VINUNIVERSITY

CURRICULUM FRAMEWORK

PROGRAM CODE: 7520201

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Electrical and Computer Engineering program

Applicable for the intake beginning in 2021 - 2022

(Decision 421a/2023/QĐ-VUNI, Dated: Dec 9th, 2023 by the Provost of VinUniversity)

This curriculum framework has been reviewed and validated by Cornell University

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1. VINUNI GENERIC GRADUATE ATTRIBUTES

Generic graduate attributes are a set of skills, attributes, and values that all learners should achieve regardless of discipline or field of study; should be measurable and broad. The five Generic Graduate Attributes for VinUni, framed around the EXCEL Model, are listed as below:

2. PROGRAM EXPECTED OUTCOMES

2.1 Program Profile

Name of the degree	Bachelor of Science in Electrical engineering
Name of the program	Electrical and Computer Engineering (ECE)
Program duration	to be completed in 4 years on a full-time basis
Total credits	***Option 1 Single major:*** 123 credits
	Option 2 Major + minor in Robotics or Product Design or Artificial Intelligence or another minor: 129 credits

2.2 Program Purpose

The overall aim of the program is to nurture and develop young leaders in electrical 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.

2.3 Program Educational Objectives and Student Outcomes

2.3.1 Program Educational Objectives

The educational objectives of the Bachelor of Science in Electrical 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:

1. Apply basic knowledge of electrical engineering principles and in-depth knowledge of one area of concentration to solve a full range of technical and societal problems;

2. Conceive, design, and realize products, systems, and services, while properly respecting economic, environmental, cultural, safety, and ethical standards or constraints;

3. Be leaders with an entrepreneurial mindset, effective communicators, and informed decision makers as members of multidisciplinary teams, supporting collaborative and inclusive environments;

4. Discover and apply new knowledge, and engage in life-long learning for the profession of electrical engineering;

5. Engage with their communities, profession, the nation, and the world.

2.3.2 Student Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;

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;

3. An ability to communicate effectively with a range of audiences;

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;

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;

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies;

8. An entrepreneurial mindset and a recognition of the importance of traditional values, national pride and global awareness.

3. CURRICULUM STRUCTURE

3.1 Curriculum Composition

No.	**Curriculum Components**	**Number of Credits (New)**	**Credit Distribution** (%/Total Credits)
I	**GENERAL EDUCATION**	**27**	**22%**
I.1	*University Core Requirement*	10	8.1%
I.2	*Distributional Requirement*	17	13.9%
I.3	*Co-curricular Learning*	Non-credit	
II	**PROFESSIONAL EDUCATION**	**96**	**78%**
II.1	*College Core Requirement*	39	31.7%
II.2	*Major Core Requirement*	15	12.2%
II.3	*Major Foundation Requirement*	15	12.2%
II.4	*Area of Concentration (Elective)*	12	9.8%
II.5	*Free Electives (minor*)*	9 (15*)	7.2%
II.6	*Internship/Co-op (at least 640 hours)*	Non-credit	
II.7	*Capstone Design*	6	4.9%
	TOTAL	**123 (129*)**	**100%**

* ***Instead of taking 9 credits of free electives, students have an option of taking 15 credits to fulfill the requirements of a minor. Free electives can be any courses offered by CECS or the other colleges at VinUniversity.***

3.2 Courses and Credit Distribution by Courses

No	Course code	Name of Courses	Total Credit	Credit Allocation	
				Theory	Practice
I	**GENERAL EDUCATION (GenED)**		***27***		
I.1	**University Core Requirement**		***10***		
1	ENGL1010	Academic English 1	*3*		
2	ENGL1020	Academic English 2	*3*		
3	LEAD1020	Organizational Behavior	*2*		
4	ENTR1020	Agile Innovation	*2*		
I.2	**Distributional Requirement**		***17***		
5	HASS1010	Marxism-Leninism Philosophy (Philosophy Science and Society)	*3*		
6	HASS1020	Marxism-Leninism Political Economy (Global Political Economy)	*2*		
7	HASS1030	Scientific Socialism (Politics and Social Change)	*2*		
8	HASS1050	History of the Communist Party (Vietnam: History and Culture I)	*2*		
9	HASS1040/ 1041	Ho Chi Minh Ideology (Vietnam: History and Culture II)	*2*		
10	LAW1010	Introduction to Law	*2*		
11	ARTS1010	Culture - Arts	1		
12	VCOR1011	OASIS	3		
I.3	**Co-curricular Learning**				
13	VCOR1020	Healthy Lifestyle	*Non-credit*		*45 hrs*
14	VCOR1030	National Defense Education	*Non-credit*		*165 hrs*
15	LEAD1030	Leadership Bootcamp	*Non-credit*		*45 hrs*
16	ENTR1010	Entrepreneurship Innitiatives	*Non-credit*		*45 hrs*
17	COSL1010	Community Service Learning	*Non-credit*		*45 hrs*
18	GLEX1010	Global Experience	*Non-credit*		*45 hrs*
II	**PROFESSIONAL EDUCATION**				
II.1	**College Core Requirement**		***39***		
19	MATH2010	Probability and Statistics	*4*	3	1
20	MATH1010	Calculus I	4	3	1
21	MATH1020	Calculus II	4	3	1
22	MATH2030	Differential Equations	3	2	1

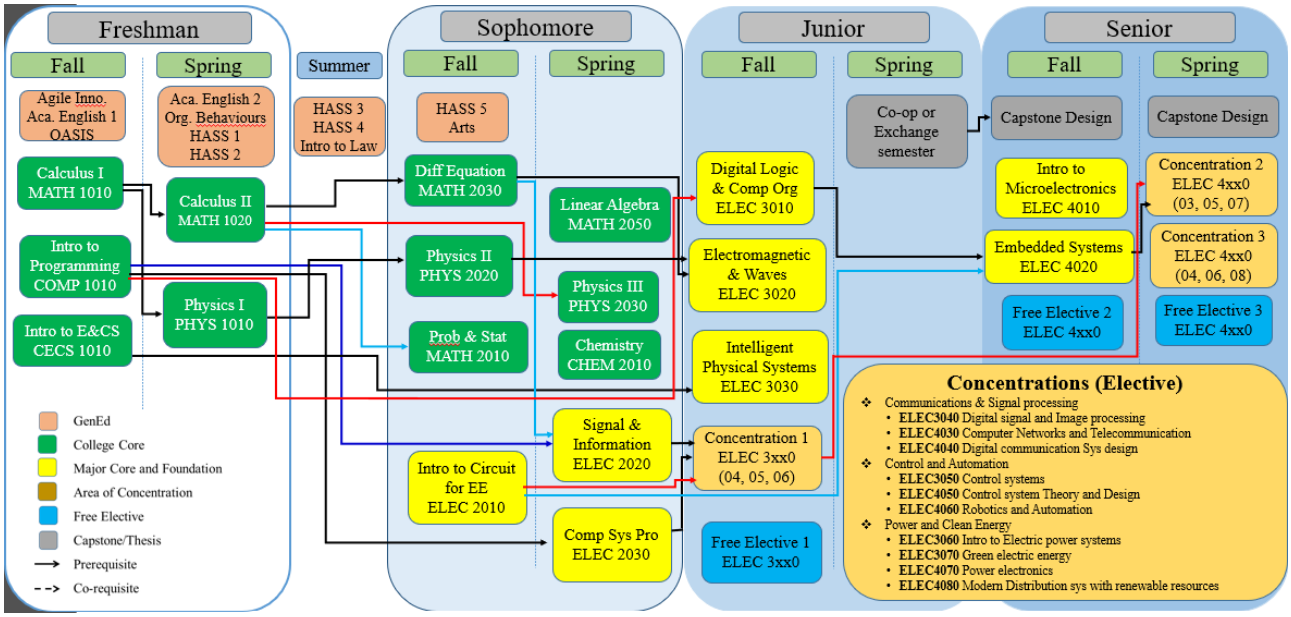
No	Course code	Name of Courses	Total Credit	Credit Allocation	
				Theory	Practice
23	MATH2050	Linear Algebra	4	3	1
24	PHYS1010	Physics I	4	3	1
25	PHYS2020	Physics II	3	2	1
26	PHYS2030	Physics III	2	2	0
27	CHEM2010	Chemistry	3	2	1
28	CECS1010	Introduction to Engineering and Computer Science	4	2	2
29	COMP1010	Introduction to Programming	4	2	2
II.2	**Major Core requirement**		***15***		
30	ELEC2010	Introduction to Circuits for Electrical Engineers	4	3	1
31	ELEC2020	Signals and Information	4	3	1
32	ELEC3010	Digital Logic and Computer Organization	4	3	1
33	ELEC2030	Computer Systems Programming	3	3	0
II.3	**Major Foundation requirement**		***15***		
34	ELEC3020	Electromagnetic Fields and Waves	4	3	1
35	ELEC4010	Introduction to Microelectronics	4	3	1
36	ELEC4020	Embedded Systems	4	3	1
37	ELEC3030	Intelligent Physical Systems (Interdisciplinary Engineering Design Project)	3	2	1 (lab + project)
II.4	**Area of Concentration (Elective) (Select one)**				
II.4.1	***Communications and Signal Processing***		***12***		
1	ELEC3040	Digital Signal and Image Processing	4	3	1 (project)
2	ELEC4030	Computer Networks and Telecommunications	4	3	1
3	ELEC4040	Digital Communication System Design	4	3	1
II.4.2	***Control and Automation***		***12***		
1	ELEC3050	Control Systems	4	3	1
2	ELEC4050	Control System Theory and Design	4	3	1
3	ELEC4060	Robotics and Automation	4	3	1
II.4.3	***Power and Clean Energy***		***12***		
1	ELEC3060	Introduction to Electric Power Systems	3	2	1

No	Course code	Name of Courses	Total Credit	Credit Allocation	
				Theory	Practice
2	ELEC3070	Green Electric Energy	3	2	1
3	ELEC4070	Power Electronics	3	2	1
4	ELEC4080	Modern Distribution Systems with Renewable Resources	3	3	0
II.5	**Free Electives (or minor)**		***9 (15)***		
II.6	**Internship**				
1	ELEC3870	Internship	*640 hrs*		
II.7	**Capstone Design**		***6***		
1	ELEC4890	Capstone Design	*6*		6

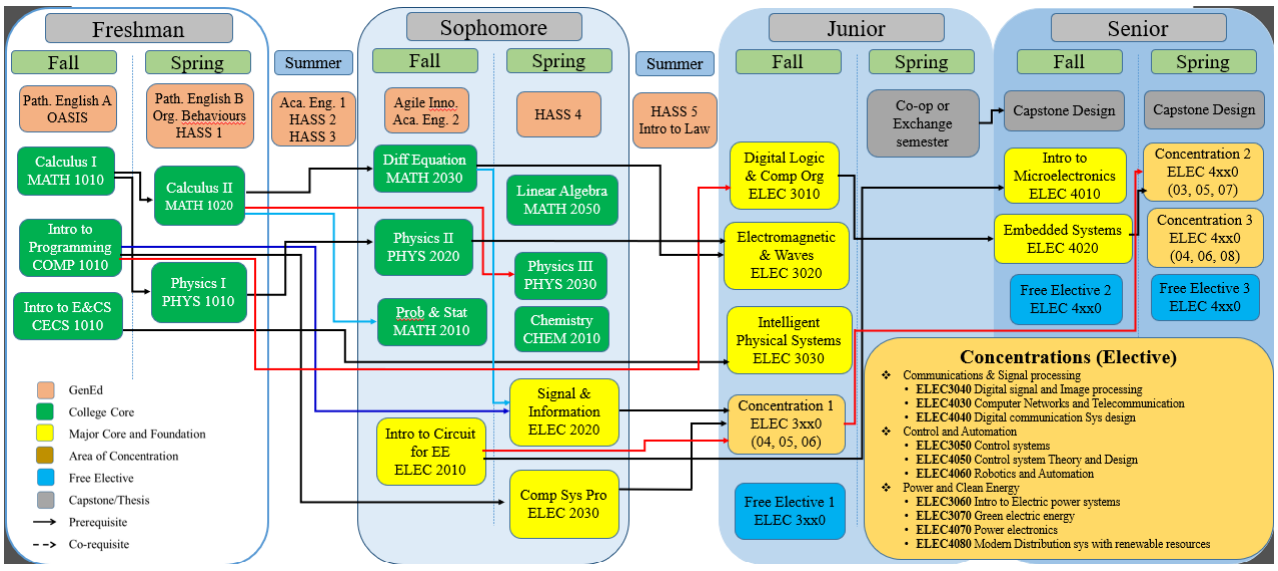
3.3 Curriculum Planner

There are two tracks: Main track and Pathway English track (for students who need to improve English requirement)

Course flow - Main track



Course flow – Pathway track



Main track:

Undergraduate Electrical Engineering Curriculum		GenED Core	College Core	Major core and Foundation	Area of Concentration	Free Electives/ Minor	Practice/ Internship	Graduation Thesis/ Capstone
Year 1 Fall	Calculus I		4					
	Introduction to Programming		4					
	Introduction to Engineering and CS		4					
	Academic English 1	3						
	Agile Innovation	2						
	OASIS	3						
	Healthy Lifestyle	Non-Credit						
Total Semester Credits			**20**					
Year 1 Spring	Calculus II		4					
	Physics I		4					
	Academic English 2	3						
	Organization behaviors	2						
	HASS course 1	2						
	HASS course 2	2						
	Healthy Lifestyle	Non-Credit						
Total Semester Credits			**17**					
Summer 1	HASS course 3	3						
	HASS course 4	2						
	Introduction to Law	2						
Total Semester Credits			**7**					
Year 2 Fall	Differential Equations		3					
	Physics II		3					
	Probability and Statistics		4					
	HASS course 5	2						
	Arts	1						
	Introduction to Circuits for Electrical Engineers			4				
Total Semester Credits			**17**					
Year 2 Spring	Linear Algebra		4					
	Physics III		2					
	Chemistry		3					
	Signals and Information			4				
	Computer Systems Programming			3				
Total Semester Credits			**16**					
Summer 2	Internship or exchange program						Non Credit	
Year 3 Fall	Digital Logic and Computer Organization			4				
	Electromagnetic Fields and Waves			4				
	Intelligent Physical Systems (interdisciplinary Design project)			3				
	Concentration 1				4			
	Free Elective 1					3		
Total Semester Credits			**18**					
Year 3 Spring	**Co-op semester (No credit)**							
Total Semester Credits			**0**					
Summer 3	Internship or exchange						No credit	
Year 4 Fall	Capstone Design							3
	Introduction to Microelectronics			4				
	Embedded Systems			4				
	Free Elective 2					3		
Total Semester Credits			**14**					
Year 4 Spring	Capstone Design							3
	Concentration 2				4			
	Concentration 3				4			
	Free Elective 3					3		
Total Semester Credits			**14**					

Pathway track:

Undergraduate Electrical Engineering Curriculum		GenED Core	College Core	Major core and Foundation	Area of Concentration	Free Electives/ Minor	Practice/ Internship	Graduation Thesis/ Capstone
Year 1 Fall	Calculus I		4					
	Introduction to Programming		4					
	Introduction to Engineering and CS		4					
	Pathway English Advanced A	6						
	OASIS	3						
	Healthy Lifestyle	Non-Credit						
Total Semester Credits			**21**					
Year 1 Spring	Calculus II		4					
	Physics I		4					
	Pathway English Advanced B	6						
	Organization behaviours	2						
	HASS course 1	2						
	Healthy Lifestyle	Non-Credit						
Total Semester Credits			**18**					
Summer 1	Academic English 1	3						
	HASS course 2	3						
	HASS course 3	2						
Total Semester Credits			**8**					
Year 2 Fall	Differential Equations		3					
	Physics II		3					
	Probability and Statistics		4					
	Agile innovation	2						
	Academic English 2	3						
	Introduction to Circuits for Electrical Engineers			4				
Total Semester Credits			**19**					
Year 2 Spring	Linear Algebra		4					
	Physics III		2					
	Chemistry		3					
	HASS course 4	2						
	Signals and Information			4				
	Computer Systems Programming			3				
Total Semester Credits			**18**					
Summer 2	Introduction to Law	2						
	HASS course 5	3						
Total Semester Credits			**5**					
Year 3 Fall	Digital Logic and Computer Organization			4				
	Electromagnetic Fields and Waves			4				
	Intelligent Physical Systems (interdisciplinary Design project)			3				
	Concentration 1				4			
	Free Elective 1					3		
Total Semester Credits			**18**					
Year 3 Spring	**Co-op semester (No credit)**							
Total Semester Credits			**0**					
Summer 3	Internship or exchange						No credit	
Year 4 Fall	Capstone Design							3
	Introduction to Microelectronics			4				
	Embedded Systems			4				
	Free Elective 2					3		
Total Semester Credits			**14**					
Year 4 Spring	Capstone Design							3
	Concentration 2				4			
	Concentration 3				4			
	Free Elective 3					3		
Total Semester Credits			**14**					

3.4 Course Descriptions

ENTR1020 Agile Innovation

2 credits

Pre-requisites: None

The purpose of this course is to provide students with a basic understanding of the entrepreneurial and innovation mindset and provide students the opportunity to learn about and develop behaviors correlated with successful entrepreneurs and innovators. Skills to be taught include opportunity identification, idea generation, design thinking, building and leading an innovative team, optimizing creativity, seeking customer feedback, and prototyping. This hands-on course will allow students to refine their innovation skills and develop confidence in their creativity skill set. This course involves lectures and in-team innovation experience, generating an innovative product concept. The course is intended for a mix of students from various academic disciplines, such as medicine, nursing, engineering, business, real estate, and hospitality. The course will focus on identifying opportunities in a changing environment. Students will gain a broader perspective of both the challenges and opportunities related to technology and social change. (i.e. unmet customer needs and opportunities for future ventures). As part of the course all students will engage in a 3-day hackathon. For the hackathon event, students will form teams and will identify problems and generate 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 will also help students build their professional network.

ENGL1010 Academic English 1

3 credits

Pre-requisites: None or Pathway English Advanced B for Pathway track

This course is designed as a continuation of the Pathway English Program Advanced course to further develop students' competency in the English language and introduce and develop students' academic skills and literacies. Academic English 1 is the first of two courses in the General Education Program aimed at developing students' English language and skill competencies for English medium instruction at the university level. Students in this course will continue to develop their academic English language ability in Reading, Listening, Writing, and Speaking. While this course seeks to improve the overall capacity of the students' English language and academic literacy skills, there is an emphasis on the development of academic writing at the essay level and oral communication skills

to prepare students for Academic English 2 and long-term success in university-level coursework.

ENGL1020 Academic English 2

3 credits

Pre-requisites: Academic English 1

Academic English 2 reinforces and expands the language and academic skills developed in Academic English 1. Students will continue to expand and refine their range and accuracy of English but will now focus more intensively on the skill of writing. The principle aim of this course is to transition from the written essay to the research paper, augmenting students' academic writing skills to prepare them for the type of writing that is essential to their university studies. After identifying a key academic question, through a scaffolded and multistage approach, students will demonstrate a diversity of writing skills to create a coherent research paper and share their findings with an interdisciplinary audience through formal presentations. Students will further develop their academic inquiry skills, synthesizing and critically evaluating knowledge from various sources, creating new connections and ultimately crafting their own original ideas.

LEAD1020 Organization behaviors

2 credits

Pre-requisites: None

This course introduces students theoretically and practically to key facets of leadership in organizations. It lays the foundations for students' preparation to being influential leaders who can effectively work in local and global teams. The course covers aspects of self-leadership through developing self-awareness, critical thinking, resilience, and a global mindset. It builds interpersonal leadership through addressing perspective taking, conflict management, and effective feedback, and strengthens team leadership skills. Students develop skills through theoretical lectures, case study analysis, individual and team assignments, and self-reflection.

HASS1030 Scientific Socialism (Politics and Social Change)

2 credits

Pre-requisites: None

Introduction to Political Science is intended to be a survey course and thus, it covers briefly various topics in the broad field of political science. The purpose of this course is to provide a bird's-eye view of political science and social science inquiry, as well as equip students with the tools needed to explore the subject further on their own.

This course will familiarize students with important fundamental concepts in political science through concrete and exciting examples and cases studies, as well as stimulating and thought-provoking class activities. The goal is to build a lively learning environment where students are equipped with a systematic approach to learning political science and other kinds of social sciences. After the course, students will have the analytical, presentational, research and data analysis skills that are critical to higher-level specialized classes.

The class will first consider the fundamental concepts of political science and the scientific method. Next, we will cover substantive topics simultaneously from the point of view of sub-areas such as: Comparative Politics, International Relations, Marxist – Leninist Political Economy, and Scientific Socialism. By the end of the course, students should be fundamentally prepared to explore, research, and critique issues related to politics in the real world.

HASS1010 Marxism-Leninism Philosophy (Philosophy, Science and Society)

3 credits

Pre-requisites: None

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 Philosophy 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 Epistemology, 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-requisites: None

This course is designed to help students develop a critical lens to understand social reality and social issues, including pressing questions, such as: What is Vietnam's place in the world? What are the opportunities and challenges for Vietnam in the current configuration of the global political economy? To do so, we begin with a brief introduction to the study of political economy, informed by different persuasions in Marx-Leninism, political science, economic, sociology, anthropology, and history. Students will gain a nuanced understanding of this interdisciplinary field through hands-on workshops and exercises on the principles of scientific and logical arguments. The second part of this course will focus on specific issues related to globalization and international integration. In particular, we focus on the role of development, modernization, and regional development in Vietnam's prospects in the world. Our case studies pay special attention to the immediate regions surrounding Vietnam, namely ASEAN, East Asia (in particular, China) and South Asia. In the third and final part of this course, we examine the expressions of global inequality and consider how individuals and communities within Vietnam can move forward in an ever-globalizing world.

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

2 credits

Pre-requisites: None

This course is designed to promote critical thinking, inquiry, creating skills by examining the social, cultural, economic and political development of Vietnam since the nineteenth century. From Confucian-inspired ideas of culture and society to the transformation wrought by French colonialism, the rise of the Vietnamese Communist Party, and the revolution of Ho Chi Minh ideology this course engages

students to investigate how the Vietnamese have received, adopted, and adapted the various trends of thought introduced to the country throughout modern history.

HASS1040/1041 Ho Chi Minh Ideology (Vietnam: History and Cultures II)

2 credits

Pre-requisites: None

In the past two decades, Vietnam has achieved remarkable economic development while deepening its international ties and committments. As a result, the country is enjoying a transformation rarely seen in human history. This makeover extends to fields as diverse as education, health care, technology, information, transportation, nutrition and real estate. But as Vietnam has developed, so have the complexities it faces, both at home and internationally. How do we make sense of it all?

In reality, Vietnam has long been a global crossroads. However, its history, culture and economy are rarely understood in this way. Vietnam History and Culture (II) considers Vietnam's significance as a point of international intersection since the arrival of French Colonialism to examine its history and contemporary events. Surverying modern Vietnam, the course explores such topics as French colonialism and the end of Dynastic Vietnam, Vietnamese responses to colonialism, the rise of nationalism and Communism, Hồ Chí Minh, the First and Second Indochina Wars, the post-1975 period, and Đổi Mới.

To tell this story, the course approaches events as William Shakespeare famously wrote, "All the world's a stage." In order to dive deep into events and the figures who participated in them, students will be challenged to reenact key moments and engagements on the classroom stage. Just who were Phan Thanh Giản and Phan Đình Phùng? How did Hồ Chí Minh experience September 2, 1945? And what was the air like in Geneva in 1954? Students will imagine themselves at these events and in these roles as well as a host of others.

This course is intended for students both with an aversion to history as well as advanced historians. As Vietnam's legendary economic historian Đặng Phong has argued, only with a strong understanding of history can leaders make appropriate decisions and policy. Therefore, this course aims to train future leaders of all fields, so they can better navigate and assess the complex issues facing Vietnam today as well as make informed judgements about what lies ahead.

LAW1010 Introduction to Law

2 credits

Pre-requisites: None

This course is an introduction to the concept and role of law which considers the nature of the rule of law and its relationship with morality, ethics, politics, and human rights. It provides students with general knowledge of the law that will serve as a helpful foundation for understanding how the law interacts with other disciplines that they study and pursue in the future. The course covers various aspects from legal theory including the notions of law, rules and legal systems to comparative legal analysis between different bodies of law, branches of international law as well as different means of settling disputes, either at municipal courts or other international forums worldwide. Of these, it focuses on the topic of Vietnamese civil law to help students gain familiarity with fundamental concepts and issues relating to contract formation, implementation and remedies in accordance with Vietnamese law. 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, and experiential learning in the form of legal simulation or moot court projects.

ARTS1010 Arts

1 credits

Pre-requisites: None

The Arts component of Vin University General Education Program seeks to cultivate the creative and affective senses in students. This is a part of our mission to provide a well-rounded and broad-based education. Through the "aesthetics," broadly defined, we hope to foster creativity and critical thinking stills among students either through an informed exposure to a particular art form and/or hands-on experiential learning of a particular art form. Being at the dawn of a new era of humanity where digital technology permeates every aspect of our lives, it is critical that students are able to sensitively reflect on the importance of the Arts in society and re-discover what keeps us human.

The Arts component is offered as a singular one-credit course but available in a variety of renditions in each semester. Each course will focus specifically on one particular type of art form, a specific genre or an introductory set of skills. Students are required to complete one arts course offered by the General Education Program during the Third Year or before graduation.

VCOR1011 OASIS

3 Credits

Pre-requisites: None

OASIS – an acronym of Orientation, Advising, Skills, Identity & Diversity, Service Learning - is a mandatory, 3-credit (equivalent to 45 contact hours) bearing course of the General Education Program.

OASIS is a foundational course that comprises 5 education blocks:

- **O**rientation, aimed to equip the first-year students with a proper understanding of the general nature, value, and requirement of university education and help them to become college-ready, and successfully transform from high school to university students.
- Through the **A**dvising and **S**kills blocks, the course aims to assist students to successfully navigate their university learning pathway while equipping skills which will help them to become future and career-ready.
- The **I**dentity-Diversity block provides students with diversified perspectives about themselves, their community, country, and the world.
- The **S**ervice Learning is a unique experiential learning block that integrates students' academic study with meaningful community service. Students will go outside the classrooms to be engaged in real-life situation. Students are encouraged to apply professional knowledge to serve the community and become responsible global citizens.
- (OASIS is delivered through 2 parts: faculty-led OASIS learning (3-credit compulsory) and student-led OASIS lab (optional)

VCOR1020 Healthy Lifestyle

No Credit

Pre-requisites: None

This component provides student with the knowledge to make better choices during their daily routines to build a healthy lifestyle. A healthy lifestyle doesn't just include external/internal physical wellbeing, but also good mental health. Students receive mentorship that guide and shape their perspective, showcasing the importance of having a well-balanced life. Fitness and exercise will be broken down to a process and science that allows students to have a greater understanding of what it takes to achieve their physical goals. Nutrition and diet will be taught to dispel the myths about how and what you should eat to achieve desired health results. Rounding out the course will be session about mental health, as a healthy body is nothing without a healthy mind. Having clarity of thought and the ability to effectively process information is a key trademark of a healthy lifestyle.

Topics will include workout/fitness styles and how to perform exercises properly and safely, results oriented diet design and nutrition fundamentals, stress

management, goal setting, and time management. This course emphasizes practical application of the learned concepts in order to integrate subject matter into student daily routines. 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. Students learn through the use of group discussions, case studies, written assessments, 1 on 1 mentorship sessions, and most importantly practical applications in individual and group settings.

VCOR1030 National Defense Education

No Credit

Pre-requisites: None

National Defense Education, under MOET framework, plays a crucial role in building national pride, perseverance, and physical endurance among learners to secure the country's civil defense system. By challenging themselves with early morning rituals, followed by rigid mental and physical requirements as well as schedules, students develop their self-discipline, grit & durability. Various extracurricular activities are integrated to the curriculum to foster inclusivity, maturity & responsibility towards student families and their societies.

LEAD1030 Leadership Bootcamp

No Credit

Pre-requisites: None

The intensive 4-week Boot Camp instills foundational leadership values and skills into incoming students, while bringing the class together and creating esprit de corps. Students will learn and apply basic leadership concepts and skills through hands-on learning. Students will have to work individually and in team-based settings to solve complex and dynamic problems taken from the military, government, and business sectors. This includes but is not limited to: conducting long distance land navigation, negotiating obstacle courses, analyzing leadership case studies, and more. From developing self-awareness and thinking critically to innovating ideas and displaying resilience, students will learn fundamentals of Self, Interpersonal, and Team

Leadership through theoretical lectures, case study analysis, individual and team practical exercises, and self-reflection.

ENTR1010 Entrepreneurship Innitiatives

No Credit

Pre-requisites: None

The entrepreneurship program is a framework which provides students with the mindset and skillset to be successful not just in the context of a new venture but in a broad number of settings. While rigorous critical thinking and problem solving skills are developed, the program also prioritizes a growth mindset, curiosity, and initiative which help students to "ask the right questions" and identify new issues at local, regional, and global levels. Through a combination of multi-disciplinary coursework (in the credit requirements of General Education Program and E-Ship minor/major), labs, and co-curricular activities, students are exposed to entrepreneurship, business and economic issues with emphasis on issues affecting innovative ventures. Students learn through the use of case studies, self-assessments, experiential exercises, readings, discussions, papers, and group activities.

COSL1010 Community Service Learning

No Credit

Pre-requisites: None

This course aims at fostering students' sense of civic and social responsibility as well as their moral personality by engaging them to serve the primary and secondary school students (PSSS) through creatively designing activities, whereby they could apply their knowledge to the monitoring of the PSSS's health conditions and promote the correct and effective ways of enhancing their health awareness. This course is composed of lectures, seminars, workshops and on-site activities. This is a course where the students' problem-solving minds and community-serving hearts converge.

GLEX1010 Global Experience

No Credit

Pre-requisites: None

The module of global experience is a mandatory, non-credit bearing requirement of the GenED program. It is designed in alignment with the component of global awareness from the VinUni Graduate Attributes, forming a nexus that holistically coheres with the other Attributes.

A multi-faceted approach is adopted in enhancing students' global experience through a variety of effective pedagogical channels, such as Semester

Abroad/exchange programs, community service learning abroad, cross culture experiences, summer programs and short-term overseas courses.

This module is offered through the collaboration of the General Education Program Committee, Office of Students Affairs and the Colleges.

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: Calculus II

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.

CECS1010 Introduction to Engineering and Computer Science

4 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).

ELEC2010 Introduction to Circuits for Electrical Engineers

4 credits

Co-requisites: Differential Equations and Physics II

This course establishes the fundamental properties of circuits with application to modern electronics. Topics include circuit analysis methods, operational amplifiers, basic filter circuits, and elementary transistor principles. The laboratory experiments are coupled closely with the lectures.

ELEC2020 Signals and Information

4 credits

Pre-requisites: Differential Equations**,** Introduction to Programming, ***Co-requisite:*** Linear Algebra

This course teaches introduction to signal processing. Topics include frequency-based representations: Fourier analysis and synthesis; discrete-time linear systems: input/output relationships, filtering, spectral response; analog-to-digital and digital-to-analog conversion; continuous time signals and linear time-invariant systems: frequency response and continuous-time Fourier transform.

ELEC3010 Digital Logic and Computer Organization

4 credits

Pre-requisites: Introduction to Programming

This course provides an introduction to the design and implementation of digital circuits and microprocessors. Topics include transistor network design, Boolean algebra, combinational circuits, sequential circuits, finite state machine design, processor pipelines, and memory hierarchy. Design methodology using both discrete components and hardware description languages is covered in the laboratory portion of the course.

ELEC2030 Computer Systems Programming

3 credits

Pre-requisites: Introduction to Programming

This course provides a strong foundation in the principles, practices, and art of computer systems programming using the C and C++ programming languages. Students will learn procedural programming in C and how to theoretically analyze and practically implement basic data structures and algorithms. Students will transition to C++ to explore object-oriented, generic, functional, and concurrent programming before exploring advanced data structures and algorithms involving

trees, tables, and graphs. Students will explore systems programming using the POSIX standard library. The course includes a series of programming assignments for students to put the principles they have learned into practice.

ELEC3020 Electromagnetic Fields and Waves

4 credits

Pre-requisites: Physics II, Differential equations, Introduction to Circuits for Electrical Engineers

This course covers static, quasi-static, and dynamic electromagnetic fields and waves. Topics include Maxwell's equations (integral and differential forms), fields of charge and current distributions, boundary conditions, fields near conductors, method of images, material polarization and dielectrics; energy, work, and power in electromagnetic systems; wave propagation and polarization, waves in media (dielectrics, conductors, and anisotropic materials); reflection, transmission, and refraction at media interfaces; guided waves in transmission lines, Smith charts, transients; metallic and dielectric waveguides; radiation and antennas, antenna arrays, electric circuits for transmission and reception, aperture antennas and diffraction.

ELEC4010 Introduction to Microelectronics

4 credits

Pre-requisites: Introduction to Circuits for Electrical Engineers

This course introduces the basic devices and circuits in modern microelectronics. Students learn not only basic structures and operations of semiconductor devices through simple models (diodes, CMOS, and BJT) but also how to analyze and design basic transistor modules in digital and analog circuits including biasing, amplifiers, filters, logic gates, and memory. The course introduces intuitive design methods to map circuit specifications to transistor topology, as well as first-order time-constant estimation. SPICE and measurement labs accompany the progress in lectures for hands-on experiences.

ELEC4020 Embedded Systems

4 credits

Pre-requisites: Digital Logic and Computer Organization

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.

ELEC3030 Intelligent Physical Systems

3 credits

Pre-requisites: Introduction to Engineering, Programming language

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.

ELEC3040 Digital Signal and Image Processing

4 credits

Pre-requisites: Signals and Information

This course focuses on developing a toolbox of techniques to process and analyze real-world signals, model them under uncertainty/noise, and make decisions about them. Highlights of the course will include sampling, filtering, multirate signal processing, intro to statistical signal processing including Wiener and Kalman filtering, and the foundations of computer vision. The course will aim to include a broad range of applications including audio/music, imaging, and data analytics. The coursework includes a design project to emphasize design experiences.

ELEC4030 Computer Networks and Telecommunications

4 credits

Pre-requisites: Embedded Systems

This course teaches basic networking with an emphasis on the Internet. Examples of topics include the World Wide Web, Email and Peer to Peer networks, data transmission and data encoding, circuit vs. packet switching, local area network technology, routing and switching, congestion control, network security, wireless networks, and multimedia. Though the emphasis will be on the Internet, application modules on 4G/5G cellular, WiFi (802.11), and Bluetooth will be presented.

ELEC4040 Digital Communication System Design

4 credits

Pre-requisites: Probability and Statistics, Signals and Information
The course covers communication theory, transceiver algorithms that enable reliable communication, wireless channels, and modern communication standards (such as 3GPP LTE and WiFi). The students will design a working audio-band communication system that relies on orthogonal frequency-division multiplexing (OFDM).

ELEC3050 Control Systems

4 credits

Pre-requisites: Introduction to Circuits for Electrical Engineers

This course covers the analysis and design of control systems with emphasis on modeling, state variable representation, computer solutions, modern design principles, and laboratory techniques. Topics include Modeling and dynamic response, Root locus design method, Frequency response design methods, State-space design.

ELEC4050 Control System Theory and Design

4 credits

Pre-requisites: Control Systems

This course covers System modeling and analysis, System structural properties, Feedback system design, Optimum feedback control, Introduction to the minimum principle.

ELEC4060 Robotics and Automation

4 credits

Pre-requisites: Control Systems

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.

ELEC3060 Introduction to Electric Power Systems

3 credits

Pre-requisites: Signals and Systems

This course teaches modern electric power system modeling, analysis, and computation with a focus on analysis techniques appropriate for power system modeling, analysis, and power flow computation. Topics include transmission line models, transformers and per unit system, generator models, network matrices, power flow analysis and computation, real and reactive power control, voltage control, economic dispatch.

ELEC3070 Green Electric Energy

3 credits

Pre-requisites: Introduction to Circuits for Electrical Engineers

This course provides a quantitative, practical introduction to a wide range of renewable energy systems. Topics include wind resource and turbines, Photovoltaic Cells, Solar Resource, Photovoltaic Systems, energy and financial performance of green energy projects; integration of green energy into the power grid, Demand Side Management, Economics of Energy Efficiency.

ELEC4070 Power Electronics

3 credits

Pre-requisites: Introduction to Circuits for Electrical Engineers

This course teaches major power electronics concepts, from both systems and components perspectives and design considerations for switching power conversion. Topics include switching conversion and analysis, DC-DC converters, rectifiers and switched capacitor circuits, inverters, power semiconductors in converters, feedback control for converters, control modeling, and design, AC-AC conversion, resonance in converters.

ELEC4080 Modern Distribution Systems with Renewable Resources

3 credits

Pre-requisites: Introduction to Electric Power Systems

This course teaches the operation of modern electric power distribution systems with the integration of renewable energy sources. Topics include the operation of distribution systems, power quality, solar power systems, wind power systems, system efficiency, and cost-effectiveness.

ELEC3870 Practice/Internship

Non-credit course

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).

ELEC4890 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.