Fullbright

MAJOR DESCRIPTION & FLOWCHART

AS OF DECEMBER, 2022

Fulbright

COMPUTER SCIENCE

Description

The Computer Science major prepares students with an adaptable skill set to respond to the astonishing speed of technological change and develop solutions for the problems of today and tomorrow. Using a student-centered, interdisciplinary, and future-focused approach, the Computer Science major aims to educate the next generation of local leaders who will make a meaningful and lasting societal impact both in Vietnam – one of the most quickly emerging and innovative technology economies in the world – and beyond. As part of the major, students will be equipped with the foundational knowledge in Computer Science and relevant disciplines. They will be exposed to essential areas of the CS discipline including theory, systems, and applications. They will learn about the underlying mathematical ideas that are critical for computation, establish proficiency in the process of designing systems and applications, gain experience in collecting and analyzing data using modern technologies, and begin to develop an understanding for the role of users in the design of systems and applications. Courses in Computer Science go beyond content to help students learn through direct experiences in projects and problems. In the future, they will also have the opportunity to further focus their studies by selecting a concentration, such as data science, artificial intelligence and machine learning, business analytics, digital media, and software engineering. The Computer Science major at Fulbright is designed to prepare students for work in industry or continue their lifelong learning as well as potential graduate-level studies.

Learning Outcomes

Students in the Computer Science major will:

1. Think computationally: critically analyze, decompose, evaluate, and solve problems.
2. Demonstrate an understanding of, and gain experience in, foundational areas in computer science, including in theory, systems, and applications.
3. Explain emerging aspects of their discipline (e.g., artificial intelligence, machine learning, data science, business analytics, digital media, etc.).
4. Practice collaboration, communication, and lifelong learning skills essential to an evolving computer science industry.

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5. Apply knowledge of different disciplines to mathematics and computer science through Fulbright's unique liberal arts approach.
6. Produce a portfolio of tangible projects (e.g., apps, community-service work, capstone projects, etc.).
7. Prepare for cutting edge and developing careers in computer science and for competitive graduate and professional study at top-tier international programs.

Degree Requirements

A Bachelor of Science in Computer Science is awarded following the successful completion of:

- 5 core courses of liberal arts and science (20 credits), and 8 exploratory courses (32 credits), of which up to two courses can be counted toward the major courses.
- Fulbright Seminar (4 credits, optional) and Experiential Learning (4 – 12 credits).
- 4-5 CS foundation courses (16-20 credits)
- 4 CS major courses (16 credits)
- 4 CS concentration courses (16 credits)
- 1 year-long capstone project (8 credits, optional) or 2 CS intermediate/concentration courses (8 credits)

Sample Student Journey

Year 1	Year 2	Year 3	Year 4
Core Courses Exploratory Courses	Exploratory courses Intro Programming (CS1) Data Structure (CS2) Discrete Math	Computer Architecture Algorithm Design & Analysis Database Systems Object-oriented Design Artificial Intelligence Software Engineering Fulbright Seminar Experiential Learning	Concentration Courses Elective Courses Capstone I Capstone II OR 2 Major/Concentration Courses

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Major Outline

All students are first required to take the core courses in Liberal Arts and Science. In addition to the two courses in "Global Humanities and Social Change", and "Modern Vietnamese Culture and Society", they will be exposed to computational thinking as part of Fulbright's undergraduate core courses in "Quantitative Reasoning for a Digital Age.", "Scientific Inquiry", and "Design and Systems Thinking". Exploratory courses encourage students to step out of their comfort zone by exploring broad areas of study and discover more fully where their interests and passions lay. Students need to complete 8 credits (2 courses) chosen from each course category.

They will be then equipped with the knowledge in the foundational courses in Computer Science including the courses that will lay out the Mathematics Foundation, Software Foundation, and Hardware Foundation, and one course in Professional Responsibilities and Ethics in CS. These courses provide students with an opportunity to build a solid knowledge base in computation, while also permitting non-majors to pursue courses of interest. After having the knowledge in the CS foundation courses, the students will continue their journey with the major courses, which are designed to cover the most important and basic knowledge in the major aspects in Computer Science including a series of six courses that prepare for them to pursue their studies in the concentration areas of Computer Science. Following the completion of their foundation and major courses, students will have flexibility in their choice of elective/concentration courses to continue on with their areas of interest. Potential concentrations will include artificial intelligence and machine learning, data science, software engineering, digital media, CS for business, security, etc.

<u>CS Foundation Courses</u>

- *Mathematics Foundation Courses*

  <u>Discrete Mathematics</u>

  The answers to many questions relevant to the core of computing arise from the study of discrete mathematical objects. In contrast to calculus, which is a valuable tool for modeling continuous phenomena like the growth rate of populations or the motion of objects, discrete mathematics is concerned with entities like integers, sets, and graphs, which take on distinct and separate values. These structures are better suited for answering the kinds of questions that computer scientists care about. This course is an introduction to topics from different branches of mathematics, such as set theory,

number theory, combinatorics, and probability, with applications to computer science. Students will be introduced to formal mathematical reasoning and will practice writing rigorous proofs.

- *Software Foundation Courses*

  Computer Science I: Introduction to Programming

  This course is an introduction to the discipline of computer science and aims to equip students with the skills necessary to solve computational problems using a high-level programming language. Students will develop their algorithm design abilities and implement their ideas using fundamental programming constructs such as loops, branching statements and functions, and abstract data types like lists and maps. The course will also expose students to a variety of computer science applications.

  Computer Science II: Data Structures

  How do we develop software that solves problems efficiently and reliably? How do we write programs that work correctly and can be refactored and improved over time? This course continues and expands on content from Computer Science I, with a greater focus on theoretical concepts, abstraction, and larger programs. Topics include object-oriented programming, unit testing and refactoring, basic algorithm analysis, searching and sorting, linear data structures (lists, maps, stacks, and queues), trees, and graphs.

- *Hardware/System Foundation Courses*

  Computer Architecture

  Computer systems often involve many layers of abstraction, from gates and circuits through machine and assembly code to software libraries and applications. This course introduces students to the design and implementation of computer systems from the digital level upwards. It also explores design decisions and tradeoffs. Applied projects might include the design and simulation of a CPU, and the tools used to program low-level systems.

- *Professional Responsibility in CS*

  The course aims to help students to consider and grapple with ethical dimensions of their work. The students will be able to learn how to identify ethical issues in different enterprise computing settings, review real-life ethical cases and develop ethical resolutions and policies, and be able to understand laws

and regulations related to ethics, and the consequences of ignoring and non-compliance with ethical imperatives, etc.

CS Major Courses

• Database Systems
• Object-Oriented System Design
• Artificial Intelligence
• Software Engineering
• Programming Language Paradigms
• Operating Systems and Network

CS Concentration Courses

The students will be able to choose the courses in the following concentrations:

- Data Science and AI
- CS for Business
- Digital Media
- Software Engineering
- Security Engineering

More courses will be provided as needed.

Requirements for Declaring the Computer Science Major and Minor.

Major

In order to formally declare Computer Science as your major, you must complete Introduction to Programming (CS1), Data Structures (CS2), and one other Foundational course.

Minor

In order to formally declare the Computer Science minor, you must complete at least one course in the Computer Science program.

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Graduation with Honors Requirements

- Student must complete Capstone I and Capstone II
- The Capstone must be graded Honors

Minor Requirements

A Minor in Computer Science is awarded following the successful completion of:

- Intro to Programming (CSI)
- Data Structure (CSII)
- Discrete Mathematics
- Computer Architecture
- Algorithm Design and Analysis
- 1 major course
- 1 concentration course

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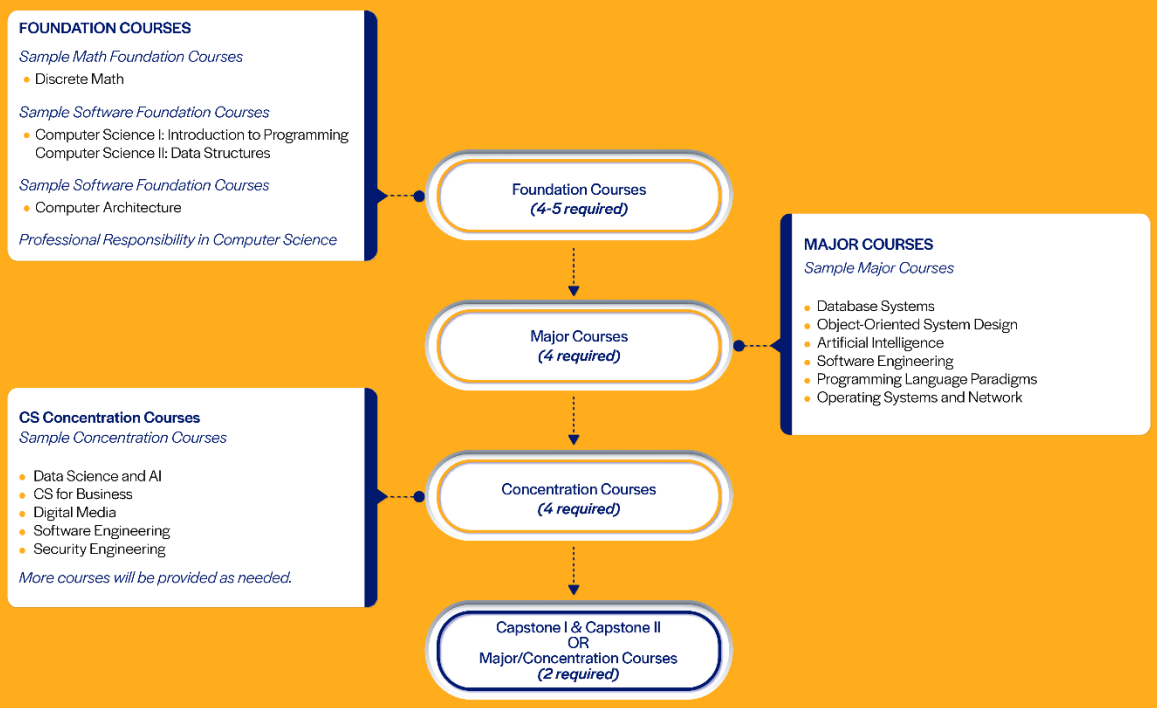
COMPUTER SCIENCE FLOWCHART



COMPUTER SCIENCE MINOR
(7 courses)

- Intro to Programming (CSI)
- Data Structure (CSII)
- Discrete Mathematics
- Computer Architecture
- Algorithm Design and Analysis
- 1 major course
- 1 concentration course