

## **Computer Science, B.S. 2023-2024**

The objectives of the B.S. program in Computer Science relate to the abilities of the graduates several years after graduation. These goals are for students to have accomplished the following 3-5 years out of the degree:

- Established themselves as successful and productive computing professionals or engaged in advanced study such as a graduate degree program.
- Worked effectively both in team environments and as individuals.
- Fulfilled their responsibilities in the areas of ethics, continuing professional development, and effective written and oral communications.

This bachelor's degree program is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>

### **Admission Requirements**

Admission to George Mason is competitive. Each candidate who presents sufficient admission qualifications is reviewed in the context of other qualified applicants. An offer of admission is valid only for the semester for which the student applied. Application for undergraduate admission should be made to the Office of Admissions. Please consult <http://admissions.gmu.edu> for additional information. See the last page of this document for details about admission to the BS/Accelerated MS programs.

#### **Freshman Admission Requirements**

The following factors are considered when reviewing applications for admission:

- Cumulative high school grade point average for course work completed in grades 9 through 12.
- Level of difficulty of course work elected throughout the high school years, particularly in English, Mathematics, laboratory science, social studies, and foreign language.
- Scores from Scholastic Aptitude Test I (SAT I) or the American College Test (ACT).
- Test of English as a Foreign Language (TOEFL) where applicable.
- Essays, list of extracurricular activities, and teacher and guidance counselor recommendations.

#### **Transfer Admission Requirements**

The university accepts qualified students who wish to transfer from other colleges. Transfer applicants must submit official transcripts from each collegiate institution attended. Transfer applicants with fewer than 30 semester hours of transferable credit must also submit a copy of their secondary school record and test scores. All non-native English speakers are also required to submit a TOEFL or IELTS score or acceptable grades (C or better) in at least two English composition or literature classes taken at a regionally accredited U.S. college or university.

#### **Undecided Students**

Students who are undecided but interested in pursuing a career in Computer Science should seek the advice of the College of Engineering and Computing Undergraduate Advising Coordinator. Sample schedules of the majors within the College of Engineering and Computing are also available from each individual department.

## Change of Major

Students requesting a change of major to computer science must have a GPA of at least 2.75 in all computer science and math courses and successfully completed CS 109, 112, or 211 and MATH 113, 114, or 125, with a B or better, at George Mason University.

## Advanced Placement, Credit by Exam

A score of 4 on the Advanced Placement (AP) computer science exam qualifies the student for credit in CS 112. A score of 4 on the International Baccalaureate (IB) computer science exam qualifies students for credit in CS 112, and a score of 5 or more qualifies students for credit in CS 211.

## Degree Requirements

Undergraduate degree work in computer science provides students with essential background for studying the design and implementation of computer system software, computer architecture, and computer software applications for science and business. The program emphasizes both computer system fundamentals and computer software applications. Required areas of study include data structures, analysis of algorithms, low-level programming, computer architecture and language translation, ethics and law for the computing professional, and software design and development. Evolving software technologies are a major concern. The BS in Computer Science program also requires 12 credits of natural science and 20 credits in mathematics and statistics, including calculus, discrete mathematics, linear algebra, and applied probability theory.

A sample schedule that fulfills degree requirements for a Bachelor of Science in Computer Science degree is shown below.

### Sample Schedule for B.S. in Computer Science

#### First Semester

CS 110 Essentials of Computer Science	3
CS 112 Intro Computer Programming	4
MATH 113 Calculus I	4
Mason Core (ENGH 101 suggested)	3
Total Hours	14

#### Second Semester

CS 211 Object-Oriented Programming	3
MATH 114 Calculus II	4
Natural Science with lab	4
Mason Core	3
Total Hours	14

#### Third Semester

CS 262 Intro Low-level Programming	3
Natural Science with lab	4
MATH 125 Discrete Mathematics	3
COMM 100/COMM 101 [MC]	3
Mason Core	3
Total Hours	16

#### Fourth Semester

CS 310 Data Structures	3
Natural Science with lab	4
MATH 213 Calculus III	3
Mason Core	3
General Elective	3
Total Hours	16

#### Fifth Semester

CS 330 Formal Methods & Models	3
CS 367 Computer Systems & Programming	4
MATH 203 Linear Algebra	3
ENGH 302 (Natural Science section) [MC]	3
Mason Core	3
Total Hours	16

#### Sixth Semester

CS 321 Software Engineering	3
CS 483 Analysis of Algorithms	3
STAT 344 Probability and Statistics	3
CS-Related Elective	3
Mason Core	3
Total Hours	15

#### Seventh Semester

CS 306 Synthesis - Ethics & Law [MC]	3
CS 471 Operating Systems	3
Senior CS Course	3
Senior CS Course	3
General Elective	3
Total Hours	15

#### Eighth Semester

Senior CS course	3
Senior CS course	3
Senior CS course	3
CS-related Elective	3
General Elective	2
Total Hours	14

**B.S. DEGREE IN COMPUTER SCIENCE  
FROM 2023-24 CATALOG**

(The GMU catalog is the official reference – see [catalog.gmu.edu](http://catalog.gmu.edu))

• **MASON CORE [MC] REQUIREMENTS (24 credits)**

FOUNDATION

- ✓ ENGH 101 Composition [Non-native English speakers see catalog about using ENGH 100]
- ✓ ENGH 302 Advanced Composition (Natural Sciences section)
- ✓ COMM 101 Fundamentals of Communication
- ✓ [Information Technology is satisfied by major requirements]
- ✓ [Quantitative Reasoning is satisfied by major requirements]

CORE [see university catalog for currently approved classes for these requirements]

- ✓ Literature
- ✓ Global History
- ✓ Social and Behavioral Science
- ✓ Global Understanding
- ✓ Arts
- ✓ [Synthesis is satisfied by the major requirement - CS 306]
- ✓ [Natural Science is satisfied by major requirements]

• **MAJOR REQUIREMENTS (88 credits)**

**Required Computer Science**

- ✓ CS 110 Essentials of Computer Science
- ✓ CS 112 Introduction to Computer Programming (or complete CS 108 and CS 109)
- ✓ CS 211 Object-Oriented Programming
- ✓ CS 262 Introduction to Low-Level Programming
- ✓ CS 306 Synthesis of Ethics and Law for the Computing Professional
- ✓ CS 310 Data Structures
- ✓ CS 321 Software Engineering
- ✓ CS 330 Formal Methods and Models
- ✓ CS 367 Computer Systems and Programming
- ✓ CS 471 Operating Systems
- ✓ CS 483 Analysis of Algorithms
- ✓ **Senior CS:**
  - one of CS 455, 468, 475 or 487
  - Four additional courses chosen from: CS 425, 440, 450, 451, 452, 455, 463, 465, 468, 469, 475, 477, 478, 480, 482, 484, 485, 487, 490, 491, 499; MATH 446 (or OR 481)
  - At most three credits of CS 490, 491 can be used toward the Senior CS requirement. Additional credits may be applied to CS-related elective.
  - At most six credits of CS 499 can be used toward the Senior CS requirement. Additional credits may be applied to CS-related elective.

**Mathematics and Statistics**

- ✓ MATH 113 (or MATH 123/124), MATH 114, MATH 125: Calculus I, II, and Discrete Mathematics
- ✓ MATH 203, MATH 213, STAT 344\*: Linear Algebra, Calculus III, Probability and Statistics for Engineers & Scientists I.  
→ Students may replace STAT 344 with MATH 351 and 352 (while also satisfying one CS-related elective.)

**Computer Science Related Electives** – Any two of the following (not used to satisfy other requirements):

ECE 301 (or ECE 231 and 232), 350, 446, 447, 455, 511; ENGH 388; OR 335, 441, 442; PHIL 371, 376; STAT 354, SWE 419, 432, 437, 443; SYST 371, 470; any MATH course above 300 except MATH 351; any CS course above 300; any SWE course above 300 except SWE 301, 401, 510.

## Natural Science Requirement for CS Majors

The BS in CS requires 12 credits of natural science. The courses should be intended for science and engineering students and must include a two-course sequence with laboratories (selected from below). The remaining four natural science credits may be another course that uses the chosen sequence as a required prerequisite, or any course from the Mason Core natural science with lab list in a different subject.

<b>BIOLOGY</b>	102(4)	and	103(3) & 105(1).
<b>CHEMISTRY</b>	211(3) & 213(1)	and	212(3) & 214(1).
<b>GEOLOGY</b>	101(3) & 103(1)	and	102(3) & 104(1).
<b>PHYSICS</b>	160(3) & 161(1)	and	260(3) & 261(1).

## General Electives (8 credits)

Additional academic hours beyond Mason Core and Major Requirements. MATH 104 Trigonometry and Transcendental Functions, MATH 105 Precalculus Mathematics, MATH 108 Introductory Calculus with Business Applications, and courses with an IT designation (and any associated cross-listed courses) cannot be counted toward this degree. Degree requirements for College of Engineering and Computing undergraduate programs may not include credits earned in military science. At most 3 credits of 100-level RECR coursework may be taken to satisfy the degree requirements of those CEC programs that allow general electives. Whenever there is uncertainty, students must consult with a CS academic advisor.

## Grade and Credit Hour Requirements for CS Majors

Students must earn a C or better in any course intended to satisfy a prerequisite for a computer science course. Computer science majors may not use more than one course with grade C- or D toward departmental requirements; this one low grade thus cannot be used as a prerequisite for a CS course. Any course can be repeated and the new grade is used in the computation of the cumulative GPA; see “repeating a course” in the University Catalog.

Graduation requires 120 total credit hours (at least 30 at GMU) and 45 upper division hours (at least 12 at GMU).

## Repeating Courses

Students may attempt an undergraduate course taught by the College of Engineering and Computing twice. A third attempt requires approval of the department offering the course. This policy does not apply to STAT 250, which follows the normal university policy for repeating undergraduate courses.

The CS Department may elect not allow students to retake certain high-demand CS courses in which they have already earned a grade of C or better simply to improve their GPA.

## Termination from the Major

No math, science, or College of Engineering and Computing course, required for the major, may be attempted more than three times. Those students who do not successfully complete such a course within three attempts will be terminated from the major. For more information, see "Termination from the Major" in the College of Engineering and Computing Undergraduate Policies section of the University Catalog.

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## Computer Science Courses (CS)

**100 Principles of Computing (3:3:0).** *Prerequisite: none.* This course is intended to help students learn to think in the manner necessary to fully grasp the nature and power of the digital world around us. The early era of the Internet and the personal computer led to the need for “computer literacy.” Now, the changing nature of our global society requires that students learn new ways to think about problems and how to solve them, regardless of students’ specific fields of endeavor. Through this course, students will explore major issues related to the “big ideas” of computational thinking (namely, (i) Creativity, (ii) Abstraction, (iii) Data, (iv) Algorithms, (v) Programming, (vi) Internet, and (vii) Societal Impact), as well as how these issues will impact their future lives.

**105 Computer Ethics and Society (1:1:0).** *Prerequisite: none.* Intensive introduction to legal, social, and ethical issues surrounding software development and computer use. Stresses professional conduct, social responsibility, and rigorous standards for software testing and reliability. Examines issues such as liability, ownership of information, and computer crime.

**110 Essentials of Computer Science (3:3:0).** *Declared ACS/CS Majors only.* Offers a broad overview of computer science designed to provide computer science majors with an introduction to their discipline. Fundamental computing concepts such as number representation, programming environments, communication tools, and basic network security measures are covered. Privacy and ethical use of computing are also discussed along with guest lectures to sample current computer science research. Note: All computer science majors are required to take this course within their first year as a computer science major.

**108 Intro to Computer Programming, Part A (3:3:0).** *Prerequisite: none.* CS 108, with 109, is a two semester sequence intended for students with little or no programming experience, which introduces the field of Computer Science as well as the basics of programming commensurate with a first course in programming. CS 108 discusses the history of computing, as well as ethical, security, and societal impacts of technology. Basics of tools and technology used for programming are introduced. This course also covers the basics of programming in a procedural style, including expressions, control structures, functions, testing, debugging, and general problem solving techniques. The course prepares students for more in-depth programming courses.

**109 Introduction to Computer Programming, Part B (3:3:1).** *Prerequisite: Grade of C or better in CS 108, calculus readiness.* CS 109 is the second part of a two semester sequence intended for students with little or no programming experience, which introduces the field of Computer Science as well as the basics of programming commensurate with a first course in programming. CS 109 follows CS 108 with coverage of procedural programming appropriate for a first course in programming. The course begins with a review of expressions, control structures, and functions. Further topics include testing and debugging, multidimensional lists, mutability and references, file input/output, data types, recursion, exceptions, and basics of classes and objects.

**112 Introduction to Computer Programming (4:3:1).** *Prerequisite: calculus readiness.* Rigorous introduction to problem solving through development of computer programs. Focuses on identifying algorithmic patterns in problems, describing problem solutions in high-level pseudocode, then implementing in a procedural programming language. Basic programming concepts are covered in detail including expressions, control structures, simple data types, and input/output. Program testing and debugging are discussed to verify that problems are solved correctly.

**211 Object-Oriented Programming (3:3:1).** *Prerequisite: Grade of C or better in CS 112.* Thorough treatment of programming according to object-oriented principles. Introduces classes, interfaces, inheritance, polymorphism, and single dispatch as means to decompose problems. Covers intermediate programming techniques including error handling through exceptions, arrangement of source code into packages, and simple data structures. Intermediate debugging techniques and unit testing are covered.

**222 Computer Programming for Engineers (3:3:0).** *Prerequisites: Grade of C or better in CS 112.* Introduction to C as a second programming language with emphasis on problems and language features relevant to engineers. Topics include basic data types, pointers, elementary data structures, file input/output, bitwise operations, and Unix commands for compilation and debugging.

**262 Introduction to Low-Level Programming (3:2:1)** *Prerequisite: Grade of C or better in CS 211 or CS 222. Co-requisite: CS 110.* Introduction to the language C, as well as operating system concepts, in UNIX, to prepare students for topics in systems programming.

**306 Synthesis of Ethics and Law for the Computing Professional (3:3:0).** *Prerequisites: CS 110; (COMM 100 or 101, and ENGH 302); junior standing (at least 60 credit hours). Recommended prerequisite: all required Mason Core courses.* Practical course to become effective computer professional. Examines legal & ethical issues surrounding computer technology and its use, as well as the foundation building that is necessary to deal with those challenges. Applies philosophical bases for ethical decision-making to modern concerns raised by computers and technology. Addresses topics covered by CS 110 in a more intensive manner, and focuses on the emerging legal and ethical issues involved in e-commerce and widespread use of the Internet.

**310 Data Structures (3:3:0).** *Prerequisite: Grade of C or better in CS 211 and MATH 113. Co-requisite: CS 105 or 110.* This course continues to focus on object-oriented programming with an emphasis on tools and techniques for developing moderate to large programs. Topics include use and implementation of linear and non-linear data structures and the design and analysis of elementary algorithms.

**321 Software Engineering (3:3:0).** *Prerequisite: Grade of C or better in CS 310 and ENGH 302N. Declared ACS/CS Majors only.* An introduction to concepts, methods, and tools for the creation of large-scale software systems. Methods, tools, notations, and validation techniques to analyze, specify, prototype, and maintain software requirements. Introduction to object-oriented requirements modeling, including use of case modeling, static modeling, and dynamic modeling using the Unified Modeling Language (UML) notation. Concepts and methods for the design of large-scale software systems. Fundamental design concepts and design notations are introduced. A study of object-oriented analysis and design modeling using the UML notation. Students participate in a group project on software requirements, specification, and object-oriented software design.

**325 Introduction to Game Design (3:3:0)** *Prerequisite: Grade of C or better in CS 211.* Game design, in various electronic entertainment technologies, involves a diverse set of skills and backgrounds, from narrative and art to computer programming. This course surveys the technical aspects of the field, with an emphasis on programming.

**330 Formal Methods and Models (3:3:0).** *Prerequisite: Grade of C or better in CS 211 and MATH 125. Declared ACS/CS Majors only.* Abstract concepts that underlie much advanced work in computer science, with major emphasis on formal languages, models of computation, logic, and proof strategies.

**351 Visual Computing (3:3:0).** *Prerequisites: Grade of C or better in CS 262 and CS 310.* The focus of this course is programming essential mathematical and geometric concepts underlying computer graphics. It covers fundamental topics in computational geometry, 3D modeling, graphics algorithms, and graphical user interfaces using both 2D and 3D implementations. Furthermore, it reinforces object oriented programming practices.

**367 Computer Systems and Programming (4:3:1).** *Prerequisites: Grade of C or better in CS 110, CS 262 or 222, and MATH 125. Declared ACS/CS Majors only.* Introduces students to computer systems from the perspective of a programmer. Topics covered include data representation, assembly and machine level representation of high-level language programs, the memory hierarchy, linking, exceptions, interrupts, processes and signals, virtual memory, and system-level I/O. This course serves as a foundation for courses on compilers, networks, operating systems, and computer architecture, where a deeper understanding of systems-level issues is required.

**390 Research and Project Design Principles in Computing (3:3:0).** *Prerequisite: Grade of C or better in CS 262; CS 310 and 321 highly recommended.* This course introduces students to the research and project design process within the computing field. Students will learn about the tools of the trade, work through design principles beginning with the articulation of a question, reviewing methods of exploration, gathering evidence, communicating results, and assessing and evaluating research or project outcomes.

**425 Game Programming I (3:3:0)** *Prerequisites: Grade of C or better in CS 310 and 351.* The course will provide an introduction to technologies and techniques used in modern computer games. Teams will explore the various facets of a complete design, using sophisticated tools. The course will involve a project in which a game is prototyped; this prototype and initial design will serve as the starting point for the project in CS 426.

**426 Game Programming II (3:3:0)** *Prerequisite: C or better in CS 325 and 425.* This is a project-oriented course. It is a continuation of CS 425 with an emphasis on the implementation of a complete game.

**440 Language Processors and Programming Environments (3:3:0).** *Prerequisite: Grade of C or better in CS 310, 330, and 367.* Survey of basic programming language processors and software development tools, such as assemblers, interpreters, compilers. Topics include design and construction of language processors, formal syntactic definition methods, parsing techniques, and code generation techniques.

**450 Data Base Concepts (3:3:0).** *Prerequisite: Grade of C or better in CS 310 and 330.* This course covers from basics to intermediate knowledge for the design, implementation and use of relational database systems. The main topics include the Entity-Relationship (ER) and Entity-Enhanced Relationship (EER) models for database design, Relational Algebra (RA), Structured Query Language (SQL), SQL programming techniques, functional dependencies and normalization, object- and object-relational databases, and security. Students will practice to design, develop, and implement a relational ORACLE database, and use the database for queries, transaction processing, and report generation.

**451 Computer Graphics (3:3:0).** *Prerequisite: Grade of C or better in CS 310, CS 367, and MATH 203.* Basic graphics principles and programming. Topics include scan conversion, transformation, viewing, lighting, blending, texture mapping, and some advanced graphics techniques.

**452 Virtual Reality (3:3:0).** *Prerequisite: Grade of C or better in CS 351 or 451.* This course covers the concepts and techniques underlying virtual reality (VR) technologies. From display technologies, visual computing, sound, haptics, to navigation, and 3D interaction techniques, students will learn about the pipeline of techniques applied to devise a practical VR system. This course will also cover other immersive technologies such as augmented reality and holographic displays. Students will also learn about the applications of VR technologies for training, serious games, design, exhibitions, and education.

**455 Computer Communications and Networking Systems (3:3:0).** *Prerequisite: Grade of C or better in CS 310, CS 367, and STAT 344.* Data communication and networking protocols, with study organized to follow layers of the Internet Protocol Suite (TCP/IP family of protocols). Topics include role of various media and software components, local and wide area network protocols, network performance, and emerging advanced commercial technologies.

**463 Comparative Programming Languages (3:3:0).** *Prerequisite: Grade C or better in CS 310, 330, and 367.* Key programming mechanisms described independently of particular machines or languages, including control, binding, procedural abstraction, types, and concurrency. Includes basic programming competence in several different types of programming languages, including a language that provides concurrency.

**465 Computer Systems Architecture (3:3:0).** *Prerequisite: Grade of C or better in CS 367.* Computer subsystems and instruction set architectures. Single cycle, multiple-cycle, and pipeline architectures. Memory hierarchy, cache, and virtual memory input-output processing.

**468 Secure Programming and Systems (3:3:0).** *Prerequisite: Grade of C or better in CS 310 and 367.* Fundamental principles and techniques for implanting secure computer systems. Topics include security and cryptography basics, vulnerability analysis, secure software development and distributed system security. Projects involve designing and programming basic security tools, secure programs and distributed systems.

**469 Secure Engineering (3:3:0).** *Prerequisite: Grade of C or better in CS 330, 367 and STAT 344.* Modern enterprise computers are constantly under attack. A number of devices and subsystems are deployed in the enterprise defense. Course covers the software subsystems that are involved in defending computer systems. We cover threats and a plethora of architecting solutions against them including but not limited to access control and identity management, network and system security, intrusion detection and recovery systems, monitoring and forensic system.

**471 Operating Systems (3:3:0).** *Prerequisites: Grade of C or better in CS 310, and in CS 367 or ECE 445.* Issues in multiprogramming. Covers concurrent processes and synchronization mechanisms; processor scheduling; memory, file, I/O, deadlock management; performance of operating systems. Projects dealing with synchronization in a multi-programmed OS and virtual memory management.

**475 Concurrent and Distributed Systems (3:3:0).** *Prerequisite: Grade of C or better in CS 310 and (CS 367 or ECE 445).* Practical issues in designing and implementing distributed software. Topics include concurrent programming, synchronization, multithreading, local and wide-area network protocols, distributed computation, system integration, and techniques for expressing coarse-grained parallelism at the application level. Projects involve network programming at the application level.

**477 Mobile Application Development (3:3:0).** *Prerequisite: Grade of C or better in CS 310 and 367.* This project based course will teach fundamental principles of software development for the mobile device environment, emphasizing the application of numerous academic concepts and the new design and programming paradigms that stem from the use of mobile devices. Topics include user interfaces, event-based programming, interprocess communications, networking, mobile-specific capabilities and performance in a resource restricted environment.

**478 Natural Language Processing (3:3:0).** *Prerequisites: CS 310 and 330.* This covers the core concepts and algorithms for the theory and practice of natural language processing (NLP), the creation of computer programs that aim to understand, generate, and learn natural language. Topics include language modeling, word and sentence representations, sentiment analysis, POS tagging, and syntactic parsing.

**480 Introduction to Artificial Intelligence (3:3:0).** *Prerequisite: Grade of C or better in CS 310 and 330.* Principles and methods for knowledge representation, reasoning, learning, problem solving, planning, heuristic search, natural language processing, and their application to building intelligent systems in a variety of domains. Uses LISP, PROLOG, or expert system programming languages.

**482 Computer Vision (3:3:0).** *Prerequisite: Grade of C or better in MATH 203, STAT 344 and CS 310.* Basic principles of visual perception and their implementation on computer systems. Topics include early visual processing, edge detection, segmentation, intrinsic images, image modeling, representation of visual knowledge, and image understanding. Students complete projects involving real images.

**483 Analysis of Algorithms (3:3:0).** *Prerequisite: Grade C or better in MATH 125 and CS 310 and 330.* Analyzes computational resources for important problem types by alternative algorithms and their associated data structures, using mathematically rigorous techniques. Specific algorithms are analyzed and improved.

**484 Data Mining (3:3:0).** *Prerequisite: Grade of C or better in CS 310, and in STAT 344 or 334.* Basic principles and methods for data analysis and knowledge discovery. Emphasizes developing the basic skills needed for modeling and prediction, on one side, and performance evaluation, on the other. Topics include system design; data quality, preprocessing, and association; event classification; clustering; biometrics; business intelligence; and mining complex types of data.

**485 Autonomous Robotics (3:3:0).** *Prerequisites: CS 262, 310, and MATH 203, or permission of the instructor.* This course covers various basic software topics in autonomous robotics, including autonomous architectures, elementary

kinematics and controls, simulation, localization and mapping, reasoning, and multiagent environments. The course will have several projects involving physical robots.

**487 Introduction to Cryptography (3:3:0).** *Prerequisites: CS 310, 330, and STAT 344.* Covers formal definitions of security for the most common tasks: data encryption and authentication, in both the private key and public key settings. Covers the process of formally proving that constructions meet the appropriate security definitions. Also covers practical constructions and applications, such as how to correctly use block ciphers and hash functions for the tasks above. In addition, several current topics in cryptography may also be covered.

**490 Design Exhibition (3:3:0).** *Prerequisite: Grade of C or better in CS 321, 483, two other CS 400-level courses and senior standing.* Capstone course focusing on the design and successful implementation of a major software project, encompassing a broad spectrum of knowledge and skills, developed by a team of students. Requires final exhibition to faculty-industry panel.

**491 Industry-Sponsored Senior Design Project (6:6:0).** *Prerequisite: Senior standing and grade of C or better in CS 367. Co-requisites: CS 321 and CS 483 (must be co-requisite with first semester of CS 491).* Senior design project course focusing on design and successful implementation of major software project specified by an industry sponsor, encompassing broad spectrum of knowledge and skills, developed by team of students. Requires final exhibition to faculty-industry panel.

**498 Independent Study in Computer Science (1-3:0:0).** *Prerequisite: 60 credit hours, major in computer science, and permission of instructor.* Research and analysis of selected problems or topics in computer science. Topic must be arranged with and instructor and approved by the department chair before registering. May be repeated for a maximum of 6 credits if the topics are substantially different.

**499 Special Topics in Computer Science (3:3:0).** *Prerequisite: CS 310 and 330; 60 credit hours and permission of instructor; specific prerequisites vary with nature of topic.* Topics of special interest to undergraduates. May be repeated for a maximum of 6 credits if the topics are substantially different.

## CS Honors Program

The Department of Computer Science offers a CS Honors Program for students with strong computational foundations and the drive to delve deeper into computing. Students must be seeking a Bachelor of Science in Computer Science or a Bachelor of Science in Applied Computer Science and must apply for entry into the CS Honors Program after completing 12 credits of CS courses. Applicants must meet GPA requirements to enter into the CS Honors Program.

## BS/Accelerated MS Degree Programs

These programs are for students interested in immediately continuing on to graduate studies in computer science:

BS/Accelerated MS in Computer Science  
BS/Accelerated MS in Information Security and Assurance  
BS/Accelerated MS in Information Systems  
BS/Accelerated MS in Software Engineering

**Admission Requirements:** Students in the BS program in computer science can apply for a BS/Accelerated MS program if they have completed CS 310, 330, earned 60 undergraduate credits, and have an overall GPA of at least 3.30.

**Degree Requirements:** Students must satisfy requirements of both the BS program as well as those for the MS program, with 3-12 credits of overlap. Students register for CS 500-level courses in place of the corresponding CS 400-level courses required for the undergraduate degree requirements. The approved CS courses are CS 540, 550, 551, 555, 571, 580, 583, 584, and 587, as well as SWE 619, 637, and 642. Students are permitted to take two additional graduate courses in reserve while completing their undergraduate programs (not dual counted).

**Degree Conferral:** Students must apply to have the BS degree conferred the semester before they expect to complete the BS requirements. At the completion of the MS requirements, a master's degree is granted.

Additional information about these and other degree options is available from the Computer Science Department office or at <http://catalog.gmu.edu>