INTERNATIONAL COMPUTER SCIENCE

The International Computer Science curriculum prepares students for careers in all areas of the computer industry as well as for graduate studies in computer science and computer related fields. Students have also found a computer science major to be excellent preparation for careers in law, medicine, business administration, industrial engineering, biomedical engineering, and other technical and non-technical fields.

Computer science is a rapidly changing discipline. The lifetime of a particular computer system or software package can be very short. The international computer science curriculum is designed to prepare students for multiple careers in a rapidly changing, global environment. The program's courses emphasize fundamental concepts and techniques that will last longer than present technology.

International computer science majors complete a core of basic computer science courses that includes the study of algorithms, data structures, database concepts, computer systems, computer architecture, programming languages, operating systems, and software engineering. Advanced courses in theory of computation, computer networks, distributed systems, security, and real time systems add depth to the degree program. A three-term senior thesis provides students the opportunity to research in depth an area of computer science that is of interest to them under the mentorship of a faculty member. Majors also complete important courses in closely related fields, e.g., discrete mathematics and probability and statistics, as well as study a foreign language. The major requires students to study all aspects of the science of computing, including hardware, software, and theory.

Five free electives allow students to tailor their undergraduate education to their specific goals and pursue topics of interest to them. Students may choose to do advanced elective work in computer science and software engineering and/or in the humanities and social sciences, and/or pursue a minor or double major in another discipline.

Programming assignments and large projects are part of most computer science courses. These assignments familiarize students with the wide variety of tasks performed by software professionals. Programming assignments include system specification, system feasibility studies, system design, system maintenance studies, and user interface design in addition to system implementation (i.e., coding), testing (verification and validation), and documentation. Projects include both individual and team activities and require appropriate written and oral presentations.

The department has active programming teams that compete in the ACM Programming Contest and the Collegiate Cyber Defense Competition. The national computer science honor society, Upsilon Pi Epsilon, has chartered its Indiana Alpha Chapter at Rose-Hulman; it sponsors several seminars throughout the year.

Requirements

Summary of Graduation Requirements for the International Computer Science Major

HSS electives must be distributed as required by HSS. Science elective is any CHEM, PH, GEOL, or BIO course(s) totaling at least 4 credits.

To complete the major in international computer science a student must complete the following:

1. All required courses listed by number, symbol, or name in the schedule of courses above:

Code	Title	Hours
CSSE 120	Introduction to Software Development	4
CSSE 132	Introduction to Systems Programming	4
CSSE 212	MSPP – Multicore Systems Programming and Performance	4
CSSE 220	Object-Oriented Software Development	4
CSSE 230	Data Structures and Algorithm Analysis	4
CSSE 232	Computer Architecture I	4
CSSE 304	Programming Language Concepts	4
CSSE 333	Intro to Database Systems	4
CSSE 473	Design and Analysis of Algorithms	4
or MA 473	Design & Analysis of Algorithms	
CSSE 474	Theory of Computation	4
or MA 474	Theory of Computation	
CSSE 494	Senior Thesis I	4
CSSE 495	Senior Thesis II	4
CSSE 496	Senior Thesis III	4
MA 111	Calculus I	5
MA 112	Calculus II	5
MA 113	Calculus III	5
MA 221	Matrix Algebra & Differential Equations I	4
MA 276	Introduction to Proofs	4
MA 371	Linear Algebra I	4
or MA 373	Applied Linear Algebra for Engineers	
MA 374	Combinatorics	4
MA 381	Introduction to Probability with Applications to Statistics	4
PH 111	Physics I	4
PH 112	Physics II	4
CHEM 111	General Chemistry I	3
HUM H190	First-Year Writing Seminar	4
ENGL H290	Technical & Professional Communication	4
GER L111	German Language & Culture I	4
GER L112	German Language & Culture II	4
GER L113	German Language & Culture III	4
RHIT 100	Foundations for Rose-Hulman Success	1
CSSE 371	Software Requirements Engineering	4
CSSE 400	CSSE Seminar	4
CSSE 225	Programming 3	4
ECE 233	Introduction to Digital Systems	4
CSSE 374	Software Design	4
CSSE 332	Operating Systems	4
CSSE 432	Computer Networks	4

2. Eight credits of additional computer science courses (Special Subject A (Module I) and Special Subject A (Module II)) numbered between 200 and 492. No more than four credits may be at the 200 level, and none of the credits may be from CSSE 372 Software Project Management, CSSE 373 Formal Methods in Specification and Design, CSSE 375 Software Construction and Evolution, CSSE 376

Software Quality Assurance, and CSSE 477 Software Architecture. The students academic advisor must approve the courses to satisfy this requirement. (Use of computer science courses numbered 490 through 492 to fulfill this requirement must be approved by the department head).

3. Four credits of science electives, which can be any CHEM, PH, BIO, or GEOL courses not already required for the international computer science major.
4. Twelve credits of additional courses offered by the Department of Humanities and Social Sciences and/or appropriate humanities or social science courses offered at Hochschule Ulm. The distribution of these courses must meet the requirements of the Department of Humanities and Social Sciences at Rose-Hulman.
5. Sixteen credits of free elective courses. These courses must have the approval of the student's academic adviser. Free electives may be selected from any Rose-Hulman course.
6. A total of 192 credits.

See Computer Science for course descriptions (https://www.rose-hulman.edu/academics/course-catalog/current/programs/Computer%20Science/course-descriptions.html).

Plan of Study

Below is a sample plan of study that illustrates one way to achieve the program requirements. Any given student's plan of study may differ based on a variety of factors (e.g., advanced credit, placement exams, adding a minor). Enrolled students will work with their academic advisor; utilize the degree audit/planner to create a specific plan of study.

Course	Title	Hours
Freshman		
Fall		
CSSE 120	Introduction to Software Development	4
MA 111	Calculus I	5
PH 111	Physics I	4
HUM H190	First-Year Writing Seminar	4
RHIT 100	Foundations for Rose-Hulman Success	1
	Hours	**18**
Winter		
CSSE 220	Object-Oriented Software Development	4
MA 112	Calculus II	5
PH 112	Physics II	4
HSSA Elective		4
	Hours	**17**
Spring		
CSSE 132	Introduction to Systems Programming	4
MA 113	Calculus III	5
HSSA Elective		4
CHEM 111	General Chemistry I	3
CHEM 111L	General Chemistry I Lab	1
	Hours	**17**
Sophomore		
Fall		
CSSE 280	Introduction to Web Programming	4
GER L111	German Language & Culture I	4
MA 221	Matrix Algebra & Differential Equations I	4
CSSE 230	Data Structures and Algorithm Analysis	4
	Hours	**16**
Winter		
CSSE 304	Programming Language Concepts	4
ENGL H290	Technical & Professional Communication	4
GER L112	German Language & Culture II	4
MA 276	Introduction to Proofs	4
	Hours	**16**
Spring		
MA 374	Combinatorics	4
GER L113	German Language & Culture III	4
MA 381	Introduction to Probability with Applications to Statistics	4
CSSE 333	Intro to Database Systems	4
	Hours	**16**
Junior		
Fall		
CSSE 225	Programming 3	4
CSSE 371	Software Requirements Engineering	4
CSSE 400	CSSE Seminar	4
CSSE Elective Special Subject A (Module 1)		4
HSSA Elective Technical German		4
ECE 233	Introduction to Digital Systems	4
	Hours	**24**
Winter		
CSSE 212	MSPP – Multicore Systems Programming and Performance	4
CSSE 332	Operating Systems	4
CSSE 374	Software Design	4
CSSE 432	Computer Networks	4
CSSE Elective Special Subject A (Module 2)		4
Free Elective		4
	Hours	**24**
Senior		
Fall		
CSSE 494	Senior Thesis I	4
MA 371 or MA 373	Linear Algebra I or Applied Linear Algebra for Engineers	4
Science Elective		4
CSSE 232	Computer Architecture I	4
	Hours	**16**
Winter		
CSSE 495	Senior Thesis II	4
CSSE/MA 473	Design and Analysis of Algorithms	4
HSSA Elective		4
Free Elective		4
	Hours	**16**
Spring		
CSSE 496	Senior Thesis III	4
CSSE/MA 474	Theory of Computation	4
Free Elective		4
	Hours	**12**
	Total Hours	**192**

Notes:

The courses listed in the Junior Year plan of study above represents courses taken at Hochschule Ulm. Students that successfully complete the identified Hochschule Ulm courses will receive transfer credit for Rose-Hulman equivalent courses (identified in parenthesis).

Program Objectives

International Computer Science Program Educational Objectives

Graduates from the international computer science program will be prepared for many types of careers in the field of computing and prepared

for graduate study in computer science and in closely related disciplines. In the early phases of their careers, we expect Rose-Hulman international computer science graduates to be:

1. Computing professionals in a variety of organizations, including ones doing traditional software development, technological innovation, and cross-disciplinary work
2. Business and technological leaders within existing organizations
3. Entrepreneurial leaders
4. Recognized by their peers and superiors for their communication, teamwork, and leadership skills
5. Actively involved in social and professional service locally, nationally, and globally
6. Graduate students and researchers
7. Leaders in government and law as government employees, policy makers, governmental advisors, and legal professionals

Learning Outcomes

International Computer Science Student Outcomes

By the time students graduate with an international computer science degree from Rose-Hulman, they will be able to:

1. Effectively apply a variety of computing resources, programming languages, programming paradigms, operating systems, networks, and software development tools
2. Anticipate complexities and problems involved in the development of large computing systems
3. Analyze requirements, design computing systems that satisfy those requirements, and implement that system
4. Analyze problems and design solutions using ideas of problem complexity, models of computation, decidability, and scalability
5. Analyze algorithms in terms of correctness, as well as time and space efficiency
6. Evaluate and discuss the legal, social, and ethical aspects of significant events that arise in the field of computing both domestically and internationally
7. Interact effectively with colleagues and clients located abroad and overcome challenges that arise from geographic distance, cultural differences, and multiple languages
8. Communicate effectively, both orally and in writing
9. Collaborate effectively in teams
10. Recognize the need for, and engage in, lifelong learning
11. Understand the structure and functionality of modern computer systems
12. Live and work in the computing field in a country other than their native country
13. Demonstrate proficiency in a second language that allows them to interact effectively with colleagues and clients in their field

The faculty strives to maintain an open atmosphere that encourages mutual respect and support as well as learning and sharing of knowledge.