

# Computer Science - B.S.

The Computer Science bachelor's degree program is designed to provide a broad overview to the fundamentals of computer science, including software and systems analysis, programming languages, machine architecture, algorithmic thinking, and theoretical foundations of computing.

Upon completion of the program, graduates are expected to:

- Apply knowledge of math, science, engineering and contemporary developments in the fields of software programming, networking, system design, computer science and/or project management.
- Analyze problems through the use of computer science concepts and processes to formulate, implement and test software-based algorithms.
- Incorporate historical context and emerging developments in computer science to create adaptable and efficient algorithmic solutions that reflect ethical considerations and global awareness.
- Use the techniques, skills and emerging tools necessary for analysis and evolution of algorithms in computer science.

Upon completion of the Software Engineering specialization (offered at the Providence campus), graduates are expected to:

- Integrate knowledge, tools and problem-solving skills to carry out the design, creation, maintenance and testing of state-of-the-art software solutions.

Upon completion of the Network Engineering specialization (offered at the Providence Campus), graduates are expected to:

- Apply computer science knowledge, skills and tools focused on real-time, finite state machine development methods aimed at creating network products, network designs, troubleshooting plans and advanced protocol tracking.

Modern computer science touches many academic pursuits (i.e., business, economics, the sciences, mathematics, etc.). Computer Science students have the flexibility to truly pursue integrated learning across the university and beyond, made possible by additional elective options with this degree. The benefits of problem-solving and algorithmic thinking can be applied to many intellectual pursuits changing the way students approach problem solving. Coupled with the pragmatic skills of programming and computer internals training, students can be action-oriented in mobilizing and automating problem-solving methods.

In the Software Engineering specialization, the core concepts found in computer science are expanded upon in the pursuit of perfecting the methods and tactics necessary for large-scale software development. Software engineering applies problem-solving methods, data-handling techniques and programming skills to large-scale implementations. Large projects pose unique challenges in terms of specification of problems to be solved, practical application development concerns, testing, project management and documentation. The Software Engineering specialization focuses on learning in these key areas. Programming is comprised of unique skills that separate software engineers from pure computer scientists. Students that complete this specialization are ready to join software development teams and make significant contributions to software product development.

In the Network Engineering specialization, students learn how computer science drives the next level of networking enhancements: application-aware networks, software-driven networks, advanced network security screening/firewalling/packet examination, and data-handling improvements based on advanced-routing algorithms. Finite state-based programming has always been at the core of networking and is the focus of this program. Students who complete this specialization are intimately familiar with the evolution of network products, the software internals of switches and routers, and the latest trends in software development specific to this industry. Students are positioned to lead network design teams, benchmark network products, create network products, and analyze network problems from both a software and hardware point of view.

## Computer Science

A four-year program leading to the bachelor of science degree

### Major Courses

CSIS1101	Computer Science I	3
CSIS1112	Computer Science II	3

CSIS2018	Advanced Data Structures	3
CSIS2023	Survey of Programming Languages	3
CSIS2030	Database Concepts	3
CSIS2045	Introduction to Operating Systems	3
CYB2010	Computer Architecture with Assembly Language Programming	3
ITEC2081	Network Protocols I	3
ITEC3050	Information Security with Cryptography	3
MATH1030	Precalculus	3
PRMG2010	Introduction to Project Management & Project Membership	3

### Major Courses/Specialization

Choose additional major courses or a specialization listed below†

CSIS3126	Design Project I	18
CYB3038	HCI/Usable Security	
ITEC3070	Systems Modeling and Simulation	

9 credits at the 2000+ level in the following subjects: BIO, CAD, CHM, CSIS, CYB, ECON, ENGN, GDES, ITEC, LEAD, MATH, MGMT, PHY, PSYC, SCI, SOC

### Applied/Experiential Learning

Choose 6 credits from the following:

DEE3999	Directed Experiential Education <sup>D</sup>	6
TECX4099	College of Engineering & Design Internship <sup>IC</sup>	
TECX4190	Technical Solutions Design Project	

### Related Professional Studies

CAR0010	Career Management	1
ENG2010	Introduction to Technical Communication	3
FYS1020	First-Year Seminar	1
LAW2001	The Legal Environment of Business I	3
MATH2020	Discrete Mathematics	3
MGMT2020	Organizational Behavior	3

### A&S Core Experience

Communications Foundation Courses		9
ENG1020	Rhetoric & Composition I	
ENG1021	Rhetoric & Composition II	
ENG1030	Communication Skills	

Integrative Learning

Two ILS courses, one at the 2000 level, and one at the 4000 level

Arts and Humanities

PHIL3240	Ethics: A Global Perspective	6
One course from ART, HIST, HUM, LIT or REL		

Mathematics

MATH1020	Fundamentals of Algebra (or higher, based on student's placement)	6
MATH2001	Statistics I	

Science

PHY1011 & PHY1016	General Physics I and General Physics I Laboratory	4
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Social Sciences

LEAD1010	Foundations of Leadership Studies	6
One course from ANTH, ECON, GEND, PSCI, PSYC, RES or SOC		

A&S Electives

Two courses with an EASC attribute

**Free Electives <sup>F</sup>**

9 (6 for students in the Software Engineering specialization) credits selected from 1000-4999 numbered offerings within the university

**Total Credits** **123.0**

### †Software Engineering Specialization

Students must use 3 credits of free electives to complete this specialization

CSIS3106	Software Verification, Validation, Testing and Security	21
CSIS3126	Design Project I	
CSIS4010	Software Engineering	
ENGN2085	Introduction to Embedded Systems	
ITEC2085	Distributed Systems with TCP/IP	
ITEC3040	Systems Analysis	
MATH1040	Calculus I	

### †Network Engineering Specialization

18

ITEC2082	Network Protocols II	
ITEC2085	Distributed Systems with TCP/IP	
ITEC3031	Router Internals and Integration	
ITEC3075	Network Security	

<sup>D</sup> Directed Experiential Education (DEE) opportunities are based on project availability with community partners and student eligibility. For more information, visit Experiential Education & Career Services (EE&CS).

<sup>I</sup> Typically, internships require a minimum of six credits. Students interested in a 9 or 12-credit internship can apply additional experiential learning and free elective credits, if available. Students are strongly encouraged to contact a faculty advisor before scheduling internship and free elective credits.

<sup>#</sup> In addition to classes, free elective credits may be applied to a number of options such as internship, study abroad, Directed Experiential Education courses and courses in a specialization or minor as relevant. For Accelerated Master's program students, up to three graduate-level courses may apply. Students are strongly encouraged to contact a faculty advisor before scheduling free elective credits.

NOTE: Students must pass MATH0010 Pre-Algebra or have equivalent placement scores to enroll in required math course(s).

Note: Students must pass ENG0001 Writing Workshop or have equivalent placement scores to enroll in ILS 2000-level courses

In collaboration with academic colleges across all JWU campuses, JWU Global Study Abroad programs offer a variety of international options for major, minor, arts and sciences, and elective credit at many affordable price points for students during the academic year, break periods, and summer. Faculty-led, exchange, affiliate, and direct-enroll programs range in duration from one week to a full semester or full year. Financial aid may be applied and scholarships are available. Visit the study abroad website for information, program descriptions and online applications. Where will you go?