response spectra, framed structures modeled as discrete multi-degree-of-freedom systems, dynamic analysis of nonlinear systems. Response of structural systems to earthquake excitation. PREREQ: ME 472.

CE 554 TIMBER DESIGN (3-0-3)(F/S). Design of wood, and wood composite, structures and systems based on mechanical and structural characteristics and specifications. PREREQ: CE 352.

CE 555 STRUCTURES II (3-0-3)(S)(Odd years). Analysis and design of structural systems. Stiffness method including the development of element properties, coordinate transformations, and global analysis theory. Three-dimensional building systems and an introduction to the Finite Element Method. PREREQ: CE 352.

CE 556 MASONRY DESIGN (3-0-3)(F/S). Design of masonry structures and systems based on mechanical and structural characteristics and specifications. PREREQ: CE 352.

CE 562 FOUNDATION DESIGN (3-0-3)(F/S). Design of foundations, slope stabilization, and retaining structures. PREREQ: CE 460.

CE 564 SEEPAGE, DRAINAGE, FLOW NETS AND EMBANKMENTS (3-0-3)(F/S). Emphasis on the applied aspects of groundwater flow and seepage through porous media from a theoretical point of view; examination and development of governing field equations; flow net construction, modeling techniques, filter design, construction dewatering; simplified design of small earthfill dams and slope stability of embankments. PREREQ: CE 360, CE 361.

CE 570 HIGHWAY AND TRAFFIC SYSTEMS DESIGN (2-3-3)(F/S). Planning, design, and operations of urban and rural highway systems. PREREQ: CE 360 and CE 370.

CE 572 TRANSPORTATION PLANNING (3-0-3)(S)(Odd years). Theory and practice of transportation planning at the metropolitan as well as regional levels. Use of software and completion of a project will be required. Recent advances in transportation planning will be introduced. PREREQ: CE 370 or PERM/INST.

CE 575 TRAFFIC ENGINEERING (3-0-3)(F)(Odd years). Covers the theory and practice of traffic operations, control, and management. Topics include traffic signal systems, isolated and area-wide signal system operations, and traffic simulation. Use of software and completion of a project will be required. PREREQ: CE 370 or PERM/INST.

CE 623 (GEOPH 623)(GEOS 623) ADVANCED HYDROGEOLOGY (3-0-3)(F). Treatment of groundwater occurrence and flow, theory fundamental mechanisms, hydrologic parameters, flow regimes and systems, geologic controls. May be taken for credit in GEOS, GEOPH, or CE, but not for more than one department. PREREQ: MATH 275, MATH 333, and GEOS 412 or GEOS 512 or CE 412 or CE 512 or PERM/INST.

CE 624 (GEOPH 624)(GEOS 624) APPLIED HYDROGEOLOGY (3-0-3)(S). Quantitative determination of hydrologic parameter values and groundwater flow conditions. Conceptual models and geologic context, boundary condition, analytical and numerical solution techniques, measurement methods, applications to engineering and environmental problems. May be taken for credit in CE, GEOPH, or GEOS, but not for more than one department. PREREQ: CE 623 or GEOPH 623 or GEOS 623 or PERM/INST.

ENGR—ENGINEERING SCIENCE

ENGR 500 RESEARCH METHODS (1-0-1)(F/S). Topics include defining a thesis or other research project, library and internet searching techniques, completing a literature review, preparing a research or project plan, research methods, preparing the thesis proposal, preparing the final thesis or research project document, and preparing a successful oral presentation.

Department of Computer Science

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Master of Science in Computer Science

Graduate Program Coordinator: Amit Jain
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General Information

The Master of Science in Computer Science program has been designed for people who have a good background in computer science at the undergraduate level—that is, either

- a baccalaureate degree in computer science, or
- a degree in a related field with significant course work in computer science.

The Computer Science Graduate Committee may grant provisional admission to promising students with limited computer science background.

Application and Admission Requirements

Applicants must have either a baccalaureate degree in computer science, or a baccalaureate degree in a related field plus substantial course work and/or professional experience in computer science, with an undergraduate GPA of 3.0 or higher.

Admission as a graduate student at Boise State University has two components: 1) admission to the Graduate College, which can occur with unclassified status and 2) admission to a particular program. To apply for admission to the Graduate College, complete the following steps:

- Submit the Boise State University Graduate Admission Application, along with the application fee, to Graduate Admission and Degree Services.
- Arrange for official transcripts from all post-secondary institutions attended to be sent directly to Graduate Admission and Degree Services.

To apply for admission to the graduate program in Computer Science, you will need to complete the following additional steps. A decision on admission into the masters program (for Regular or Provisional status) will not be considered prior to the completion of these steps.

- Send a cover letter, resume and an optional statement of interests directly to the Computer Science Graduate Committee in the Department of Computer Science.

- Take the GRE General test and arrange for the scores to be sent to the Graduate Admission and Degree Services.
- If you do not have a degree in Computer Science from a college or university with a ABET accredited program in Computer Science, you may take the GRE Computer Science Subject test to strengthen your application. The scores should be sent to the Graduate Admission and Degree Services.
- Arrange for three letters of reference that address your preparation for graduate study in computer science to be sent directly to the Computer Science Graduate Committee in the Department of Computer Science.

Regular and Provisional Status Completed applications will be reviewed by the Computer Science Graduate Committee.

- Applicants who meet the stated requirements and whose computer science background is deemed sufficient will be admitted to the program with Regular status.
- Applicants whose computer science background is deemed deficient may be granted admission with Provisional status. In this case the applicant will be required to pass specific undergraduate computer science courses in order to remove the deficiency and be granted Regular admission status.
- Unless otherwise specified, all deficiencies must be removed within two years of Provisional admission to the program. Time spent in Provisional status counts toward the limit of five years (or up to seven years if an extension is granted) allowed for completion of the degree.

Degree Requirements

The degree requirements described below allow the students a fair amount of flexibility in designing a program to fit his or her needs. The course work is to be chosen by the student, in consultation with his/her advisor and the Computer Science Graduate Committee. The Master of Science in Computer Science requires a minimum of 30 credit hours, as specified in the table below. In addition, the student's advisor and the Computer Science Graduate Committee must approve the student's proposed degree plan to ensure that it meets these criteria and forms a coherent program of study. All requirements for the degree must be completed within five years of initial enrollment in the program, unless the Computer Science Graduate Committee grants an explicit extension of time. In no event will more than seven years be allowed for completion of the degree.

Master of Science in Computer Science	
Course Number and Title	**Credits**
Graduate Courses related to Computer Science Graduate courses in computer science or a related field; all courses to be selected with student input and approved by the supervisory committee.	21-27
One of the following culminating activities Thesis or Project Option COMPSCI 591 Project..... 3-6 **OR** COMPSCI 593 Thesis 6-9	3-9
TOTAL	**30**

Course Offerings

COMPSCI—COMPUTER SCIENCE

COMPSCI 510 DATABASES (3-0-3)(S). Foundations of database management systems. Database models: relational, object and other models. Database design: entity-relationship modeling, logical relational schema design, physical design, functional dependencies and normalization, and database tuning. Database application development using database interfaces embedded in host languages. PREREQ: COMPSCI 342 or PERM/INST.

COMPSCI 512 ADVANCED TOPICS IN DATABASES (3-0-3)(F/S). Parallel and distributed database system architectures, distributed database design, client/server database systems. Selected topics from new developments in: extended relational databases, multimedia databases, information retrieval systems, object-oriented databases, temporal databases. PREREQ: COMPSCI 410 or COMPSCI 510 or PERM/INST.

COMPSCI 521 DESIGN AND ANALYSIS OF ALGORITHMS (3-0-3)(F/S). Design techniques such as amortized analysis, dynamic programming, and greedy algorithms. Computational geometry, graph algorithms, primality and other number-theoretic algorithms, specialized data structure techniques such as augmenting data structures, combinatorial graph reduction and functional repetition. NP completeness and approximation algorithms. PREREQ: COMPSCI 342 or PERM/INST.

COMPSCI 525 COMPUTER NETWORKS (3-0-3)(F/S). OSI reference model. Performance analysis of protocols—mathematical modeling and simulation. Quality of Service, flow control, and scheduling. MAC and routing in wireless networks. PREREQ: COMPSCI 425 and MATH 361 or PERM/INST.

COMPSCI 530 PARALLEL COMPUTING (3-0-3)(F). Models of parallel computation. Fundamental design patterns used in parallel algorithms: embarrassingly parallel, partitioning, divide and conquer, software pipelining, synchronous computations and load balancing. Implementation on parallel clusters. Hardware and systems software design of parallel systems. PREREQ: COMPSCI 253 and COMPSCI 342 or PERM/INST.

COMPSCI 531 ADVANCED PROGRAMMING LANGUAGES (3-0-3)(F/S). Advanced topics in programming-language theory, design, and implementation. Topics include: data types; binding, scope, and extent; abstraction, extensibility, and control mechanisms; formal semantics and program verification. Emphasis on alternative programming-language paradigms. PREREQ: COMPSCI 354 or PERM/INST.

COMPSCI 541 (ECE 532) COMPUTER ARCHITECTURE (3-0-3)(S). Structure of computer systems using processors, memories, input/output (I/O) devices as building blocks. Computer system instruction set design and implementation, including memory hierarchies, microprogramming, pipelining and multiprocessors. Issues and tradeoffs involved in the design of computer system architectures with respect to the design of instruction sets. Applications of hardware description languages (HDL) in the design of computer systems. May be taken for COMPSCI or ECE credit, but not both. PREREQ: COMPSCI 117 or COMPSCI 125 and ECE 332 or PERM/INST.

COMPSCI 542 QUANTITATIVE COMPUTER ARCHITECTURE (3-0-3)(S). Quantitative analysis on computer architectures and software optimizations with static and dynamic simulation techniques. Design implications of memory latency and bandwidth limitations. Performance enhancement via within-processor and between-processor parallelism. In particular, the study of pipelining, instruction-level parallelism, memory hierarchy design, storage systems, and multiprocessors are emphasized. PREREQ: COMPSCI 441 or PERM/INST.

COMPSCI 546 COMPUTER SECURITY (3-0-3)(F/S). Computer and network security. Public-key and private-key cryptography, authentication, digital signatures, key exchange, key management, certification authorities, and distributed trust models. File system security, Mail system security, and Web security. Intruders, Trojan Horses, and viruses. Covert channels. Projects will involve using currently available security tools. PREREQ: COMPSCI 453 or PERM/INST.

COMPSCI 550 PROGRAMMING LANGUAGE TRANSLATION (4-0-4)(S). Theory and practice of formal language translation, experience with compiler construction tools under UNIX. Students work on significant projects. PREREQ: COMPSCI 253 and COMPSCI 342 and COMPSCI 354 or PERM/INST.

COMPSCI 551 ADVANCED TOPICS IN COMPILATION (3-0-3)(F/S). Code generation, analysis, and optimization. Projects will use a simple framework for performing analysis and optimizations at the assembly level. PREREQ: COMPSCI 450 or COMPSCI 550.

COMPSCI 552 OPERATING SYSTEMS (4-0-4)(F). Process management, concurrency, interprocess communication, synchronization, scheduling, memory management, file systems and security. Case studies of multiple operating systems. PREREQ: COMPSCI 253 and COMPSCI 342 and ECE 332 or PERM/INST.

COMPSCI 554 ADVANCED OPERATING SYSTEMS (3-0-3)(S). In-depth exploration of the various components of an actual operating system. Includes modifying operating system code to observe behavior, adding new functionality, understanding how various parts work as well as other experiments. Special emphasis on soft and hard real-time operating systems. PREREQ: COMPSCI 453 or COMPSCI 552 or PERM/INST.

COMPSCI 555 DISTRIBUTED SYSTEMS (3-0-3)(S). Principles and paradigms of distributed systems. Communication, processes, naming, synchronization, consistency and replication, fault tolerance and security. In-depth coverage of Remote Procedure Call (RPC), Remote Method Invocation (RMI) and socket programming. Survey of major distributed systems. Several software projects. PREREQ: COMPSCI 453 or COMPSCI 552 or PERM/INST.

COMPSCI 557 ARTIFICIAL INTELLIGENCE (3-0-3)(F/S). Course will include a survey of some of the following topics, plus a project: Principles of knowledge-based search techniques; automatic deduction; knowledge representation using predicate logic, semantic networks, connectionist networks, frames, rules; applications in problem solving, expert systems, game playing, vision, natural language understanding, learning, robotics; LISP programming. PREREQ: COMPSCI 342 and COMPSCI 354 or PERM/INST.

COMPSCI 561 INTRODUCTION TO THE THEORY OF COMPUTATION (3-0-3)(F). Grammars, automata, Turing machines, decidability and complexity, language hierarchies, normal forms, NP-completeness, and reducibilities. Applications will be drawn from various areas of computer science. PREREQ: COMPSCI 342 or PERM/INST.

COMPSCI 562 COMPLEXITY THEORY (3-0-3)(S). Abstract machines, relativizations, upper and lower bounds on complexity, recursive hierarchies and alternation, time-space interaction, parallel and randomized complexity classes, approximation algorithms. PREREQ: COMPSCI 461 or COMPSCI 561

COMPSCI 564 COMPUTER GRAPHICS I (3-0-3)(F). The mathematics and programming techniques for computer graphics emphasizing raster graphics, rasterization algorithms, and scanline rendering. Two- and three-dimensional transformations, homogeneous coordinates, projections; clipping, hidden-surface removal. PREREQ: COMPSCI 342 and MATH 301; MATH 275 recommended.

COMPSCI 565 COMPUTER GRAPHICS II (3-0-3)(S). A continuation of COMPSCI 564. Polygonal representation of 3D objects, lighting models, shading and shadows, texture mapping, antialiasing, interactive graphics. Nonrecursive and recursive ray tracing. PREREQ: COMPSCI 464 or COMPSCI 564.

COMPSCI 567 CRYPTOLOGY I (4-0-4)(F). Introduction to modular arithmetic. The study of: the RSA, El-Gamal, Diffie-Hellman, and Blum-Blum-Shub public key cryptosystems, authentication and digital signatures, anonymity protocols. Protocol failures for these systems. Crosslisted with MATH 307 and COMPSCI 367; credit may be received for only one of these three courses. PREREQ: MATH 170, MATH 171, and MATH 187.

COMPSCI 568 CRYPTOLOGY II (4-0-4)(S). Introduction to groups, fields, polynomial rings and Lucas numbers. The study of: the Elliptic Curve, LUC, and NTRU public key cryptosystems, authentication and digital signatures, anonymity protocols. Crosslisted with MATH 308 and COMPSCI 368; credit may be received for only one of these three courses. PREREQ: MATH 170, MATH 171, and MATH 187.

COMPSCI 571 SOFTWARE ENGINEERING (3-0-3)(F). A formal study of the software development process. Topics include: lifecycle models, requirements definition, specification, design, implementation, validation, verification, maintenance, and reuse. Students work in small teams on significant projects. PREREQ: COMPSCI 342 or PERM/INST.

COMPSCI 572 OBJECT-ORIENTED DESIGN PATTERNS (3-0-3)(S). Reviews object-oriented design principles, explains the goals and form of design patterns, and examines several well-known patterns. PREREQ: COMPSCI 342 or PERM/INST.

COMPSCI 573 ADVANCED SOFTWARE ENGINEERING (3-0-3)(S). A study of selected aspects of contemporary software development methodology. Topics are taken from recent research articles. These topics include: definition of user requirements, formal specification of solutions, design and implementation techniques, validation and testing, verification, maintenance, and reuse. PREREQ: COMPSCI 471 or PERM/INST.

SELECTED TOPICS (Variable credit). In depth study of current trends and advanced topics in targeted areas of computer science.

COMPSCI 580 PARALLEL COMPUTING
COMPSCI 581 ALGORITHMS
COMPSCI 583 COMPUTER SECURITY
COMPSCI 584 NETWORKS
COMPSCI 585 OBJECT-ORIENTED DESIGN
COMPSCI 586 DATABASES
COMPSCI 587 SOFTWARE ENGINEERING

COMPSCI 591 PROJECT (Variable credit).

COMPSCI 593 THESIS (Variable credit).

COMPSCI 600 ASSESSMENT [Comprehensive Examination] (1 Credit)(Pass/Fail).