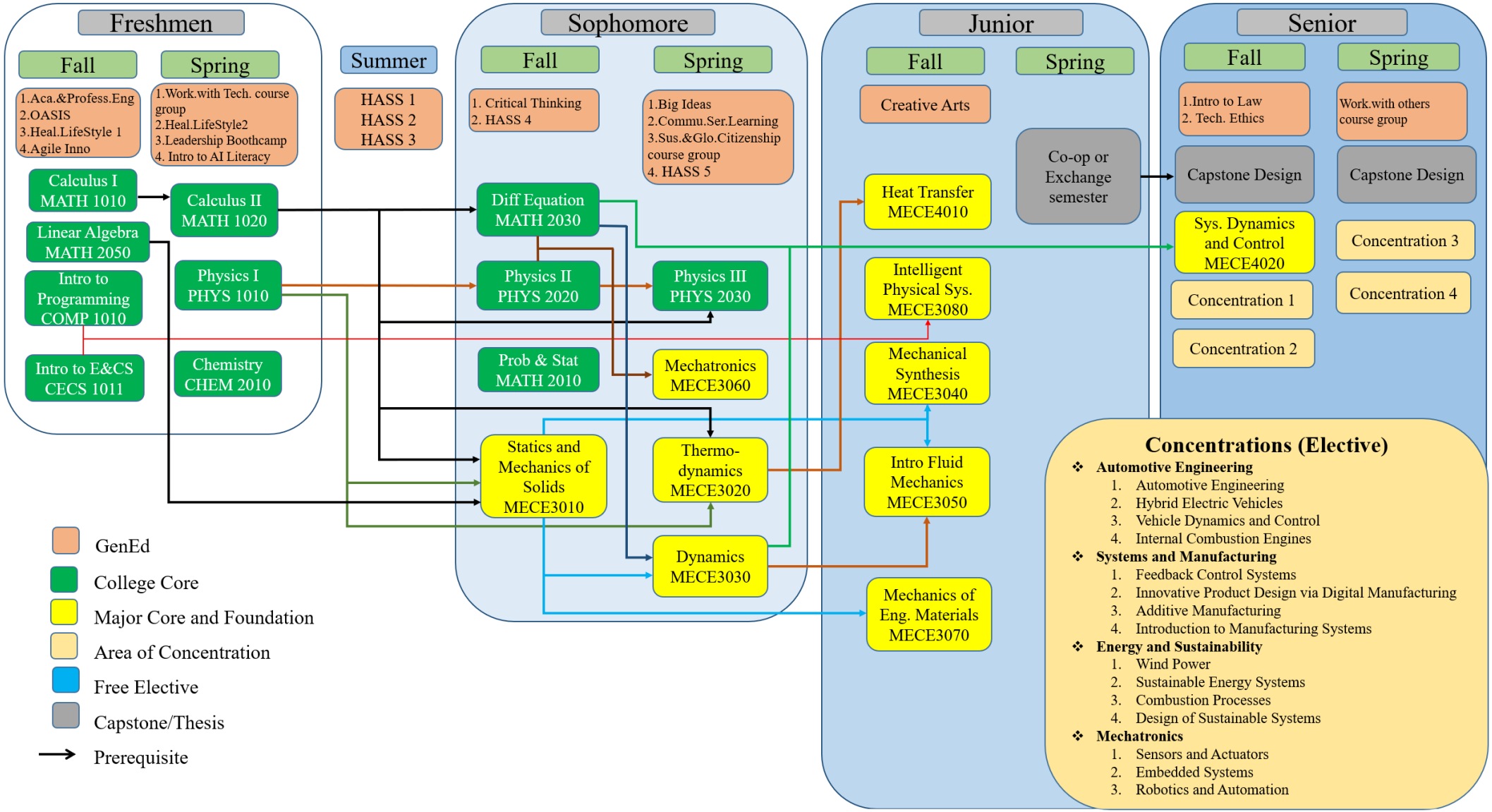
4. Computer Engineering (12 credits)
- Sensors and Actuators (4)
- Embedded Systems (4)
- Robotics and Automation (4)

II.7. PRACTICE/ INTERNSHIP
- Internship (640 hrs)
- Experiential Learning – Company Field Trips (Student must participate at least 3 trips) (Non-credit)

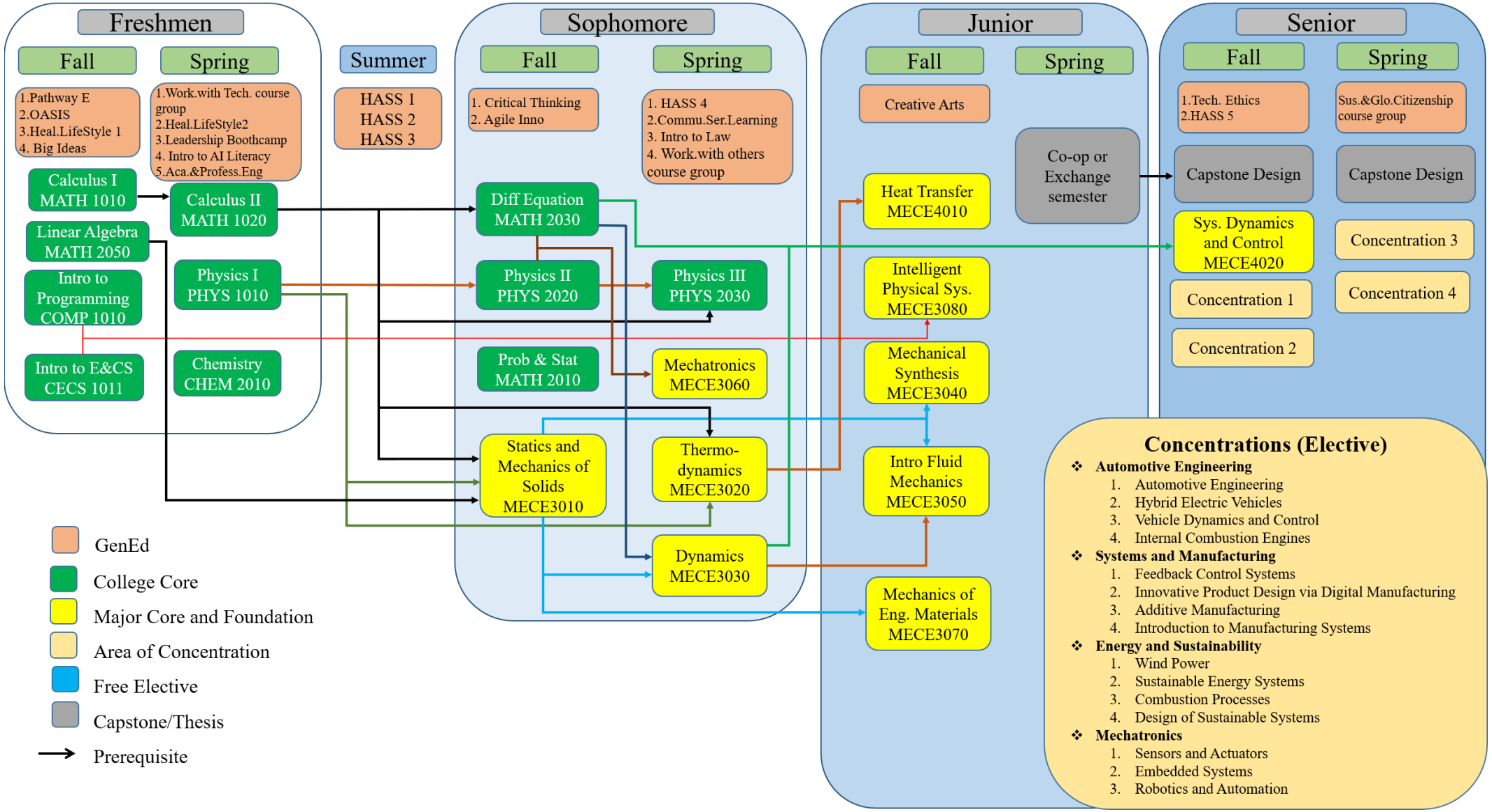
II.8. GRADUATION THESIS/CAPSTONE (6 credits)
- Capstone Design (6)

3.4. Curriculum Roadmap

For Main track



For Pathway track



3.5.Standard Study Plan

For Main Track

Semester 1:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	MATH1010	Calculus I	Giải tich I	4
2	MATH2050	Linear Algebra	Đại số Tuyến tính	4
3	COMP1010	Introduction to Programming	Nhập môn Lập trình	4
4	CECS1011	Introduction to Engineering and Computer Science	Nhập môn kỹ thuật và KHMT	2
5	ENTR1022	Agile Innovation and Entrepreneurship	Khởi nghiệp và Đổi mới sáng tạo	2
6	ENGL1030	Academic and Professional Writing	Kỹ năng viết học thuật	2
7	VCOR1012A/B	OASIS	OASIS	Non-credit
8	VCOR1021	Healthy Lifestyle 1	Lối sống Khoẻ Mạnh 1	Non-credit
Total				18

Semester 2:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	MATH1020	Calculus II	Giải tich II	4
2	PHYS1010	Physics I	Vật Lý I	4
3	CHEM2010	Chemistry	Hóa học	3
4	LEAD1031	Leadership and Teambuilding Bootcamp	Trại huấn luyện kỹ năng lãnh đạo và làm việc nhóm	2
5	CECS1031/ CECS1050	Computational Thinking/Introduction to Data Literacy	Tư Duy Máy Tính/ Nhập Môn Hiểu Biết về Dữ Liệu	2
6	CECS1040	Introduction to AI Literacy	Nhập môn Trí tuệ Nhân tạo	2
7	VCOR1022	Healthy Lifestyle 2	Lối sống Khoẻ Mạnh 2	Non-credit
Total				17

Summer 1:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	HASS1010	Marxism-Leninism Political Economy (Philosophy, Science and Society)	Triết học Mác-Lênin (Triết học, Khoa học và Xã hội)	3
2	HASS1020	Marxism-Leninism Philosophy (Global Political Economy	Kinh tế Chính trị Mác-Lênin (Kinh tế chính trị toàn cầu)	2
3	HASS1030	Scientific Socialism (Politics and Social Change)	Chủ Nghĩa Xã Hội Khoa Học (Chính trị và Biến đổi Xã hội)	2
Total				7

Semester 3:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	MATH2030	Differential Equations	Phương trình vi phân	3
2	PHYS2020	Physics II	Vật Lý II	3
3	MATH2010	Probability and Statistics	Xác suất Thống kê	4
4	MECE3010	Statics and Mechanics of Solids	Tĩnh học và Cơ học vật rắn	4
5	THINK1010	Critical and Creative Thinking	Tư Duy Sáng Tạo và Phản Biện	2
6	HASS1041	Ho Chi Minh Ideology (Vietnam: History and Cultures II)	Tư Tưởng Hồ Chí Minh (Lịch sử và Văn hóa Việt Nam II)	2
Total				18

Semester 4:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	PHYS2030	Physics III	Vật Lý III	2
2	MECE3060	Mechatronics	Cơ điện tử	3
3	MECE3020	Thermodynamics	Nhiệt động học	3
4	MECE3030	Dynamics	Động lực học	3
5	COSL1010	Community Service Learning	Học tập qua phục vụ cộng đồng	Non-credit
6	IDEA10xx	Big Ideas	Ý tưởng lớn	2
7	HASS1070/ HASS100/UROP /SUST1010	Cross Cultural Navigation/Introduction to International Relations/Undergraduate Research Opportunities Program/Humans and Environmental Intelligence	Định Hướng Liên Văn Hoá/ Nhập Môn Quan Hệ Quốc Tế/Cơ hội nghiên cứu cho sinh viên/Con người và Trí tuệ Môi trường	2
8	HASS1050	History of the Communist Party (Vietnam: History and Cultures I)	Lịch Sử Đảng Cộng Sản Việt Nam (Lịch sử và Văn hóa Việt Nam I)	2
Total				17

Summer 2:

Internship or exchange	Non-credit

Semester 5:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	MECE4010	Heat Transfer	Truyền nhiệt	3
2	MECE3040	Mechanical Synthesis	Cơ khí tổng hợp	4
3	MECE3080	Intelligent Physical Systems (Interdisciplinary Engineering Design Project)	Hệ thống Vật lý thông minh	3
4	MECE3050	Introductory Fluid Mechanics	Cơ học chất lỏng	3
5	MECE3070	Mechanics of Engineering Materials	Cơ học Vật liệu kỹ thuật	3
6	ARTS1030/ PERF1010	Arts Appreciation and Application / Artistic Performance and Application	Thưởng Thức và Thực Hành Nghệ Thuật/ Biểu Diễn và Thực Hành Nghệ Thuật	2
Total				18

Semester 6:

Co-op semester	Credits

Summer 3:

Internship or exchange	Non-credit

Semester 7

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	ELEC4890	Capstone Design	Đồ án tốt nghiệp	3
2		Concentration eletive 1	Môn chuyên ngành tự chọn 1	4
3	MECE4020	System Dynamics and Control	Động lực học và Điều khiển hệ thống	3
4	LAW1010	Introduction to Law	Pháp Luật Đại Cương	2
5	TECH1010	Technology Ethics	Đạo Đức Trong Công Nghệ	2
Total				14

Semester 8:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	ELEC4890	Capstone Design	Đồ án tốt nghiệp	3
2		Concentration eletive 2	Môn chuyên ngành tự chọn 2	4
3		Concentration eletive 3	Môn chuyên ngành tự chọn 3	4
4	ENGL1040/ MANA1011	Interpersonal and Multimedia Communication/ Introduction to Managing Skills	Giao Tiếp Cá Nhân và Đa Phương tiện truyền thông/ Nhập môn kỹ năng quản lý	2
Total				13

For Pathway Track

Semester 1:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	MATH1010	Calculus I	Giải tich I	4
2	MATH2050	Linear Algebra	Đại số Tuyến tính	4
3	COMP1010	Introduction to Programming	Nhập môn Lập trình	4
4	CECS1011	Introduction to Engineering and Computer Science	Nhập môn kỹ thuật và KHMT	2
5	IDEA10xx	Big Ideas	Ý tưởng lớn	2
6		Pathway English	Tiếng anh học thuật chuyển tiếp	Non-credit
7	VCOR1012A/B	OASIS	OASIS	Non-credit
8	VCOR1021	Healthy Lifestyle 1	Lối sống Khoẻ Mạnh 1	Non-credit
Total				16

Semester 2:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	MATH1020	Calculus II	Giải tich II	4
2	PHYS1010	Physics I	Vật Lý I	4
3	CHEM2010	Chemistry	Hóa học	3
4	LEAD1031	Leadership and Teambuilding Bootcamp	Trại huấn luyện kỹ năng lãnh đạo và làm việc nhóm	2
5	ENGL1030	Academic and Professional Writing	Kỹ năng viết học thuật	2
6	CECS1031/ CECS1050	Computational Thinking/Introduction to Data Literacy	Tư Duy Máy Tính/ Nhập Môn Hiểu Biết về Dữ Liệu	2
7	CECS1040	Introduction to AI Literacy	Nhập môn Trí tuệ Nhân tạo	2
8	VCOR1022	Healthy Lifestyle 2	Lối sống Khoẻ Mạnh 2	Non-credit
Total				19

Summer 1:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	HASS1010	Marxism-Leninism Political Economy (Philosophy, Science and Society)	Triết học Mác-Lênin (Triết học, Khoa học và Xã hội)	3
2	HASS1020	Marxism-Leninism Philosophy (Global Political Economy	Kinh tế Chính trị Mác-Lênin (Kinh tế chính trị toàn cầu)	2
3	HASS1030	Scientific Socialism (Politics and Social Change)	Chủ Nghĩa Xã Hội Khoa Học (Chính trị và Biến đổi Xã hội)	2
Total				7

Semester 3:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	MATH2030	Differential Equations	Phương trình vi phân	3
2	PHYS2020	Physics II	Vật Lý II	3
3	MATH2010	Probability and Statistics	Xác suất Thống kê	4
4	MECE3010	Statics and Mechanics of Solids	Tĩnh học và Cơ học vật rắn	4
5	THINK1010	Critical and Creative Thinking	Tư Duy Sáng Tạo và Phản Biện	2
6	ENTR1022	Agile Innovation and Entrepreneurship	Khởi nghiệp và Đổi mới sáng tạo	2
Total				18

Semester 4:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	PHYS2030	Physics III	Vật Lý III	2
2	MECE3060	Mechatronics	Cơ điện tử	3
3	MECE3020	Thermodynamics	Nhiệt động học	3
4	MECE3030	Dynamics	Động lực học	3
5	COSL1010	Community Service Learning	Học tập qua phục vụ cộng đồng	Non-credit
6	LAW1010	Introduction to Law	Pháp Luật Đại Cương	2
7	ENGL1040/ MANA1011	Interpersonal and Multimedia Communication/ Introduction to Managing Skills	Giao Tiếp Cá Nhân và Đa Phương tiện truyền thông/ Nhập môn kỹ năng quản lý	2
8	HASS1041	Ho Chi Minh Ideology (Vietnam: History and Cultures II)	Tư Tưởng Hồ Chí Minh (Lịch sử và Văn hóa Việt Nam II)	2
Total				17

Summer 2:

Internship or exchange	Non-credit

Semester 5:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	MECE4010	Heat Transfer	Truyền nhiệt	3
2	MECE3040	Mechanical Synthesis	Cơ khí tổng hợp	4
3	MECE3080	Intelligent Physical Systems (Interdisciplinary Engineering Design Project)	Hệ thống Vật lý thông minh	3
4	MECE3050	Introductory Fluid Mechanics	Cơ học chất lỏng	3
5	MECE3070	Mechanics of Engineering Materials	Cơ học Vật liệu kỹ thuật	3
6	ARTS1030/ PERF1010	Arts Appreciation and Application / Artistic Performance and Application	Thưởng Thức và Thực Hành Nghệ Thuật/ Biểu Diễn và Thực Hành Nghệ Thuật	2
Total				18

Semester 6:

Co-op semester	Credits

Summer 3:

Internship or exchange	Non-credit

Semester 7

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	ELEC4890	Capstone Design	Đồ án tốt nghiệp	3
2		Concentration eletive 1	Môn chuyên ngành tự chọn 1	4
3	MECE4020	System Dynamics and Control	Động lực học và Điều khiển hệ thống	3
4	HASS1050	History of the Communist Party (Vietnam: History and Cultures I)	Lịch Sử Đảng Cộng Sản Việt Nam (Lịch sử và Văn hóa Việt Nam I)	2
5	TECH1010	Technology Ethics	Đạo Đức Trong Công Nghệ	2
Total				14

Semester 8:

No	Course Code	Course name (English)	Course name (Vietnamese)	Credits
1	ELEC4890	Capstone Design	Đồ án tốt nghiệp	3
2		Concentration eletive 2	Môn chuyên ngành tự chọn 2	4
3		Concentration eletive 3	Môn chuyên ngành tự chọn 3	4
4	HASS1070/ HASS100/UROP /SUST1010	Cross Cultural Navigation/Introduction to International Relations/Undergraduate Research Opportunities Program/Humans and Environmental Intelligence	Định Hướng Liên Văn Hoá/ Nhập Môn Quan Hệ Quốc Tế/Cơ hội nghiên cứu cho sinh viên/Con người và Trí tuệ Môi trường	2
Total				13

3.6.Course Descriptions

3.6.1. VINCORE Courses

ENTR1022 Agile Innovation and Entrepreneurship

Credit: 2

Pre-requisite: None

The purpose of this course is to provide students with a basic understanding of the innovation/entrepreneurial process and experiential learning opportunities to practice and refine those skills. This course is highly interactive and involves a mix of lectures and activities to immediately apply course concepts. The course is intended for students from all academic disciplines and intended to provide skills that are applicable in many other aspects of life beyond creating a new venture.

Students will gain a broader perspective of both the challenges (i.e. organizational and institutional) and opportunities (i.e. unmet customer needs and possibilities for future ventures) for innovation.

As part of this class, students will form teams for a Hackathon event where they will generate innovative solutions to real-world problems. Students will learn and apply team innovation processes, business model innovation, design thinking, creativity management, product pitches, data analysis, critical thinking, and product innovation. This course also helps students build their professional network.

IDEA1010/11/12 Series: Big Ideas (X)

2 credits

Pre-requisite: N/A

On successful completion of this course, students will be able to:

1. Describe and explain a “big idea”, which may be a new solution to a problem, a disrupting technology, or an innovative method or way of doings things

2. Identify the implications of a big idea for everyday life or a professional setting

3. Develop a strategy for using a big idea to improve an existing approach or create a new application

4. Evaluate the application of a big idea, including an assessment of its positive impacts, negative impacts, and mitigating strategies for the theme of the year

TECH1010 Technology Ethics

2 credits

Pre-requisite: N/A

On successful completion of this course, students will be able to:

1. Understand and explain the principles and values applied to technology, including privacy and data protection, algorithmic fairness and bias, digital inclusion, accountability and transparency, sustainability, and ethical AI and machine learning)

2. Identify uses of technology that produce unethical behavior or harm to users, society, or the environment

3. Apply relevant ethical theories to moral dilemmas involving technology

4. Evaluate different responses to ethical practice in technologies and justify an opinion based on ethical theory

COSL1010 Community Service Learning

45 hours

Pre-requisite: N/A

The Introduction to Service-Learning is a P/F, course which aims to promote skill-building: reflection, empathy, teamwork, oral communication, written communication (in your reflective journals), and attitudes: societal awareness and social responsibility. Students can choose from different topics such as pollution, teaching, or cultural preservation which change from year to year (see examples below).

In addition, this class focuses on project-based activities during the 8 in-person sessions and requires additional hours participating in a service-learning field experience.

For this course, students will unpack their own motivations and identity related to social issues using a public narrative and concepts related to civic engagement.

CECS1031 Computational Thinking

2 credits

Pre-requisite: N/A

This course is designed for students with no prior background in computing, offering them foundational skills to analyze problems, design computational solutions, and implement basic programs. Through hands-on labs and interdisciplinary case studies, students will learn to approach challenges in areas such as business, economics, engineering, and healthcare. By emphasizing core concepts such as abstraction, algorithms, efficiency, and correctness, this course fosters critical thinking and practical problem-solving abilities. It also introduces students to emerging topics like artificial intelligence, data science, and ethical computing, helping them become informed and adaptable digital citizens.

CECS1050 Introduction to Data Literacy

2 credits

Pre-requisite: N/A

This course provides a foundational understanding of data collection, analysis, and interpretation. The course equips students with practical skills in data visualisation and problem-solving using tools such as Excel and Python. Students will gain insights into the entire data lifecycle, from data collection and cleaning to analysis and presentation within data-centric projects. The course will also introduce basic probabilistic ideas and ethical considerations in data. Learning will occur through lectures, recitations, and projects, with assessment based on quizzes, take-away activities, and in-class project presentations. Upon completion, students will be able to interpret data sets, articulate data analysis workflows, apply data visualisation techniques, and function effectively within data-centric projects.

CECS1040 Introduction to AI Literacy

2 credits

Pre-requisite: N/A

This course provides a foundational understanding of the fundamental concepts, principles, and key technologies underlying Artificial Intelligence. The course equips students with the competence to use contemporary AI tools, such as ChatGPT for work and study tasks. Students will cultivate the ability to discuss the significant ethical considerations and societal impacts associated with AI systems, including data privacy and algorithmic bias. Furthermore, the course will explore how AI together with appropriate user interfaces can be strategically applied to improve efficiency and foster innovation in academic and professional settings. Learning will occur through lectures, and assessment will be based on individual assessments and a group assignment. Upon completion, students will be able to understand basic AI principles, use AI tools effectively, recognise ethical implications, apply AI to improve efficiency and innovation, and contrast user interfaces for better human-AI interaction.

ENGL1040 Interpersonal and Multimedia Communication

2 credits

Pre-requisite: N/A

On successful completion of this course, students will be able to:

1. Identify and explain the fundamental concepts, scope, and diversity of oral and visual communication.

2. Identify communication expectations based on an understanding of different professional audiences and contexts and apply this knowledge in delivering communication.

3. Demonstrate responsible, ethical, and respectful attitudes as the field undergoes disruptive changes fueled by rapid technological advancements.

4. Develop your own oral communication skills in key situations, from speeches to conversation, discussion, giving feedback.

5. Grow your skills in developing digital content for multimedia, including presentations, pitches, blog posts, viral videos, podcasts, and basic media management.

MANA1011 Introduction to Managing Skills

2 credits

Pre-requisite: N/A

On successful completion of the course, students will be able to:

1. Apply the SMART technique to define specific, measurable, achievable, relevant, and time-bound goals, ensuring clarity and focus on their objectives.

2. Develop skills to effectively organize tasks and prioritize them based on importance and urgency, facilitating efficient and systematic progress towards achieving objectives.

3. Understand how to assign tasks based on team members' individual strengths, skills, and expertise, ensuring optimal use of resources, and enhancing team performance.

4. Learn to create and manage project schedules, monitor progress, and employ motivational techniques to keep team members engaged and productive, overcoming challenges and maintaining momentum.

5. Acquire the ability to give professional, accurate, and timely feedback, fostering a positive energy and environment within the team.

HASS1100 Introduction to International Relations

2 credits

Pre-requisite: N/A

On successful completion of this course, students will be able to:

1. Know the main actors, structures, and processes of international relations

2. Understand the basic theoretical principles of international relations and compare the competing underlying frameworks on human and social nature

3. Identify the respective objectives of international organizations in international politics, collaboration, and cooperation

4. Explore a case study, problem-solving scenario or dilemma involving international relations and devise a strategy/solution supported by theory and solid argumentation

5. Critically assess alternative strategies and points of view on complex scenarios requiring international relations

ARTS1030 Art Appreciation and Application

2 credits

Pre-requisite: N/A

On successful completion of this course, students will be able to:

1. Demonstrate an understanding and appreciation of arts and visual arts in general, including their function, and historical, religious, cultural, social, and environmental contexts and relevance;

2. Understand and define the basic principles of arts, visual arts, and design; explain and analyze a work of art from an informed and objective viewpoint, its physical attributes and formal construction;

3. Identify how art works are created and processed;

4. Make a reference to the significance and application of the arts in students' own field of studies and interests;

5. Analyze Vietnam arts and situate Vietnam arts in the global context.

PERF1010 Artistic Performance and Application

2 credits

Pre-requisite: N/A

On successful completion of this course, students will be able to:

1. Show improved skill in their chosen artistic field (e.g., music, dance, theatre, visual arts) and express their creativity and individuality through performance(s).

2. Evaluate and discuss different forms of artistic performance, identifying key elements and techniques, and write reflective assessments on their personal artistic development.

3. Work well with peers to create and perform artistic pieces, and effectively give and receive constructive feedback.

4. Clearly communicate the artistic vision and choices behind their performances both verbally and in writing (if required) and develop their skills in presenting artistic work to an audience, including stage presence and audience engagement.

5. Explore and appreciate a variety of artistic traditions from around the world, with a special focus on Vietnamese culture, and place their own artistic work in a wider cultural and historical context.

6. Plan, organize, and complete an artistic performance project from start to finish, demonstrating good time management and organizational skills.

7. Understand and apply ethical considerations in artistic performance, including respecting intellectual property and cultural sensitivities, and behave professionally during rehearsals, performances, and collaborative projects.

ENGL1030 Academic and Professional Writing

Credit: 2

Pre-requisite: NA

On successful completion of this unit, students will be able to:

1. Identify and explain core attitudes, values, and practices of academic culture and how academic writing reflects these.

2. Reflect critically on the differences between academic and opinion writing and apply this understanding in the composition of academic essays, including referencing, quoting, and paraphrasing.

3. Evaluate the differences between academic and professional writing in terms of style, purpose, target audience, and techniques.

4. Develop your clear, concise, and well-structured writing skills, focusing on the most critical documents and situations in academic and professional work such as academic essays, newspaper articles, business reports, proposals, speeches...

5. Use AI to develop, enhance, and revise writing in both academic and professional contexts.

LEAD1031 Leadership and Team building Bootcamp

2 credits

Pre-requisites: None

This course is designed for all students to assist in leadership and teamwork development and training within an experiential outdoor setting.

This course offers hands-on leadership concepts and frameoworks that can be used for real-world situations. For example, collaboration, teamwork, communication, conflict resoluation through immersion in challenging scenarios.

THINK1010 Critical & Creative Thinking

2 credits

Pre-requisites: None

In this course students will develop their critical thinking skills through studying the nature of arguments, good reasoning, fallacies, and the art of debating. Different kinds of arguments will be presented, such as the distinction between deduction and induction, as well as causal reasoning in the sciences. With an eye on application to real-world issues, students will apply the reasoning skills they develop to evaluate and improve arguments from case studies. The examples chosen will be reflective of STEM and Business content so they can see the relevance of the skills developed to their own major and future career. Creative thinking will be developed through the study of problem-solving cases and training in various methods of idea generation. This will culminate in a case-based competition in the final two classes that will be introduced and judged by an industry expert.

HASS1070 Cross Cultural Navigation

2 credits

Pre-requisite: None

To thrive in the 21st century, young people must be able to navigate cross-cultural differences and achieve a level of cultural intelligence (CQ) – the ability to adapt to and understand culturally diverse contexts – as never before. The global impact of the Covid 19 pandemic has only further confirmed this need. Consequently, this course helps students to explore the cross-cultural experience, examine their own cultural biases, and prepare for the demands of 21st-century interconnectedness.

The main goal of this course is that everyone (including the instructor and TA) will become a better cross-cultural communicator. We will explore together and learn from each other.

Therefore, Cross-Cultural Navigation (CCN) explores factors that influence communication in an intercultural context as well as the rules and customs governing behavior. We will approach communication from the perspective of Anthropology and Cultural Geography, understanding that all relationships and group dynamics are developed and fostered within a specific cultural context. With this in mind, the course will cover a host of topics relating to communication including Ethics, Social

Structure, Religion, Communication, National Identity, Decision-making, and Leadership.

CCN will primarily focus on practical applications and case studies. Lectures will be used to frame and enhance content. We will explore how to communicate effectively in a multicultural environment and how to manage, negotiate, and resolve cross-cultural conflicts. Students will engage in real-world and simulated cross-cultural scenarios, to gain practical experience relevant to cooperating with and living with people from diverse backgrounds. In these simulations, as well as in-class discussions, course members will analyze and reflect critically upon the multifaceted nature of communication, which includes verbal, non-verbal, and written forms of expression, as well as central customs and practices that give shape to relationships.

VCOR1021/22 Healthy Lifestyle 1, 2

Credit: non-credit, required min 45 hours across Year 1

Pre-requisite: None

"Healthy Lifestyle" is a mandatory and non-credit bearing course of the General Education Program. Undergraduate students are required to enroll in this course to fulfill part of the graduation requirements and are expected to complete it by the end of their first-year study. This course provides the essential knowledge, skills and practicum lessons (exercise/sport classes), whereby students are able to develop a suitable approach in attaining a physically, mentally, socially and spiritually healthy lifestyle.

Specifically, this course provides students with the knowledge to make better choices during their daily routines to build a healthy lifestyle. A healthy lifestyle includes physical wellbeing, psychosocial, and spiritual health. Students receive mentorship that guides and shapes their perspective, showcasing the importance of having a well-balanced life. Components of a healthy lifestyle will be discussed as a process and science that allows students to have a greater understanding of what it takes to achieve their goals for overall wellbeing. Nutrition and diet will be taught to dispel the myths about how and what you should eat to achieve desired health results. Having a healthy mind, healthy body, clarity of thought and the ability to effectively process information are key trademarks of a healthy lifestyle.

This course emphasizes practical application of the learned concepts in order to integrate subject matter into students' current daily routines and throughout life. The majority of coursework will be held in different environments and venues in order to expose students to the many varieties of fitness tools and resources to maintain a healthy foundation.

HASS1010 Marxism-Leninism Philosophy (Philosophy Science and Society)

3 credits

Pre-requisite: NA

Marxist-Leninist Philosophy

Marxist-Leninist Philosophy (MLP) is a compulsory course in university curriculum according to the Vietnam Ministry of Education and Training (MOET). The course provides students with basic and foundational understanding of philosophy in general and Marxist-Leninist philosophy in particular. It is the prerequisite for other courses in the block of compulsory political and theoretical courses required by MOET (the others include: Marxist-Leninist Political Economics, Scientific Socialism, The Revolutionary Way of The Communist Party of Vietnam, and Ho Chi Minh Thoughts). MLP also plays the role of preparing students for the scientific and academic contents that they will study in different majors at VinUniversity.

As an introduction to philosophy, MLP aims at widening students' worldviews and stimulating their critical thinking. As a presentation of Marxist-Leninist philosophy, the official political ideology of the Communist Party of Vietnam (CPV) and the Socialist Republic of Vietnam, MLP provides students the most basic philosophical contents of Marxism and Leninism as well as the theoretical improvisation and development of the CPV. As a methodological preparation for students' academic journey at VinUniversity, MLP spares a small amount of its weekly contents to relate the philosophical knowledge with the development of science and society. Students will start the course with an overview of the role of Philosophy and Metaphysics and examples of important philosophical ideas East and West. The course then focuses on the presentation of Marxist worldview and method via two components: Dialectical Materialism—the Marxist philosophy of nature and Historical Materialism—the Marxist philosophy of history and human beings.

Integrated Studies: Philosophy, Science and Society

Philosophy, Science & Society (PSS) provides students with a broad survey of key ideas in Philosophy, its relevance to society and the way we think we understand the world, or to put it broadly, "science." We begin the course with an overview of the role of Epistemology and Metaphysics as we embark on this journey of critically re-examining the way we look at our world. In the second part of the course, we take a deep dive into questions of Scientific Progress based on which students can orient and develop their creative thinking, philosophy of humanity and action. We follow up with an exploration of trends that came into being with the "social turn" of epistemology found in the critical works of Thomas Kuhn and later in the burgeoning body of works clustered as Sociology of Science. Following this radical re-thinking, we return to the fundamental questions about humanity posed in Social Philosophy and Ethics, to round up our critical inquiry of the complex relationship among philosophy, science and society. PSS is one of four courses in the General Education

Program forming the ideology/national education component required for higher education curriculum as directed by the Ministry of Education & Training, Socialist Republic of Vietnam. This course forms 3 credits out of a total of 12 credits dedicated to this requirement for higher education curriculum. These four courses are written to achieve the primary objective of helping students understand core values of both country and university through objective and critical academic lenses in a global context. As these courses will be taught in English to students for whom English is mainly a second language at VinUniversity, each course is designed to be delivered in the spirit of content-based language learning approach to help students both develop English language competency (focusing on speaking, listening and reading) and basic understanding of the content.

HASS1020 Marxism-Leninism Political Economy (Global Political Economy)

2 credits

Pre-requisite: NA

Marxism-Leninism Political Economy

Marxist-Leninist Political Economy is a compulsory course in the undergraduate curriculum. This course aims to systematically equip students with knowledge of the economic theory of Marxism-Leninism and the general economic model of contemporary Vietnam, as defined and implemented by the Communist Party of Vietnam, the sole ruling party in the country. The course helps students enhance their understanding of economics and politics, gain a clear insight into the major issues facing the country and the nation in relation to global and contemporary challenges. It also contributes to fostering patriotism, a sense of responsibility, national pride, dignity, self-reliance, and the determination for national independence.

Global Political Economy: Vietnam-the Region-the World

This component offers opportunities to study how various political and economic actors, systems, conditions, and schools of thought interact and influence each other in shaping the world around us. The course would engage complex questions as to why various issues and challenges including climate change, international trade, poverty have no pure political or economic explanation? Why do foreign economic policies defy the logic of economics? The course begins with an introduction to *Political Economy* and a survey of various political-economic actors and select schools of economic thought. The students will be presented with nuanced narratives of globalization, its benefits and risks, and the future. A key development in studies of the political economy suggests that the ability of a country to integrate or cope with the extending reach of globalization is largely determined by domestic governance. In line with this, the second part of the course focuses on the economic history of Vietnam in the regional and global context and the changing domestic governance of the country from past to present. We pay attention to “alternate histories” of change

that underlined the road leading to the *Doi Moi* reforms and Vietnam's re-entry into the global political economy. In the third part of this course, we examine the changing configurations of the global political economy vis-à-vis Vietnam, paying special attention to the immediate regions surrounding Vietnam, namely ASEAN, East Asia (in particular, China), and South Asia. We shall conclude this stand-alone course on the global political economy by examining the status of Vietnam and possible pathways the country might take in the globalized digital present and future.

HASS1030 Scientific Socialism (Politics and Social Change)

2 credits

Pre-requisite: NA

The course is part of the VinCore curriculum of VinUniversity. This course is an ideology course mandated by the Vietnamese Government and it teaches the socialist path of development. It equips students with fundamental knowledge about socialism, including its birth, the system, its stages of development, its objectives, and understanding the meaning derived from studying about socialism. The approach takes philosophical, economic, and socio-political angles to understand the stages of human societal development, from capitalism to socialism and then capitalism. On that basis, students will be able to further research on advanced topics about scientific socialism.

HASS1041 Ho Chi Minh Ideology (Vietnam: History and Culture II)

2 credits

Pre-requisite: NA

HASS 1041 is one of four courses in the General Education Program forming the ideology/national education component required for higher education curriculum as directed by Vietnam's Ministry of Education & Training, Socialist Republic of Vietnam. This course forms 2 credits out of a total of 12 credits dedicated to this requirement for higher education curriculum. These four courses are written to achieve the primary objective of helping students understand core values of both country and university through objective and critical academic lenses in a global context.

As these courses will be taught in English to students for whom English is mainly a second language at VinUniversity, each course is designed to be delivered in the spirit of content-based language learning approach to help students both develop English language competency (focusing on speaking, listening and reading) and basic understanding of the content. The course has two components: 1. Hồ Chí Minh Thought and 2. Vietnam History and Culture II Extension.

HASS1050 History of the Communist Party (Vietnam: History and Culture I)

2 credits

Pre-requisite: NA

Vietnam History and Culture (I) examines Vietnamese history and cultural production from its mythical origins to the early Nguyễn empire (prehistory - *ca*.1820). We parse this history in three acts: Unit 1 – Prehistory, places, and peoples; Unit 2 – Early Empire (1010-1527); and Unit 3 – Fragmentation (1527 – 1802). Throughout this journey through time, we will pause to consider Vietnamese adaptations, developments, and innovations regarding ideology, religion, and culture.

Ultimately, we engage the former worlds of premodern Vietnam as a foil for understanding of the place and possibilities of the Vietnamese Communist Party today. We seek to accomplish this by grappling big questions. What are history and culture? Who are the Vietnamese? Where should we position Vietnamese in place and time? How has geography, climate, and ecology shaped their lives? What ideas shaped Vietnamese sense of self? How did they outlook on the world direct their responses to crisis and change? What does the past teach us about possibilities for future? By beholding the past, how can we better understand the Vietnamese Communist Party's history and reflect on its forward trajectories?

VCOR1012A/B: OASIS Orientation, Advising, Skills, Identity & Diversity, and Spirit of Pay it Forward

Non-credit

Pre-requisite: NA

This is a mandatory and non-credit bearing course of the VinCore program. Undergraduate students are required to enroll in this course to fulfill part of the graduation requirements and are expected to complete it by the end of their first-year study. This course provides the essential knowledge, skills and practicum lessons (exercise/sport classes), whereby students are able to develop a suitable approach in attaining a physically, mentally, socially and spiritually healthy lifestyle.

Specifically, this course provides students with the knowledge to make better choices during their daily routines to build a healthy lifestyle. A healthy lifestyle includes physical wellbeing, psychosocial, and spiritual health. Students receive mentorship that guides and shapes their perspective, showcasing the importance of having a well-balanced life. Components of a healthy lifestyle will be discussed as a process and science that allows students to have a greater understanding of what it takes to achieve their goals for overall wellbeing. Nutrition and diet will be taught to dispel the myths about how and what you should eat to achieve desired health results. Having a healthy mind, healthy body, clarity of thought and the ability to effectively process information are key trademarks of a healthy lifestyle.

This course emphasizes practical application of the learned concepts in order to integrate subject matter into students' current daily routines and throughout life. The majority of coursework will be held in different environments and venues in order to expose students to the many varieties of fitness tools and resources to maintain a healthy foundation.

LAW1010 Introduction to Law

2 credits

Pre-requisites: None

Introduction to law (IL) is an introduction to concepts, role and principles of law as well as major fields of law in society. It provides students with general knowledge of law that will serve as a helpful foundation for understanding how law interacts with other disciplines that they study and pursue in the future. The course covers various aspects from legal theory including notion, nature, sources, rule of law, major legal and government systems, legal profession and comparative legal analysis between different bodies of law, branches of international law as well as different mechanisms of dispute settlement, either at municipal courts or other international forums worldwide. All the topics combine

legal understanding and practical issues in both the Vietnamese context and a wide diversity of international legal backgrounds to help students gain familiarity with basic concepts of national law and be aware of international fundamental legal standards. Throughout the course, students develop critical analysis and problem solving, work-in-group and presentation skills, research literacy in law through theoretical lectures, case law analysis, individual and team assignments.

IL is among the courses in the General Education Program forming the ideology/national education component required for higher education curriculum as directed by the Ministry of Education & Training, Socialist Republic of Vietnam. This course forms 2 credits. These ideology courses are written to achieve the primary objective of helping students understand core values of both country and university through objective and critical academic lenses in a global context. As these courses will be taught in English to students for whom English is mainly a second language at VinUniversity, each course is designed to be delivered in the spirit of content-based language learning approach to help students develop basic understanding of the content.

3.6.2. BSME Core Courses

MATH1010 Calculus I

4 credits

Pre-requisites: High school three years high school mathematics, including trigonometry and logarithms, and at least one course in differential and integral calculus

This course teaches techniques of integration, finding areas and volumes by integration, exponential growth, partial fractions, infinite sequences and series, tests of convergence, and power series.

MATH1020 Calculus II

4 credits

Pre-requisites: Calculus I

This course gives an introduction to multivariable calculus. Topics include partial derivatives, double and triple integrals, line and surface integrals, vector fields, Green's theorem, Stokes' theorem, and the divergence theorem.

MATH2030 Differential Equations

3 credits

Pre-requisites: Calculus II

Taking with Linear Algebra simultaneously is not recommended.

This course gives an introduction to ordinary and partial differential equations. Topics include first order equations (separable, linear, homogeneous, exact); mathematical modeling (e.g., population growth, terminal velocity); qualitative methods (slope fields, phase plots, equilibria and stability); numerical methods; second order equations (method of undetermined coefficients, application to oscillations and resonance, boundary value problems and eigenvalues); and Fourier series. A substantial part of this course involves partial differential equations, such as the heat equation, the wave equation, and Laplace's equation.

MATH2050 Linear Algebra

4 credits

Pre-requisites: none

Taking with Differential Equations simultaneously is not recommended.

This course teaches linear algebra and its applications. Topics include matrices, determinants, vector spaces, eigenvalues and eigenvectors, orthogonality and inner product spaces; applications include brief introductions to difference equations, Markov chains, and systems of linear ordinary differential equations. This course also includes computer use in solving problems.

MATH2010 Probability and Statistics

4 credits

Pre-requisites: Calculus II

This course gives students a working knowledge of basic probability and statistics and their application to engineering including computer analysis of data and simulation. Topics include random variables, probability distributions, expectation, estimation, testing, experimental design, quality control, and regression.

PHYS1010 Physics I

4 credits

Pre-requisites: Calculus I (integration, finding areas and volumes by integration, exponential growth, partial fractions, infinite sequences and series, tests of convergence, and power series).

This course covers the mechanics of particles with focus on kinematics, dynamics, conservation laws, central force fields, periodic motion. Mechanics of many-particle systems: center of mass, rotational mechanics of a rigid body, rotational equilibrium, and fluid mechanics. Temperature, heat, the laws of thermodynamics.

PHYS2020 Physics II

3 credits

Pre-requisites: Physics I

This course covers electrostatics, the behavior of matter in electric fields, DC circuits, magnetic fields, Faraday's law, AC circuits, and electromagnetic waves

PHYS2030 Physics III: Oscillations, Waves, and Quantum Physics

2 credits

Pre-requisites: Physics II (Electromagnetism), Calculus II

This course covers the physics of oscillations and wave phenomena, including driven oscillations and resonance, mechanical waves, sound waves, electromagnetic waves, standing waves, Doppler effect, polarization, wave reflection and transmission,

interference, diffraction, geometric optics and optical instruments, wave properties of particles, particles in potential wells, light emission and absorption, and quantum tunneling.

CHEM2010 Chemistry

3 credits

Pre-requisites: High school chemistry

This course covers basic chemical concepts, such as reactivity and bonding of molecules, introductory quantum mechanics, and intermolecular forces in liquids and solids and gases. Attention will be focused on aspects and applications of chemistry most pertinent to engineering.

CECS1011 Introduction to Engineering and Computer Science

2 credits

Pre-requisites: None

This course provides a general introduction to the engineering design process–spanning core topics from problem definition through prototyping and testing, as well as other important considerations such as sustainability, failure analysis, and engineering economics. This course also emphasizes multidisciplinary design via a design project (e.g., design a line following robot) which involves students from different majors of college of engineering and computer science.

COMP1010 Introduction to Programming

4 credits

Pre-requisites: None

This course teaches programming and problem-solving using Python. Emphasizes principles of software development, style, and testing. Topics include procedures and functions, iteration, recursion, arrays and vectors, strings, an operational model of procedure and function calls, algorithms, exceptions, object-oriented programming, and GUIs (graphical user interfaces).

MECE3010 Statics and Mechanics of Solids

4 credits

Pre-requisites: Physics I, Calculus II, Linear Algebra

This course covers principles of statics, force systems, and equilibrium in solid structures. Topics include free body diagrams in two and three dimensions; frames;

mechanics of deformable solids; stress and strain; axial force; shear force, bending moment, and torsion in bars and beams; thermal stress; pressure vessels; statically indeterminate problems; buckling and yielding.

MECE3020 Thermodynamics

3 credits

Co-requisites: Physics I, Calculus II

This course presents the definitions, concepts, and laws of thermodynamics. Topics include the first and second laws, thermodynamic property relationships, and applications to vapor and gas power systems, refrigeration, and heat pump systems. Examples and problems are related to contemporary aspects of energy and power generation and to broader environmental issues.

MECE3030 Dynamics

3 credits

Pre-requisites: Statics and Mechanics of Solids, Differential Equations

This course teaches Newtonian dynamics of a particle, systems of particles, rigid bodies, simple mechanisms, and simple harmonic oscillators. Impulse, momentum, angular momentum, work, and energy. Two-dimensional (planar) kinematics including motion relative to a moving reference frame. Three-dimensional rigid-body dynamics are also introduced. Setting up the differential equations of motion and solving them both analytically and numerically with MATLAB. In-lecture laboratory demonstrations illustrate basic principles.

MECE3040 Mechanical Synthesis

4 credits

Pre-requisites: Statics and Mechanics of Solids, Corequisite: Dynamics

This course provides a hands-on introduction to the mechanical design process, from conceptualization through prototype construction and testing. Design projects provide experience in basic prototyping skills using machine tools, 3D printing, and laser cutting, as needed, as well as basic instruction in CAD and technical sketching.

MECE3050 Introductory Fluid Mechanics

3 credits

Pre-requisites: Introduction to Programming

This course covers physical properties of fluids, hydrostatics, conservation laws using control volume analysis and using differential analysis, Bernoulli's equation,

potential flows, simple viscous flows (solved with Navier-Stokes equations), dimensional analysis, pipe flows, boundary layers. Introduction to compressible flow.

MECE4010 Heat Transfer

3 credits

Pre-requisites: Introductory Fluid Mechanics

This course covers the following topics: steady and unsteady heat conduction; forced and free convection; external and internal flows; radiation heat transfer; and heat exchangers.

MECE3060 Mechatronics

3 credits

Pre-requisites: Physics II, Differential Equations

At the intersection of mechanical and electrical engineering, Mechatronics involves technologies necessary to create automated systems. This course introduces students to the functional elements of modern controlled dynamic systems. Topics include analog circuits - both passive and active components, filter design, diodes, transistors, MOSFETs and power amplification, pulse width modulation, transduction - mechanical and electro-mechanical devices such as electromagnetic systems, gear trains, optical encoders, discretization, aliasing, and microprocessors and programming. Lab experiments culminate in the design, fabrication, and programming of a microprocessor-controlled robotic vehicle, which laboratory groups enter into a class-wide competition.

ELEC3030 Intelligent Physical Systems

3 credits

Pre-requisites: Introduction to Engineering and Computer Science, Introduction to Programming

This is an interdisciplinary design project course which involves students from different engineering and computer science programs. In this course, students will engage in a holistic design approach to Intelligent Physical Systems which can perceive, reason about, and act upon their environment. This course includes topics on algorithms, sensors, actuators, power, and mechanics. Students will learn the value and trade-offs between theory, simulation, and physical implementations, and gain familiarity with rapid prototyping techniques, system debugging, teamwork, leadership skills, time management, and how to disseminate work to a broader audience through wiki-pages.

MECE4020 System Dynamics and Control

3 credits

Pre-requisites: Differential Equations, Linear Algebra, Dynamics

This course teaches dynamic behavior of mechanical systems: modeling, analysis techniques, and applications; vibrations of single- and multi-degree offreedom systems; feedback control systems. Computer simulation and experimental studies of vibration and control systems.

MECE3070 Mechanics of Engineering Materials

3 credits

Pre-requisites: Statics and Mechanics of Solids

This course gives an introduction to the broad range of properties and behaviors of engineering materials as they relate to mechanical performance. Emphasis is placed on general states of stress and strain, on elasticity and combined loading effects. Failure criteria including yielding, fracture and fatigue are developed. A general introduction to the function/constraints/objectives approach to material selection associated with mechanical design is provided with candidate material systems coming from metals, polymers, ceramics and/or composites. A general overview of material processing will be presented within this context of material selection.

MECE3090 Automotive Engineering

3 credits

Pre-requisites: Dynamics

This course covers the analysis and design of vehicle components and vehicle systems. Emphasis on automobiles. Engines, transmissions, suspension, brakes, and aerodynamics are discussed. The course uses first principles and applies them to specific systems. The course is highly quantitative, using empirical and analytical approaches.

MECE4030 Hybrid Electric Vehicles

3 credits

Pre-requisites: Dynamics

This course covers electrified powertrain concepts, Energy for Transportation; environmental impact, APUs for hybrid electric vehicles, Modeling of power split devices for hybrid vehicles, Vehicle control hierarchy and power management, Modeling and analysis of series electric hybrid powertrains, Power electronic devices

and motors, Modeling and analysis of split hybrid power-trains, Modeling and control issues of batteries, Major design issues and consideration of Hybrids….

MECE4040 Vehicle Dynamics and Control

3 credits

Pre-requisites: Dynamics

This course focuses on tire mechanics and provides a fundamental understanding of feedback control, vehicle handling and ride performance through the development, analysis and critical interpretation of vehicle/system models.

MECE4050 Internal Combustion Engines

3 credits

Pre-requisites: Thermodynamics

This course covers the analytical approach to the engineering problem and performance analysis of internal combustion engines. Topics include thermodynamics, combustion, heat transfer, friction, and other factors affecting engine power, efficiency, and emissions, design and operating characteristics of different types of engines.

MECE3100 Introduction to Manufacturing Systems

3 credits

Pre-requisites: N/A

This course provides ways to analyze manufacturing systems in terms of material flow and storage, information flow, capacities, and times and durations of events. Topics include probability, inventory and queuing models, forecasting, optimization, process analysis, and linear and dynamic systems; flow planning, bottleneck characterization, buffer and batch-size tactics, seasonal planning, and dynamic behavior of production systems. This course also covers automation process, CAD/CAM/CAE and CIMS.

MECE4060 Innovative Product Design via Digital Manufacturing

3 credits

Pre-requisites: N/A

This course combines lecture and laboratory on the new product development cycle: iterative design based on prototyping, testing, consumer feedback, and limitations set by mass manufacturing. The course instructs students on methods to identify product

concepts for machine designs with commercial potential. Design teams will perform market analysis and explore the intellectual property space around their ideas and rapidly iterate them into a final prototype via digital manufacturing (e.g., 3D CAD files manifested via robotic printing or machining); advanced instruction on these tools will be given, and quantitative marketing will be used as feedback. Early stage prototypes will progress into more sophisticated designs. Scale-up (cost, pricing, tooling) considerations for mass manufacturing will be taken into account, as well as quantitative analysis of machine designs for the expected utility.

MECE4070 Additive Manufacturing

3 credits

Pre-requisites: Introductory Fluid Mechanics

This course teaches fundamental additive manufacturing, 3D printing approaches, including extrusion-based deposition, stereolithography, powder bed-based melting, and inkjet-based deposition. Cultivate a design for-additive manufacturing skillset for CAD and CAM methodologies to produce successful 3D prints.

MECE4080 Feedback Control Systems

3 credits

Pre-requisites: System Dynamics and Control

This course covers the analysis and design of linear systems in both the frequency and time domains. The course includes a laboratory that examines the modeling and control of representative dynamic processes. The frequency domain aspects are analyzed via Laplace transforms, transfer functions, root locus, and frequency response methods. The time domain aspects are analyzed via state space models, stability, controllability, observability, state feedback, and observers.

MECE3110 Wind Power

3 credits

Pre-requisites: Introductory Fluid Mechanics

This course covers the main features of energy conversion by wind turbines. Emphasis on the characterization of the atmospheric boundary layer, the aerodynamics of horizontal axis wind turbines, and performance prediction. Structural effects, power train considerations, siting, and wind farm planning.

MECE4090 Sustainable Energy Systems

3 credits

Pre-requisites: Introductory Fluid Mechanics, Heat transfer

This course critically examines the technology of energy systems that will be acceptable in a world faced with global climate change, local pollution, and declining supplies of oil. The focus is on renewable energy sources (wind, solar, biomass), but other non-carbon-emitting sources (nuclear) and lowered-carbon sources (co-generative gas turbine plants, fuel cells) also are studied. Both the devices and the overall systems are analyzed.

MECE4100 Combustion Processes

3 credits

Pre-requisites: Introductory Fluid Mechanics, Heat transfer

This course gives an introduction to combustion and flame processes, with emphasis on fundamental fluid dynamics, heat and mass transport, and reaction-kinetic processes that govern combustion rates. Topics include thermochemistry, kinetics, vessel explosions, laminar premixed and diffusion flames, and droplet combustion. Optional topics may include complex combustion systems, turbulent flames, fuel cells, or combustion of solids.

MECE4110 Design of Sustainable Systems

3 Credits

Pre-requisites:

This course will focus on the analysis, design, and production of renewable energy (solar, wind, nuclear, hydro, and geothermal, etc.) systems, with a focus on understanding the critical material challenges as well as the design and manufacturing challenges of sustainable energy systems.

MECE4120 Sensors and Actuators

4 credits

Pre-requisites: Intelligent Physical Systems

This course aims to provide students with in-depth knowledge of sensors and actuators through the technologies, future advances, and their applications. Students will learn about instrumenting an engineering system by incorporating sensors, actuators, and associated interface hardware. This course treats the types of sensors, actuators, and interface hardware in separate chapters in which the operating principles, modeling, design considerations and integration, performance

specifications, and applications of the individual components are discussed. Throughout the course, students are engaged with case studies, work examples, and exercises related to robotic manipulators, industrial machinery, vehicles, aircraft, thermal and fluid process plants, and computer components.

ELEC4020 Embedded Systems

4 credits

Pre-requisites: Digital Logic and Computer Organization or Mechatronics

This course provides an introduction to the design of embedded systems, with an emphasis on understanding the interaction between hardware, software, and the physical world. Topics covered include assembly language programming, interrupts, I/O, concurrency management, scheduling, resource management, and real-time constraints.

ELEC4060 Robotics and Automation

4 credits

Pre-requisites: Control Systems or Mechatronics

This course introduces fundamental concepts in robotics and applications. Topics include basics of manipulators, coordinate transformation and kinematics, trajectory planning, control techniques, sensors and devices, robot applications in industrial automation.

MECE3870 Practice/Internship

Non-credit

Pre-requisites: Students must have completed sophomore year.

The professional structured internship offers students opportunities to apply theoretical knowledge to a real-world work environment and know more about companies that students may be interested in joining after graduation. During the internship, students will have the opportunity to discover and/or confirm their career interests, develop their major knowledge and gain valuable professional skills and connections with industry professionals. Students will complete the program under the guidance and support of a company advisor or Principal Investigator (PI), an industry mentor/ project researcher, and a faculty advisor, who will jointly help students to create SMART learning outcomes (specific, measurable, achievable, relevant and time-bound).

MECE4890 Graduation Thesis/Capstone

6 credits

Pre-requisites: Practice/Internship; Determined by the advisor

This Capstone course is developed for students in the College of Engineering and Computer Science (CECS) to apply technical knowledge and skills acquired in earlier coursework to a project involving actual designs and experiments. Students are strongly encouraged to work on multidiscipline-major topics to produce an end-to-end solution to a complex real-world problem from industry or academia. The assessment methods are formulated from discussions and agreements between the industry and VinUni in accordance with ABET requirements. More specially, the project involves the development of engineering systems or design alternatives, along with testing the implemented systems. The project should focus on advanced technologies, new applications, and their usefulness and benefits in the development of economy and management. In this course, students work in teams of 3 to 5, with at least one student from the Mechanical Engineering (ME) Program and one from the Electrical Engineering (EE) Program, under the supervision of VinUni faculty instructors. Students are enrolled in Capstone I in the first semester to develop or tailor a project proposal and secure instructor approval. In the following semester, they must take Capstone II to complete the project. Students are expected to be present in person for every meeting of the classes in which they are enrolled. They should be able to deliver their work and contribution to the project and engage in professional dialogues about their project during formal presentations.