VINUNIVERSITY

CURRICULUM FRAMEWORK

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

PROGRAM CODE: 7480101

Applicable for Cohort 2024-2028, Academic Year 2024-2025

(Released along with Decision No. 477/2024/ QĐ-VUNI dated September 5, 2024, 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
V1.0	05/9/2024	05/9/2024	**Developed by**: Curriculum Review Taskforce **Reviewed by**: College Academic Committee; Scientific and Educational Committee **Approved by**: Provost	First release for Cohort 2024-2028

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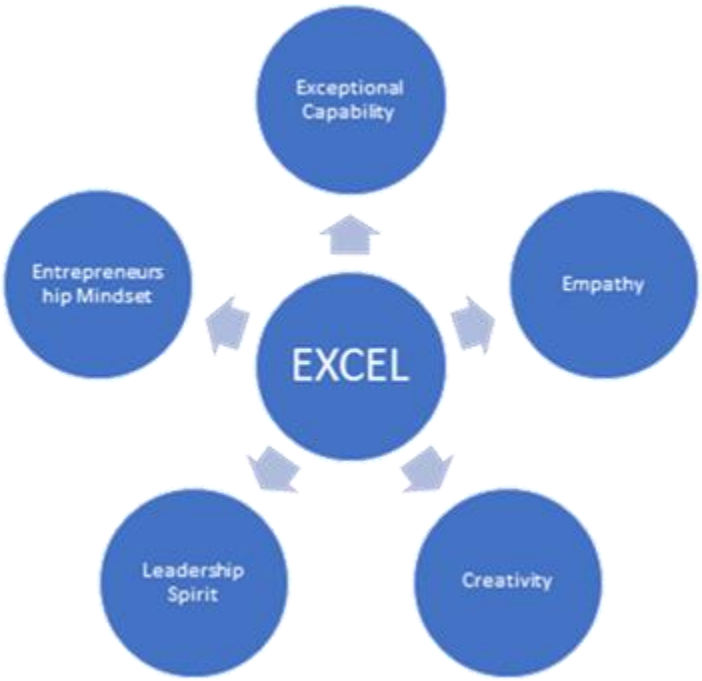
1. VINUNI GENERIC GRADUATE ATTRIBUTES

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 OVERVIEW

2.1 Program Profile

Name of the program degree	Bachelor of Science in Computer Science
Program duration	to be completed in 4 years on a full-time basis
Total credits	***Option 1 Single major:*** 120 credits
	Option 2 Major + Minor in Robotics or Product Design or Technopreneur or another minor: 135 credits

2.2 Program Purpose

The purpose of the program is to develop computer scientists with a deep understanding of underlying computer science theoretical principles, software engineering practices and significant exposure to problem-solving, project-based, authentic and hands-on learning experience which will prepare them for work and allow them to contribute to society as creative, innovative and personally well-rounded, proactively leading and advancing it.

2.3 Program Learning Goals and Program Learning Objectives

2.3.1 Program Educational Objectives

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

1 Apply basic knowledge of computer science principles and in-depth knowledge of specific computing topics (such as artificial intelligence, machine learning, or software engineering practice) to address the full range of technical and societal problems;
2 Conceive, design, and realize useful products, systems, and services, while properly respecting economic, environmental, cultural, life safety, and ethical standards or constraints;
3 Discover and apply new knowledge, and develop new tools for the practice of computer science or software development;
4 Be sensitive to professional and societal contexts, committed to ethical action, engaged in life-long learning and be prepared for future academic career, should they want one;
5 Be leaders with an entrepreneurial mindset, and effective communicators as members of multidisciplinary teams, both in the profession and in the community;
6 Engage with their communities, profession, the nation and the world.

2.3.2 Student Outcomes

Students should be able to:

1 analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions;
2 design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline;
3 apply computer science theory and software development fundamentals to produce computing-based solutions;
4 communicate effectively in a variety of professional contexts;
5 recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles;
6 function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

In addition, they should have:

7 an entrepreneurial mindset and an ability to lead themselves and others;

3. CURRICULUM STRUCTURE

3.1 Curriculum Composition

No.	Curriculum Components	Number of Credits	Credit Distribution (%/Total Credits)
I	**VINCORE**	**31**	**25.8%**
I.1	*Enterprise and Innovation*	4	3.3%
I.2	*Leadership Mindset*	2	1.7%
I.3	*Civic Responsibility*	2	1.7%
I.4	*Ethics*	2	1.7%
I.5	*Community Service Learning*	45 hours	
I.6	*Working with the Brain*	2	1.7%
I.7	*Working with Technology*		
I.8	*Working with Others*	4	3.3%
I.9	*Working with the Self*	90 hours	
I.10	*Integrated Vietnam Studies*	11	9.2%
I.11	*Sustainability and Global Citizenship*	2	1.7%
I.12	*Creative Arts*	2	1.7%
II	**NATIONAL DEFENSE EDUCATION**		
III	**PROFESSIONAL EDUCATION**	**89**	**74.2%**
III.1	*College Core Requirement*	28	23.3%
III.2	*Major (Discipline) Requirement*	32	26.7%
III.3	*Area of Concentration (Elective)*	12	10.0%
III.4	*Free Electives*	7	5.8%
III.5	*Minor**	15*	
III.6	*Science Courses*	2	1.7 %
III.7	*Course-related Projects*	2	1.7 %
III.8	*Practice/Internship*	Non-credit	
III.9	*Graduation Thesis/Capstone*	6	5.0%
	TOTAL	**120 (135)***	**100 %**

(*) Students are required to complete a minimum of 120 earned credits to graduate. They have the option to take up to 135 earned credits within the allowed timeframe without incurring additional tuition fees.

3.2 Courses and Credit Distribution by Courses

No	Course code	Name of Courses	Total	Credit Allocation	
				Theory	Practice
I	**VINCORE**		**31**		
I.1	**Enterprise and Innovation**		**4**		
1	ENTR1022	Agile Innovation and Entrepreneurship	2		
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		
I.2	**Leadership Mindset**		**2**		
	LEAD1031	Leadership and Teambuilding Bootcamp	2		
I.3	**Civic Responsibility**		**2**		
1	VCOR1030	National Defense Education	165 hrs		
2	LAW1010	Introduction to Law	2		
I.4	**Ethics**		**2**		
	TECH1010	Technology Ethics	2		
I.5	**Community Service Learning**				
	COSL1010	Community Service Learning	45 hrs		
I.6	**Working with the Brain**		**2**		
	THINK1010	Critical and Creative Thinking	2		
I.7	**Working with Technology** *(Student will take COMP1010 Introduction to Programming and MATH2010 Probability and Statistics in the College Core Requirement to fulfil this component)*				
I.8	**Working with Others** [1]		**4**		
1	ENGL1030	Academic and Professional Writing	2		
2	*Student will select 1 in 2 below courses*				
2.1	ENGL1040	Interpersonal and Multimedia Communication	2		
2.2	MANA1011	Introduction to Managing Skills	2		
I.9	**Working with the Self**				
1	VCOR1012A/B	OASIS (Orientation, Advising, Skills, Identity & Diversity and Spirit of Pay-it-Forward)	45 hrs		
2	VCOR1021/22	Healthy Lifestyle 1,2	45 hrs		
I.10	**Integrated Vietnam Studies**		***11***		

No	Course code	Name of Courses	Total	Credit Allocation	
				Theory	Practice
1	HASS1010	Marxism-Leninism Political Economy (Philosophy, Science and Society) [4]	3		
2	HASS1020	Marxism-Leninism Philosophy (Global Political Economy) [5]	2		
3	HASS1030	Scientific Socialism (Politics and Social Change) [6]	2		
4	HASS1041/ 42	Ho Chi Minh Ideology (Vietnam: History and Cultures II) [7]	2		
5	HASS1050	History of the Communist Party (Vietnam: History and Cultures I) [8]	2		
I.11	**Sustainability and Global Citizenship** *(students may select 1 course from the list below)*		**2**		
1	HASS1070	Cross-Cultural Navigation	2		
2	HASS1100	Introduction to International Relations	2		
3	CECS1060	Humans and Environmental Intelligence	2		
4	UROP1010+ 1020	UROP (Undergraduate Research Opportunity Program)	2		
I.12	**Creative Arts** [2] *(students may select 1 course from the list below)*		**2**		
1	ARTS1030	Arts Appreciation and Application	2		
2	PERF1010	Artistic Performance and Application	2		
II	**PROFESSIONAL EDUCATION**				
II.1	**College Core Requirement**		**28**		
1	MATH1010	Calculus I	*4*	*3*	*1*
2	MATH1020	Calculus II	*4*	*3*	*1*
3	MATH2050	Linear Algebra	*4*	*3*	*1*
4	MATH2010	Probability and Statistics	*4*	*3*	*1*
5	PHYS1010	Physics I	4	3	1
6	CECS1010	Introduction to Engineering and Computer Science	*4*	*2*	*2*
7	COMP1010	Introduction to Programming	*4*	*2*	*2*
II.2	**Major (Discipline) Requirement**		**32**		
1	COMP1020	Object-oriented Programming and Data Structures	*4*	*3*	*1*
2	MATH2020	Discrete Mathematics	*4*	*3*	*1*
3	COMP3020	Machine Learning	*4*	*3*	*1*
4	COMP2020	Computer Organization	*4*	*3*	*1*
5	COMP3010	Algorithm Design	*4*	*3*	*1*
6	COMP2030	Software Construction	*4*	*2*	*2*
7	COMP2040	Operating Systems	*4*	*3*	*1*

No	Course code	Name of Courses	Total	Credit Allocation	
				Theory	Practice
8	COMP2050	Artificial Intelligence	*4*	*3*	*1*
II.3	**Area of Concentration (Elective)** *(Students may select one concentration below or design own concentration)*				
	Artificial Intelligence		**12**		
1	MATH4010	Advanced Probability and Statistics	*3*	*2*	*1*
2	COMP3040	Computer Vision	*3*	*2*	*1*
3	COMP4020	Natural Language Processing	*3*	*2*	*1*
4	COMP4040	Data Mining and Big Data Analytics	*3*	*2*	*1*
	Data Analytics		**12**		
1	MATH4010	Advanced Probability and Statistics	*3*	*2*	*1*
2	COMP3030	Databases and Database Systems	*3*	*2*	*1*
3	COMP4040	Data Mining and Big Data Analytics	*3*	*2*	*1*
4	COMP4010	Data Visualization	*3*	*2*	*1*
	Cybersecurity		**12**		
1	MATH4010	Advanced Probability and Statistics	*3*	*2*	*1*
2	COMP4030	Cybersecurity	*3*	*2*	*1*
3	COMP4050	Cryptography	*3*	*2*	*1*
4	COMP3050	Networks	*3*	*2*	*1*
II.4	**Free Electives** (*if student chooses a 3-credit course for science courses, the total credit of free electives is 6*)		*7*		
1	CECS2020	Seminar on Advanced Topics in Engineering and Computer Science	1		1
2	UROP1010/ UROP1020/ UROP1030/ UROP1040	Undergraduate Research Opportunities Program 1/2/3/4	1		1
3	UROP1011/ UROP1021/ UROP1031/ UROP1041	Undergraduate Research Opportunities Program 1/2/3/4	0		
II.5	**Minor** *(students may take minor in Robotics or Product Design or Technopreneur or another minor offered by other colleges)*		**15**		
II.5	**Science Courses (required min. 2 credits of Physical Science courses)**		**2**		
1	CHEM2010	Chemistry (Physical Science)	*3*	*2*	*1*
2	BIOL1010	Biology (Physical Science)	*3*	*2*	*1*
3	PHYS2020	Physics II (Physical Science)	*3*	*2*	*1*
4	ECON1010	Microeconomics (Social Science)	*3*	*3*	

No	Course code	Name of Courses	Total	Credit Allocation	
				Theory	Practice
5	PSYC1010	Introduction to Psychology (Social Science)	*2*	*2*	
II.6	**Course-related Projects**		**2**		
1	COMP3080	Course-related Project 1	*1*		*1*
2	COMP3090	Course-related Project 2	*1*		*1*
II.7	**Practice/Internship**				
1	COMP4870	Internship	640 hrs		
2	CECS1090	Experiential Learning – Company Field Trips *(Student must participate at least 3 trips)*	*Non-credit*		
II.8	**Graduation Thesis/Capstone**		**6**		
	COMP4890	Capstone Design	6		6

Note:

For academic year 2024-2025 only, the following are also permitted as options for fulfilling some blocks in VinCore:

- *[1] Student can take ENGL1011 Fundamentals of Academic Writing to fulfil "Working with Others"*
- *[2] Student can take ARTS1010 Art Appreciation and MUSI1010 Music Appreciation to fulfil "Creative Arts"*

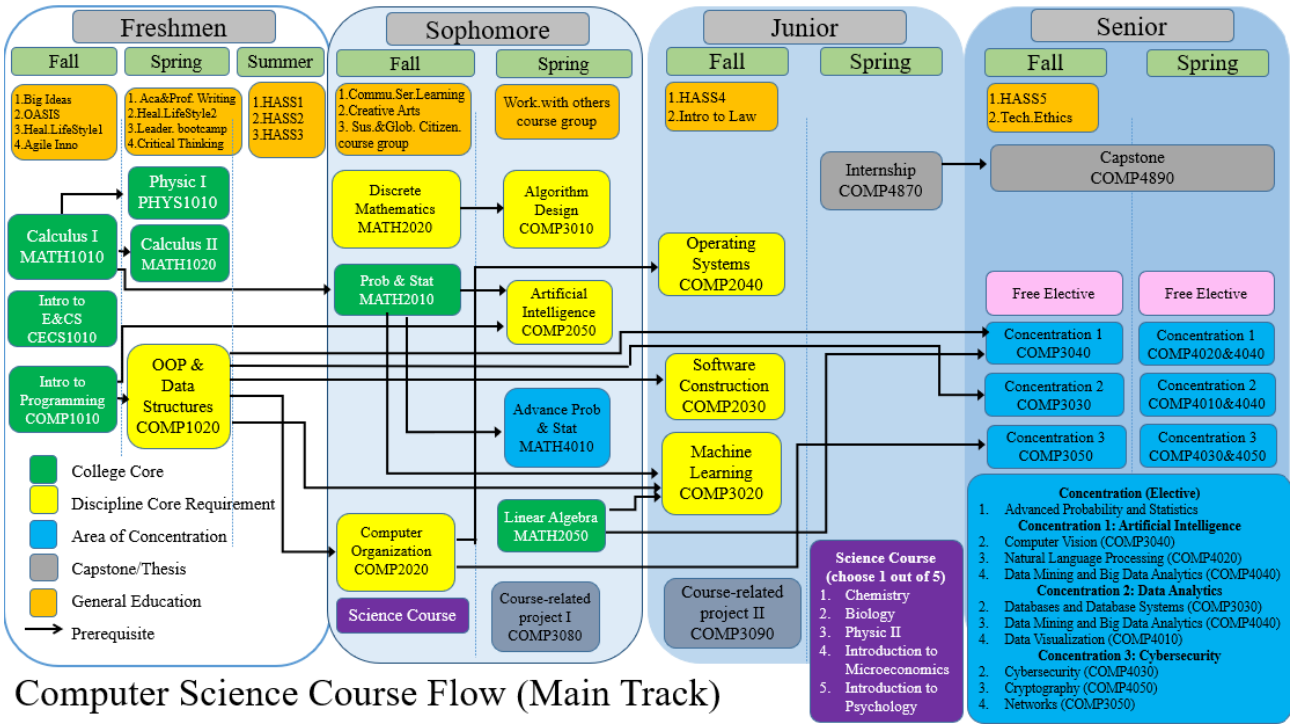
For international students:

- International students are 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).

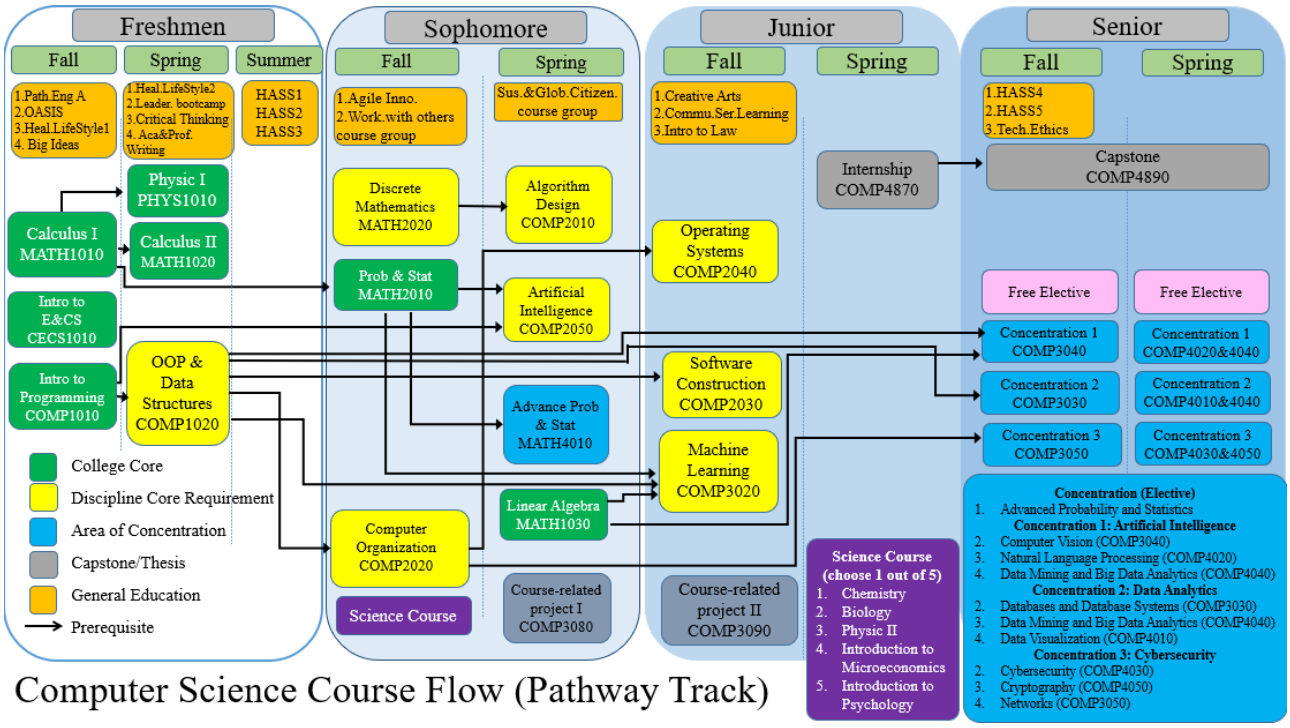
- International students are exempted from National Defense Education (in line with Circular 30/2018/TT-BGDĐT issued by the Ministry of Education and Training on December 24, 2018). Students may select other alternative courses (ie. Vietnam: History and Cultures I/II; Vietnamese Language; or other electives); to meet the required credits for graduation (at least 120 credits for a 4-year program and at least 180 credits for a 6-year program).

3.3 Curriculum Planner

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



Computer Science Course Flow (Main Track)



Computer Science Course Flow (Pathway Track)

Main track:

Undergraduate Computer Science Curriculum		VinCore	College Core	Discipline Requirement	Concentration	Free Elective	Science Courses	Course-related Projects	Practice/ Intership	Graduation Thesis/ Capstone
Year 1 Fall	Calculus I		4							
	Introduction to Engineering and CS		4							
	Introduction to Programming		4							
	Agile Innovation & Entrepreneurship	2								
	Big Ideas	2								
	OASIS	Non-Credit								
	Healthy Lifestyle 1	Non-Credit								
Total Semester Credits			**16**							
Year 1 Spring	Calculus II		4							
	Physics I		4							
	Object-Oriented Programming and Data Structures			4						
	Leadership &Team Building	2								
	Critical & Creative Thinking	2								
	Academic and Professional Writing	2								
	Healthy Lifestyle 2	Non-Credit								
Total Semester Credits			**18**							
Summer 1	HASS course 1	3								
	HASS course 2	2								
	HASS course 3	2								
Total Semester Credits			**7**							
Year 2 Fall	Probability and Statistics		4							
	Science Course						2			
	Discrete Mathematics			4						
	Computer Organization			4						
	Community Service Learning	Non-credit								
	Creative Arts	2								
	Sustainability and Global Citizenship course group	2								
Total Semester Credits			**18**							
Year 2 Spring	Algorithm Desgin			4						
	Artificial Intelligence			4						
	Advance Probability and Statistics				3					
	Linear Algebra		4							
	Course-related Project							1		
	Working with others course group	2								
Total Semester Credits			**18**							
Year 3 Fall	Operating Systems			4						
	Software Contruction			4						
	Machine Learning			4						
	Introduction to Law	2								
	HASS course 4	2								
	Course-related Project							1		
Total Semester Credits			**17**							
Year 3 Spring	**Intership (No credit)**									
Total Semester Credits			**0**							
Year 4 Fall	HASS course 5	2								
	Technology Ethics	2								
	Concentration				3					
	Free Elective					3				
	Graduation Thesis/Capstone									3
Total Semester Credits			**13**							
Year 4 Spring	Concentration				3					
	Concentration				3					
	Free Elective 2					4				
	Graduation Thesis/Capstone									3
Total Semester Credits			**13**							
	Total Program Credit Hours		**120**							
	Credit Hour Distribution	**31**	**28**	**32**	**12**	**7**	**2**	**2**	**0**	**6**
		VinCore	**College Core**	**Discipline Requirement**	**Concentration**	**Free Elective**	**Science Courses**	**Course-related Projects**	**Practice/ Intership**	**Graduation Thesis/ Capstone**

Pathway track:

Undergraduate Computer Science Curriculum		VinCore	College Core	Discipline Requirement	Concentration	Free Elective	Science Courses	Course-related Projects	Practice/ Intership	Graduation Thesis/ Capstone
Year 1 Fall	Calculus I		4							
	Introduction to Engineering and CS		4							
	Introduction to Programming		4							
	Big Ideas	2								
	Pathway English Advanced	Non-Credit								
	OASIS	Non-Credit								
	Healthy Lifestyle 1	Non-Credit								
Total Semester Credits			**14**							
Year 1 Spring	Calculus II		4							
	Physics I		4							
	Object-Oriented Programming and Data Structures			4						
	Leadership &Team Building	2								
	Critical & Creative Thinking	2								
	Academic and Professional Writing	2								
	Healthy Lifestyle 2	Non-Credit								
Total Semester Credits			**18**							
Summer 1	HASS course 1	3								
	HASS course 2	2								
	HASS course 3	2								
Total Semester Credits			**7**							
Year 2 Fall	Probability and Statistics		4							
	Science Course						2			
	Discrete Mathematics			4						
	Computer Organization			4						
	Agile Innovation & Entrepreneurship	2								
	Working with others course group	2								
Total Semester Credits			**18**							
Year 2 Spring	Algorithm Desgin			4						
	Artificial Intelligence			4						
	Advance Probability and Statistics				3					
	Linear Algebra		4							
	Course-related Project							1		
	Sustainability and Global Citizenship course group	2								
Total Semester Credits			**18**							
Year 3 Fall	Operating Systems			4						
	Software Contruction			4						
	Machine Learning			4						
	Introduction to Law	2								
	Creative Arts	2								
	Community Service Learning	Non-credit								
	Course-related Project							1		
Total Semester Credits			**17**							
Year 3 Spring	**Intership (No credit)**									
Total Semester Credits			**0**							
Year 4 Fall	HASS course 4	2								
	HASS course 5	2								
	Technology Ethics	2								
	Concentration				3					
	Free Elective 1					3				
	Graduation Thesis/Capstone									3
Total Semester Credits			**15**							
Year 4 Spring	Concentration				3					
	Concentration				3					
	Free Elective 2					4				
	Graduation Thesis/Capstone									3
Total Semester Credits			**13**							
	Total Program Credit Hours		**120**							
	Credit Hour Distribution	**31**	**28**	**32**	**12**	**7**	**2**	**2**	**0**	**6**
		VinCore	**College Core**	**Discipline Requirement**	**Concentration**	**Free Elective**	**Science Courses**	**Course-related Projects**	**Practice/ Intership**	**Graduation Thesis/ Capstone**

3.4 Course Descriptions

ENTR1022 Agile Innovation and Entrepreneurship

Credit: 2

Pre-requisite: None

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

1. Explain how an entrepreneurial mindset supports and accelerates innovation and growth in the contexts of businesses, industries, and countries.

2. Evaluate the multifaceted nature of entrepreneurship in Vietnam and internationally, and how it impacts the economy, society, and environment. Have access to insights on VinGroup's governance principles (the 6 Hóa).

3. Recommend strategies to evaluate the entrepreneurial mindset, values, and behaviors, and to further develop the entrepreneurial mindset, both individually and organizationally.

4. Grow your own entrepreneurial mindset and innovation-related skills, including identifying and evaluating opportunities, taking calculated risks, solving problems creatively, communicating effectively, and influencing stakeholder groups.

5. Demonstrate the ability to work productively in teams to collaboratively explore opportunities, generate ideas, and find and communicate solutions to a predefined challenge during the course hackathon.

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

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

1. Define and understand the essential components of service learning, including benefits, impact, and key attributes.

2. Critically reflect on social issues and UNESCO's sustainable development goals (SDGs) withreference to a planned service project

3. Plan and implement a service project in accordance with local laws and regulations

4. Reflect on the outcomes of that service project and how it could have been improved

5. Develop sensitivity and empathy to local community members

CECS1031 Computational Thinking

2 credits

Pre-requisite: N/A

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

1. Identify and analyze problems from life and business in order to determine computational solutions.

2. Break down problems into logical steps and data requirements.

3. Use basic data structures and algorithms for problem-solving.

4. Design simple algorithms and computational models.

5. Implement solutions using basic programming skills.

6. Evaluate and optimize computational solutions.

ENGL1030 Academic and Professional Writing

2 credits

Pre-requisite: N/A

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.

CECS1050 Introduction to Data Literacy

2 credits

Pre-requisite: N/A

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

1. Read, understand, create, and communicate data as information.

2. Analyze and visualize data using tools like Excel and Python.

3. Understand the importance of data in business strategy and apply data-driven insights for decision-making.

4. Develop skills to improve data collection designs and ensure data quality.

5. Utilize statistical methods and probability to interpret, present and effectively tell stories about data.

CECS1040 Introduction to AI Literacy

2 credits

Pre-requisite: N/A

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

1. Understand basic AI principles, including machine learning and neural networks.

2. Use AI tools like ChatGPT for work and study tasks.

3. Recognize ethical implications, such as data privacy and algorithmic bias.

4. Apply AI to improve efficiency and innovation in academic and professional settings.

5. Design and evaluate 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.

ENGL1011- Fundamentals of Academic Writing

3 credits

Pre-requisite: None

The course begins by focusing on academic writing at the essay level, helping students understand the aspects which make academic writing different from other styles of writing. Students will develop confidence in critically evaluating information and responding with sound argumentation and logical development of ideas. In this early stage of the course, students will strengthen core academic literacies including critical reading, summarizing, paraphrasing, and peer feedback. As the course progresses, the focus shifts towards incorporating secondary research into writing, developing students' abilities to evaluate credible sources and synthesize information with their original ideas to have a voice in the broader academic community and develop authority in communicating ideas to a wider audience. Students will develop essential academic literacies such as searching skills, strategies for reading journal articles, synthesizing information, citing and referencing, reference management, and other secondary research techniques. Finally, students will summarize key information they have found in the form of an academic poster, which is a common medium for visually communicating information in academic contexts.

Fundamentals of Academic Writing places active learning at the core, and every lesson includes practical activities to help students apply these skills. This course follows a process writing approach, which includes drafting, peer and teacher feedback, reflection, and revision before producing the final piece of writing. Working together in interdisciplinary groups, students will present, critique, and revise their work with their peers to build autonomy, write for an audience, and gain confidence as writers.

LEAD1031 Leadership and Teambuilding Bootcamp

2 credits

Pre-requisites: None

This course is designed as a required course for freshmen to help the students' leadership development by introducing the basic concepts of leadership and organizational behavior. This course has one big goal for you: to practice and apply concepts and techniques learned in the class and your life to various scenarios. This course is also intended to provide an overview of leadership trends rather than to emphasize every detail and in-depth review of academic studies. Understanding a landscape of leadership will be possible under the structure of four modules: (1) Leader as a decision-maker, (2) Leader as a problem solver, (3) Leader as a designer, and (4) Leader as a game-changer. A leader in this turbulent world is expected to be a final decision-maker to find a creative solution for difficult challenges and will need to organize a group of people with a formal and

informal system. Leadership Development offers a safe place for your learning of leadership. Practice, try, fail, and try again! This is the philosophy of this course.

The Boot Camp instills foundational leadership values and skills into students, while bringing the class together, building lasting cohesion, and creating esprit de corps. Students will learn and apply basic leadership concepts and skills through hands-on and experiential learning. Organized into individual and team-based events, the students will have to work individually and together 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 physical obstacle courses, analyzing leadership case studies, and much more. From developing self-awareness and thinking critically to innovating ideas and displaying resilience, students will learn critical elements of Self, Interpersonal, and Team Leadership. Following this course, students will gain a foundational understanding of key elements of leadership and better understand their strengths and how to effectively work in teams and organizations.

THINK1010 Critical and Creative Thinking

2 credits

Pre-requisites: None

Developing your own ideas in a logical and critical manner is an essential part of being a student in higher education. In this course you will learn about the nature of argumentation, how to evaluate arguments, uncover hidden premises, and sharpen your own thinking skills. We will start by looking at the difference between arguments and non-arguments and why being able to present an argument is such an important skill. Then we will look at different kinds of arguments, such as deduction, induction, and arguments from inference to the best explanation. Not all arguments are made equal. Some arguments are irrefutable - others barely convincing - and others still completely misleading. We will look at how you can assess the quality of an argument and avoid common logical pitfalls. Finally, we will finish by looking at some philosophical puzzles and paradoxes involving logic and reasoning including Hume's notorious problem of induction and the Sorites paradox.

HASS1070 Cross-Cultural Navigation

2 credits

Pre-requisites: None

This course aims to equip students an understanding of one aspect of the so-called “global experience” and/or inter-cultural sensitivity, so that students can become knowledgeable about the ways in which individual identities, values, and perceptions and biases are shaped by cultures across the continentals through acquiring knowledge of theories practice related to the impact of culture in our

daily ecologies in local and global contexts. In the end, students are able to identify and understand the inter-sectional of one's own and others' cultural identities in order to reflect on how various cultural concepts apply to your own life, communication and various areas of study.

VCOR1021/22 Healthy Lifestyle 1, 2

Non-credit, required min 45 hours across Year 1

Pre-requisites: 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-requisites: None

Philosophy Science and Society 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. 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.

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.

HASS1020 Marxism-Leninism Political Economy (Global Political Economy)

2 credits

Pre-requisites: None

Global Political Economy: Vietnam-Region-The World 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. 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. 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.

HASS1030 Scientific Socialism (Politics and Social Change)

2 credits

Pre-requisites: None

Assuming a basic, strong, and even pivotal relationship between society and politics, the course Politics and Social Change will guide participants to a deep understanding of that relationship in Vietnam and the wider Asian region in the 20th and 21st centuries. The course explores key concepts of politics and social change, and in explication of those concepts, examine the dynamics of politics and social change in concrete terms.

What can be learned?

Students at the end of course will become familiar with the concepts of politics and social change of Vietnam. Students will also understand and compare Vietnam with national development efforts elsewhere in Asia. Finally, they will become familiar with major political and international relations developments from the 20th century.

The medium of instruction helps students to both develop English language competency (focusing on speaking, and articulation, reading) and discourse skills through continuous practice with classmates and instructor.

Broad outlines

The course begins with a basic appreciation of the concepts of politics and social change, moving into Marxism-Leninism and its application to understanding politics & social change, and extending into how Ho Chi Minh Thought applies Marxism-Leninism and also stands apart as a set of national and contextual ideas and practices. The processes of politics and social change of other countries in the Asia-Pacific are then explored for comparison and contrast.

Medium of learning

The guiding principle for learning at the Vin Uni is active learning. This approach engages students to be active in the learning process with methods that are more than, not without, the traditional base of lectures and tutorials. The instructor or teacher plays the role of facilitator and provides the environment where students responsibly and actively acquire as much as possible, rather than are passively given, the learning points that the course desires.

Participants in this course will learn and share through a mix of lectures, tutorials, non-judgmental journal writing, presentations, and learning to collaborate with others through group projects. The learning environment should be safe, frank, friendly, collaborative, and enlightening.

The weekly lists of readings are divided into two types. Basic readings are recommended, and students should at least complete one for each week. Students who wish to do more can pick up the other basic and optional/additional readings.

HASS1041/1042 Ho Chi Minh Ideology (Vietnam: History and Culture II)

2 credits

Pre-requisites: None

Vietnam History and Culture since 1858 is continuation of the first period (from ancient time to 1858) and covers the period from 1858 until today.

The main objective of the course is to analyze the development of Vietnam and its people from 1858 when France attacked and colonized VN through two Indochina wars (1946-1965) and (1954-1975) until today as Vietnam reunified and reformed and integrated into international system.

Due to its strategic geopolitical position, Vietnam has long been a global crossroads. So, this course tries to show as much as possible the parallels, interactions between Vietnam history and events and that happened in the world's stage.

The course also aims to reflect Vietnam history and culture through the central figure of Ho Chi Minh (1890-1969), the most famous Vietnamese during this period. His life and career reflected the development of the very period of Vietnam history.

Students are encouraged to do research himself to have broader view, discover new historical details.

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

2 credits

Pre-requisites: None

The great American humorist and writer Mark Twain once said, "History doesn't repeat itself, but it often rhymes." This course takes as its point of departure the possibility of using those rhymes of the past to better help us navigate our present and future. What lessons can we draw? As future businesspeople, health care professionals, engineers, and computer scientists, these lessons have far more relevance than you may imagine.

Vietnam History and Culture (I) examines Vietnamese history and cultural production from its early origins to 1858 and the French Colonial project. The curriculum is divided into five units. We begin the curriculum by considering the study of both history and culture from theoretical perspectives and consider what these mean in the Vietnamese context. Just what are "History" and "culture"? What does it mean to be Vietnamese? In the second unit, we consider the ancient construction of Vietnamese history and cultural production. The third portion of

the course examines the Lý and Trần dynasties as well as the Ming Occupation. Fourth, we explore the movement of Vietnamese people southward and the Tây Sơn Rebellion. And finally, fifth, we assess the unification of Vietnam under the Nguyễn and what is to come.

Too often Vietnamese are portrayed in history as vessels upon which events happen to them. This course treats the Vietnamese as agents of their history, grappling with big questions and great problems. We also explore the Vietnamese people's historical willingness to learn from and integrate foreign ideas and instruments to further develop the Vietnamese culture. To this end, we will wrestle with questions such as: What are the forces that have shaped Vietnamese identity? What drives the worldview(s) of Vietnamese? How has it been transformed over time?

ARTS1010 Arts Appreciation

1 credit

Pre-requisites: None

Art Appreciation is a one-credit elective course that provides a general introduction to the visual arts, media, techniques, and history. This course takes on interdisciplinary approaches to equip students with a broad knowledge of the historical, practical, philosophical, cultural, and social contexts of the arts in order to help students gain the ability to articulate their understanding and interpretation of the arts. This course introduces students to aspects of arts research and curation, as well as elements, media, and methods used in creative processes. The application of the arts, especially visual arts in daily life and in the field of business, technology, and medicine is explored in this course. This course also aims to develop students' appreciation for Vietnam arts and visual art forms by providing them with opportunities to explore the diversity and richness of what Vietnam has to offer in terms of the arts.

This course offers students opportunities to learn about how art is created and how it evolves over time; it would cultivate and enrich students' artistic senses, experience, and enjoyment of different forms of arts even if the student is not an artist or does not have an ability to draw/paint. In addition, this course fosters and supports students' development of oral and written presentation and communication, critical and analytical thinking, and multicultural perspectives.

This course does not require students to have any prerequisite experience in art theory or practice. Rather, it is a beginning-level course to help students familiarize themselves with the different types of arts, as well as learn how to observe, appreciate, speak, write intellectually about art. Furthermore, the course helps students to think about how art can be integrated and applied in their daily lives and their own fields of interest.

MUSI1010 Music Appreciation

1 credit

Pre-requisites: None

This course offers students opportunities to learn about how music is created and how it evolves over time; it would enrich students' musical sense, experience, and enjoyment of all types of music even if the student is not a musician. In addition, this course fosters and supports students' development of oral and written presentation and communication, critical and analytical thinking, and multicultural perspectives.

Specifically, students taking this course will have the opportunity to explore the history of music, from the primitive musical forms through contemporary pieces around the world. Forms and genres of music include classical, jazz, theatrical music, gospel, folk, soul, blues, Latin rhythms, country, rock & roll, and hip hop. Various arrays of Vietnamese music (traditional, contemporary, theatrical, V-pop) are also discussed in this course. The course explores the relationship between music and people's everyday life and social movements, and its cultural significance. Digital music and the evolution of the Internet and AI impacting music industry, music distribution, and global music access are also an important part of this course.

This course does not require students to have any prerequisite experience in musical theory or performance; i.e. students are not required to be able to sight-read sheet music, or play any musical instrument. Rather, it helps students become an active and intellectual music listener, as well as it helps students to think further on how music can be integrated and applied in the daily lives and their own fields of interest. This course is delivered in class and outside class environment if appropriate.

VCOR1010A/B OASIS - Orientation, Advising, Skills, Identity & Diversity, and Spirit of Pay it Forward

Non-credit

Pre-requisites: None

OASIS, which stands for Orientation, Advising, Skills, Identity & Diversity, and Spirit of Pay it Forward, is an integral, non-credit-bearing mandatory component of the Co-curriculum Program and plays an important role as one of the graduation criteria.

OASIS is a distinctive signature program of VinUni that holds a registered trademark. Its primary objective is to cultivate a self-leadership mindset and equips students with essential skills, facilitating their transformation from high school students into effective university scholars, responsible global citizens, and be ready for future career. OASIS is implemented in the first 4 years of bachelor's degree to ensure there is enough time for students to reflect and practice their own

self-leadership development, especially in developing essential qualities for work and life, including self-confidence, self-esteem, self-determination, and self-control.

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, workin-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.

MATH1010 Calculus I

4 credits

Pre-requisites: None

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 as well as to ordinary and partial differential equations. Topics include partial derivatives, double and triple integrals, line and surface integrals, vector fields, Green's theorem, Stokes' theorem, and the divergence theorem.

MATH2050 Linear Algebra

4 credits

Pre-requisites: None

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 using software to solve linear algebra problems.

MATH2010 Probability and Statistics

4 credits

Pre-requisites: Calculus I

This course teaches random variables, probability distributions, expectation, estimation, testing, experimental design, quality control, and regression. Other topics include density functions, expectation and variance, multidimensional random variables, and important distributions including normal, Poisson, exponential, hypothesis testing, confidence intervals, and point estimation using maximum likelihood, the method of moments, conditional probability and Bayesian reasoning.

MATH4010 Advanced Probability and Statistics

3 credits

Pre-requisites: Probability and Statistics

This course teaches advanced topics in probability and statistics. Topics include random processes, convergence of random processes, Markov Chains, Bayesian statistics, nonlinear regression.

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.

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, behavior of matter in electric fields, DC circuits, magnetic fields, Faraday's law, AC circuits, and electromagnetic waves.

CHEM2010 Chemistry

3 credits

Pre-requisites: None

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 given to aspects and applications of chemistry most pertinent to engineering.

BIOL1010 Biology

3 credits

Pre-requisites: None

This course covers current topics in biology including the basics of molecular and cell biology, immunology, neurobiology, human genetics, biochemistry, biotechnology, personal genetics and genomics, metabolism, neuroscience, tissue repair and engineering, stem cells and evolution. Includes the topics of population growth, community structure, competition, mutualism and predation. Discusses social and ethical issues in modern biology.

ECON1010 Introduction to Microeconomics

3 credits

Pre-requisites: None

This course covers the fundamentals of microeconomics. Topics include consumer theory, producer theory, the behavior of firms, market equilibrium, monopoly, the

role of the government in the economy, game theory, tragedy of commons and market failures.

PSYC1010 Introduction to Psychology

2 credits

Pre-requisites: None

This course covers provides a comprehensive overview of the scientific study of thought and behavior. It explores topics such as perception, communication, learning, memory, decision-making and the and the basics of neuroscience.

COMP1010 Introduction to Programming

4 credits

Pre-requisites: None

This course covers 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, the basics of object-oriented programming (classes, objects, types, sub-typing), and GUIs (graphical user interfaces).

COMP1020 Object-oriented Programming and Data Structures

4 credits

Pre-requisites: Introduction to Programming

This course covers program structure and organization, modular programming, advanced topics in object-oriented programming (abstract data types, polymorphism, interfaces, iterators), collections, basics of graphical user interfaces, recursion, data structures (lists, trees, stacks, queues, heaps, search trees, balanced trees, hash tables, graphs), and basic graph algorithms. Java is the principal programming language.

MATH2020 Discrete Mathematics

4 credits

Pre-requisites: None

This course covers notions, techniques and algorithms of discrete mathematics with the special emphasis on sets and proof techniques, functions and relations, number theory, combinatorics, probability, logic, the basics of graph theory and the basics of cryptography.

COMP2020 Computer Organization

4 credits

Pre-requisites: Object-oriented Programming, Algorithms and Data Structures

This course provides an introduction to computer organization, systems programming and the hardware/software interface. Topics include instruction sets, computer arithmetic, datapath design, data formats, addressing modes, memory hierarchies including caches and virtual memory, I/O devices, bus-based I/O systems, and multicore architectures. Students learn assembly language programming and design a pipelined RISC processor.

COMP3010 Algorithm Design

4 credits

Pre-requisites: Theory of Computation

This course covers four major algorithm design techniques (greedy algorithms, divide and conquer, dynamic programming, and network flow), and algorithmic techniques for intractable problems, including identification of structured special cases, approximation algorithms, and local search heuristics. Applications are drawn from systems and networks, artificial intelligence, computer vision, data mining, and computational biology.

COMP2020 Software Construction

4 credits

Pre-requisites: Object-oriented Programming, Algorithms and Data Structures

This course covers the topics of abstract data types, abstractions functions, interfaces, revisits recursion and regular expressions and grammars. It deals with parser generators, concurrency, thread safety, programming for sockets and networking, queues and message passing, multithreading, locks and synchronization, map and filter, streams and laziness. The course introduces the area of information and data management and how software can be designed to improve data management. It covers testing, code review, version control, designing specifications, debugging and developing complex graphical user interfaces.

COMP2040 Operating Systems

4 credits

Pre-requisites: Computer Organization

This course covers systems programming and introductory operating system design and implementation. The basics of operating systems, namely structure, concurrency, scheduling, synchronization, memory management, filesystems,

security and networking are covered. The course introduces parallel and distributed computing.

COMP2050 Artificial Intelligence

4 credits

Pre-requisites: Introduction to Programming; Probability and Statistics

This course covers the main areas of artificial intelligence, including symbolic and connectivist approaches to artificial intelligence, state search algorithms and biologically inspired optimization algorithms, Bayesian networks, the use of logic programming and inference algorithms for logical problems. As part of the course, students will learn about various approaches to representing uncertainty, get an introduction to the decision theory, planning and decision making under uncertainty, and learn how to apply various artificial intelligence methods to different problems. The course will consider ethical and societal issues related to artificial intelligence.

COMP3020 Machine Learning

4 credits

Pre-requisites: Linear Algebra, Probability and Statistics, Object-oriented Programming, Algorithms and Data Structures

This course covers the principles and algorithms for turning training data into effective automated predictions. It covers the topics such as representation, over-fitting, regularization, and generalization, clustering, classification, recommender problems, probabilistic modeling, reinforcement learning; and methods such as support vector machines and neural networks/deep learning.

COMP3030 Databases and Database Systems

4 credits

Pre-requisites: Object-oriented Programming, Algorithms and Data Structures

This course gives an introduction to relational and noSQL database systems. The topics covered include the relational model, relational algebra, entity-relationship model, schema design, normal forms, SQL, indexing, sorting, relational operators, query optimization, transactions, concurrency control, recovery, database design, and concepts and algorithms for building database management systems.

COMP3040 Computer Vision

3 credits

Pre-requisites: Machine Learning, Linear Algebra, Object-oriented Programming, Algorithms and Data Structures

This course teaches introduction to computer vision. The goal of computer vision is to compute properties of our world-the 3D shape of an environment, the motion of objects, the names of people or things-through analysis of digital images or videos. The course covers a range of topics, including 3D reconstruction, image segmentaion, object recognition, and vision algorithms fro the Internet, as well as key algorithmic, optimization, and machine learning techniques, such as graph cuts, non-linear least squares, and deep learning. This course emphasizes hands-on experience with computer vision, and several large programming projects.

COMP3050 Networks

3 credits

Pre-requisites: Computer Organization

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.

COMP4010 Data Visualization

3 credits

Pre-requisites: Introduction to programming, statistics and probability, data mining and big data analytics

This course teaches techniques and algorithms for creating effective visualizations of large datasets and their analytics, based on principles from graphic design, visual art, perceptual psychology and cognitive science. In addition to participating in class discussions, students will have to complete several short data analysis and visualization design assignments as well as a final project. Data visualisation tools such as Tableau are considered as lab exercises.

COMP4020 Natural Language Processing

3 credits

Pre-requisites: Machine Learning, Object-oriented Programming, Algorithms and Data Structures

This course covers the introduction to natural language processing (NLP), the goal of which is to enable computers to use human languages as input, output, or both. It examines NLP in context of including machine translation, automatic conversational assistants and Internet search. Possible topics include

summarization, machine translation, sentiment analysis and information extraction as well as methods for handling the underlying phenomena (e.g., syntactic analysis, word sense disambiguation, discourse analysis, their shortcomings and solutions).

COMP4030 Cybersecurity

3 credits

Pre-requisites: Object-oriented Programming, Algorithms and Data Structures, Discrete Mathematics

This course covers the topics of technical and social understanding of how and why security and privacy matter, how to think adversarially, how (and how not) to design systems and products. Topics include user authentication, cryptography, malware, behavioral economics in security, human factors in security, privacy and anonymity, side channels, decoys and deception, and adversarial modeling. Real-world systems and attacks, including Bitcoin, Stuxnet, retailer breaches, implantable medical devices, and health apps are covered. The course discusses societal and ethical issues in cybersecurity.

COMP4040 Data Mining and Big Data Analytics

3 credits

Pre-requisites: Linear Algebra, Object-oriented Programming, Algorithms and Data Structures, Machine Learning

This course covers the statistical aspects of data mining, the effective analysis of large datasets. It covers the process of building and interpreting various statistical models appropriate to such problems arising in scientific and business applications. Topics include preparing data for data mining and interpreting and representing knowledge from big data analysis. Assignments are done using one or more data mining.

COMP4050 Cryptography

3 credits

Pre-requisites: Theory of Computation, Linear algebra

This is an introductory course in Cryptography. Topics include one-way functions, encryption, digital signatures, pseudo-random number generation, zero-knowledge and basic protocols. The emphasis will be on fundamental notions and constructions with proofs of security based on precise definitions and assumptions.

COMP3080, COMP3090 Course-related project I and II

Min 1 credit

Pre-requisites: Determined by the course lecturers

Courses for the project: Computer Organization, Algorithm Design, Operating Systems, Artificial Intelligence, Machine Learning, Human-Computer Interaction, Robotics, Cybersecurity and Data Mining and Big Data.

Students work in multidisciplinary teams on a course-related problem guided by the course instructor.

COMP4870 Practice/Internship

Non-credit course

Pre-requisites: Students must have completed sophomore year.

Course Description:

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).

COMP4890 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 computing design and implementation. 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 industry/academia and VinUni in accordance with ABET requirements. More specifically, the project involves the development of computing or information systems. The project should focus on advanced technologies, new applications, and their usefulness and benefit to the development of the economy and society. In this course, students work in teams of 3 to 5, where some students may be in other programs. They will work 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 formal group meeting and for required classes. They should be able to deliver their work and contribution to the project and engage in professional dialogue about their project during formal presentations.