Computer Science

A Bachelor of Science degree (B.S.) in Computer Science prepares students for careers in virtually any industry or to continue on with graduate study in Computer Science and many other fields. Computer science students learn to approach problems from a computational (algorithmic) point of view, this approach to problem solving often leads to better and more general solutions. Software systems, information technology, and large scale data applications are core technologies in every area and the applications continue to grow with software and information systems becoming more and more embedded in the fabric of everyday life. These systems are essential tools in science and engineering, for business and finance, government, communications, medicine, and entertainment.   Software systems make the world go round and smart devices, such as phones, tablets, glasses, wearable devices, medical implants are ubiquitous. As a result, computer science has grown from a specialized field to an independent, broadly based area that studies all aspects of the use and understanding of software systems, information, and computational processes. Students studying B.S. in Computer Science at the University of Wyoming can study for the B.S. degree in Computer Science and have the option to focus their studies by taking a concentration in Business, Big Data or International Engineering. All of the Computer Science concentrations lead to a Bachelor of Science in Computer Science and all programs are ABET accredited.

Program Objectives

The following are the measurable objectives for graduated computer science students (ABET Standards):

1. Have successfully applied the fundamentals of computer science to solve software-oriented computing problems.
2. Have effectively communicated within and outside the discipline and work effectively with others.
3. Have extended their knowledge by independent learning and continuing education.
4. Appreciate the role of computer science in the societal context and appreciate the importance of ethics in the practice of the profession.

Program Learning Outcomes

The program of study in Computer Science enables students to achieve, by the time of graduation:

- (a) An ability to apply knowledge of computing and mathematics appropriate to the discipline;
- (b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
- (c) An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;
- (d) An ability to function effectively on teams to accomplish a common goal;

- (e) An understanding of professional, ethical, legal, security, and social issues and responsibilities;
- (f) An ability to communicate effectively with a range of audiences;
- (g) An ability to analyze the local and global impact of computing on individuals, organizations and society;
- (h) Recognition of the need for, and an ability to engage in, continuing professional development;
- (i) An ability to use current techniques, skills, and tools necessary for computing practices.
- (j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
- (k) An ability to apply design and development principles in the construction of software systems of varying complexity.

Computer Science Undergraduate Major

This major consists of a core set of courses plus a concentration chosen by the student from one of: Computer Science, Computers and Business, International Engineering, or Big Data. In addition to these courses, Computer Science majors must satisfactorily meet the requirements of the University Studies Program (USP). See the front sections of this catalog for specifics on the USP. Note that some of the courses required for the Computer Science core or the concentrations will meet some of the USP requirements. Students do not have to take additional courses to meet those requirements. All courses in Computer Science, Mathematics, Application Area (Big Data) and Statistics must be completed with a grade of C or better. A grade of C- is not acceptable.

Computer Science Core

These courses, along with the USP requirements, provide a basic set of skills that all Computer Science majors should master.

Computer Science Core (all concentrations)	Hours
Computer Science courses	
COSC 1010: Intro to Programming	4
COSC 1030: Programming I	4
COSC 2030: Programming II	4
COSC 2150: Computer Organization	3

COSC 3011: Software Design	3
COSC 3020: Algorithms & Data Structures	4
COSC 3050: Ethics	1
COSC 4950: Senior Design I	1
COSC 4955: Senior Design II	2
Mathematics & Science courses	
MATH 2200: Calculus I	4
MATH 2205: Calculus II	4
COSC/MATH 2300: Discrete Mathematics	3
Statistics Course: one of STAT 2010/2050/2070/4220	4
Science Courses: must take 4, 4-hour science courses outside of Computer Science. See NOTE below.	16

NOTE: Courses meeting the Science requirement must have a lab component and be for science or engineering majors. Two must be chosen from a tightly-coupled series – CHEM 1020 & 1030 or CHEM 1050 & 1060 or PHYS 1110 & 1120 or PHYS 1210 & 1220 or PHYS 1310 & 1320 or LIFE 1010 & (2022 or 2023). See Department web pages for a current list of other approved courses.

Computer Science

These elements of the Computer Science program concentrate on the creation and understanding of computer software. The curriculum focuses first on programming and then on the central processes that support programming: operating systems, programming languages, and computational theory.

Computer Science	Hours
Computer Science courses	
COSC 3015: Functional Programming	3
COSC 4740: Operating Systems	4

COSC System Course: one of
  COSC 4760: Networks or
  COSC 4820: Databases
	3

COSC Theory Course: one of
  COSC 4100: Foundations or
  COSC 4200: Computability
	3

COSC Language Course: one of
  COSC 4780: PPL or
  COSC 4785: Compilers
	3

COSC Electives: upper division, 12 hours.
  At most 3 hours of COSC 3970 can be
  counted toward this requirement.
	12

Mathematics courses	
Math Electives: 6 hours from MATH courses above Calculus II or STAT courses 3000 and up. Exceptions: cannot count MATH 2350, MATH 2355, MATH 4000, or any variable credit courses toward this requirement.	6
Other courses	
Upper Division Electives: 6 hours from any department	6
Free Elective: 3 hours from any department. Must be 1000 level or higher	3

Computers and Business Concentration

An understanding of business fundamentals is essential for students planning a career in applied computer science in a business environment. This program of study provides a foundation in computer science, business and information management. It includes courses in accounting, management, marketing, database fundamentals, and design and implementation of software systems. The curriculum leads to the Bachelor of Science in Computer Science degree.

It is highly recommended that students in this concentration declare a Business minor, since they will meet all the requirements without any additional courses. If you are planning on attending graduate school in Computer Science, then you should take COSC 4740 for the operating systems course and COSC 4100 or COSC 4200 and COSC 4780 or COSC 4785 for the two computer science electives.

Computers and Business	Hours

Computer Science courses	
COSC 4210: Analysis and Design	3
COSC 4220: Design and Implementation	3
COSC 4820: Databases	3

COSC O/S Course: one of
  COSC 3750: Linux Programming or
  COSC 4740: Operating Systems or
  COSC 4750: Systems Programming
	3

COSC Elective: upper division, 6 hours.
  At most 3 hours of COSC 3970 can be
  counted toward this requirement.
	6

Business courses	
ACCT 1010: Accounting I	3
ACCT 1020: Accounting II	3
MGT 1040: Legal Environment of Business	3
MGT 3110: Business Ethics	3
MGT 3210: Management and Organization	3
MKT 3210: Intro to Marketing	3
FIN 3250: Corporate Finance	3
Business Elective: 3 hour upper division Business course.	3
Other courses	
Upper Division Elective: 3 hours from any department	3

International Engineering Concentration

Computer Science is a global profession, and today's computer scientists must be able to work and interact in a variety of diverse cultural and technical environments. The international engineering concentration gives computer science students an opportunity to study culture and foreign language at the same time as they pursue their computer science degrees.

The concentration includes at least one semester of study abroad with courses taken in a foreign language. In addition, students may participate in a four-to-five month international internship. Foreign language skills can be earned through a variety of means, including formal university coursework, intensive summer language programs, and previous education.

International Engineering	Hours
Computer Science courses	
COSC 3015: Functional Programming	3
COSC 4740: Operating Systems	4

COSC System Course: one of
  COSC 4760: Networks or
  COSC 4820: Databases
	3

COSC Theory Course, one of
  COSC 4100: Foundations or
  COSC 4200: Computability
	3

COSC Language Course: one of
  COSC 4780: PPL or
  COSC 4785: Compilers
	3

COSC Electives: upper division, 12 hours.
  At most 3 hours of COSC 3970 can be
  counted toward this requirement.
	12

Mathematics courses	
Math Electives: 6 hours from COSC 4340 or MATH courses above Calculus II or STAT courses 3000 and up. Exceptions: cannot count MATH 2350, MATH 2355, MATH 4000, or any variable credit courses toward this requirement.	6
Foreign Language	
Foreign Language Courses: 4 semesters (or equivalent, see above) of a single foreign language.	15
Other courses	
Upper Division Electives: 6 hours from any department	6
Free Elective: 3 hours from any department. Must be 1000 level or higher	3

Big Data Concentration

Big data is high volume, high velocity, and/or high variety assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization. The Big Data Concentration directs the students toward data handling (AI, visualization, data mining, and machine learning) courses, data analysis (statistics) courses, and adds an interdisciplinary Application Area component (chosen from a specific set of courses) that will broaden the student's experience in processing varied forms of data.

It is highly recommended that students in this concentration declare a Statistics minor, since they will meet all the requirements without any additional courses. If you are planning on attending graduate school in Computer Science, then you should take COSC 4740 for the operating systems course and COSC 4100 or COSC 4200 and COSC 4780 or COSC 4785 for the two computer science electives.

Big Data	Hours
Computer Science courses	
COSC 4450: Graphics	3
COSC 4550: Intro to Artificial Intelligence	3
COSC 4555: Machine Learning	3
COSC 4570: Data Mining	3
COSC 4820: Databases	3
COSC O/S Course: one of COSC 3750: Linux Programming or COSC 4740: Operating Systems or COSC 4750: Systems Programming	3
COSC Electives: upper division, 6 hours. At most 3 hours of COSC 3970 can be counted toward this requirement.	6
Mathematics and Science courses	
MATH 2250: Linear Algebra	3
STAT 3050: Statistical Methods	3
STAT 4015: Regression Analysis	3

STAT 4045: Categorical Data Analysis	3
STAT 4115: Time Series Analysis	3
Application Area Course, one of MOLB 4495 or BOT 4550 or CHEM 4560 or GEOG 4220 or PHYS 4830, see department web pages for the most current list of approved courses.	3

Computer Science Minor Requirements

Requirements for a minor in Computer Science are as follows:

- A total of 18 credits of computer science courses
- All 18 credits must have a grade of C or better. A grade of C- is not acceptable.