

Department of Computer Science

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The Department of Computer Science offers the Master of Science with a major in Computer Science and a minor at the graduate level.

Admission to the master's program requires a satisfactory Graduate Record Examination score.

Requirements for the Master of Science

Candidate must

1. meet the following requirements:
 - a. have completed CSCI 1170, 2170, 3080, 3110, 3130, 3160, and 3250 or equivalent of each course;
 - b. complete CSCI 5700 if he or she did not complete CSCI 4700 or an equivalent course as an undergraduate; and
 - c. complete CSCI 5560 if he or she did not complete CSCI 4560 or an equivalent course as an undergraduate.
2. have completed MATH 1910 and 2050 or equivalent of each course.
3. complete at least 24 semester hours of graduate computer science courses at MTSU.
4. complete one of the following two options:
 - a. **Thesis option:** A thesis and at least 30 hours of graduate coursework. Up to 3 hours in CSCI 6640 may be included in the 30 hours. Students must present an oral defense of the thesis. A minimum of 21 hours must be at the 6000 level.
 - b. **Nonthesis option:** At least 36 hours of graduate coursework. Successfully complete a comprehensive examination. Credit for CSCI 6640 may not be included in the 36 hours. A minimum of 24 hours must be at the 6000 level.
NOTE: A student already holding a master's degree from MTSU may complete a second master's degree in Computer Science by satisfying either of the above options with a minimum of 27 semester hours. A minimum of 18 hours must be at the 6000 level.
5. take all courses in the Computer Science Department with the following possible exceptions:
 - a. with the prior approval of the Computer Science graduate faculty, a maximum of 6 hours of cognate courses may come from departments other than Computer Science.
 - b. with the approval of the candidate's graduate advisor, a single minor up to 12 semester hours may be included. Such a minor must also be approved by the department offering the minor.
NOTE: With the approval of the Computer Science graduate faculty, a maximum of 12 semester hours of residence credit (maximum of 6 in Computer Science) may be transferred from another institution and applied to the master's degree.

Courses in Computer Science [CSCI]

- 5130 Microprocessor Operation and Control.** Three credits. Prerequisite: CSCI 3160. Digital systems based around microcomputers, microcomputer architecture, logic replacement, memory design, timing considerations, input/output design, interfacing, robotics, and total system design.
- 5160 Compiler Design and Software Development.** Three credits. Prerequisites: CSCI 3080, 3110, and 3160. The various phases of a compiler along with grammars, finite automata, regular expressions, LR parsing, error recovery, backward and forward flow analysis, and code optimization. A term project consisting of the design and construction of a functional compiler required.
- 5250 Computer Graphics.** Three credits. Prerequisites: CSCI 2170 and 3080 or consent of instructor. Topics include vector drawing displays, raster scan displays, input devices and techniques, graphics software, transformations, projections, interpolation, and approximation.
- 5300 Data Communication and Networks.** Three credits. Prerequisite: CSCI 3250. Computer network architectures, protocol hierarchies, and the open systems interconnection model. Modeling, analysis, design, and management of hardware and software on a computer network.
- 5350 Introduction to Artificial Intelligence.** Three credits. Prerequisites: CSCI 2170 and 3080 or equivalent. Principles and applications of artificial intelligence. Principles include search strategies, knowledge representation, reasoning, and machine learning. Applications include expert systems and natural language understanding.
- 5360 Intelligent Robot Systems.** Three credits. Prerequisites: CSCI 2170 and 3080. Principles and applications of intelligent mobile robotics. Various architectures used in the basic AI robotics development paradigms and basic techniques used for robot navigation. Strong emphasis on hands-on mobile robot design, construction, programming, and experimentation using a variety of robot building platforms.
- 5410 Web Technologies.** Three credits. Prerequisites: CSCI 3080 and 3110. An intensive introduction into current Web technologies including basic HTML, tools for Web page design, XML, client-side methods, and server-side methods. Students will be required to implement several Web-based projects.
- 5560 Database Management Systems.** Three credits. Prerequisites: CSCI 3080 and 3110. The relational and object models of database design along with relational algebras, data independence, functional dependencies, inference rules, normal forms, schema design, modeling languages, query languages, and current literature.
- 5600 Independent Study in Computer Science.** One to six credits. Prerequisite: Consent of instructor. Students wishing to enroll must submit a written course/topic proposal to the department prior to the semester in which CSCI 5600 is taken. Proposal must be approved prior to taking the course. At the conclusion of the course, each enrollee will submit a written summary of the project.
- 5700 Software Engineering.** Three credits. Prerequisites: CSCI 3080 and 3110. Consists of a theoretical component and a practical component. Topics include the history of software engineering, software development paradigms and life cycles, and computer-aided software engineering (CASE). A team project will be developed in parallel with the theory.

- 5800 Software Testing.** Three credits. Prerequisites: CSCI 2170 and 3080. Integrates theory and applications of software testing techniques. Provides actual hands-on testing experience. Considers multiple testing paradigms.
- 5850 Neural Nets.** Three credits. Prerequisite: CSCI 3080. Various neural net architectures, theory, and applications, including models such as Perceptron, back propagation, Kohonen, ART, and associative memory. Learning and conditioning methods also studied.
- 5900 Selected Topics in Computer Science.** Three credits. Prerequisite: CSCI 2170. Advanced topics in computer science to be selected and announced at time of class scheduling. May be repeated for up to six credits total.
- 6020 Data Abstraction and Programming Fundamentals.** Four credits. Prerequisites: Previous programming experience in a high-level language and consent of instructor. Advanced introduction to data abstraction, problem solving, and programming. Programming language concepts, recursion, program development, algorithm design and analysis, data abstraction, objects and fundamental data structures such as stacks, queues, and trees. Three hours lecture and two hours lab.
- 6050 Computer Systems Fundamentals.** Four credits. Prerequisite: CSCI 6020 or equivalent. Advanced introduction to computer systems. Data representations, computer arithmetic, machine-level representations of programs, program optimization, memory hierarchy, linking, exceptional control flow, virtual memory and memory management, basic network concepts, and basic concurrent concepts and programming. Three hours lecture and two hours lab.
- 6100 Analysis of Algorithms.** Three credits. Prerequisites: CSCI 3080 and 3110 or consent of instructor. Topics include the analysis and design of algorithms; efficiency of algorithms; design approaches including divide and conquer, dynamic programming, the greedy approach, and backtracking; P and NP; and algorithms in many areas of computing.
- 6130 Selected Topics in Parallel Processing.** Three credits. Prerequisite: CSCI 4330/5330. An in-depth investigation of one or more topics in parallel processing. Topic(s) to be selected by the professor. Possible topics include parallel algorithms, parallel programming languages, parallel programming tools, parallel software engineering, parallel architectures, parallel applications, and parallel VLSI. Repeatable up to 6 hours.
- 6180 Software Design and Development.** Three credits. Prerequisite: CSCI 3110. State-of-the-art techniques in software design and development; provides a means for students to apply the techniques.
- 6190 Theory of Compilers.** Three credits. Prerequisite: CSCI 4160/5160. Theory of parsing methods as well as symbol table construction, code optimization, run time storage management, and implementation of recursion.
- 6250 Advanced Operating Systems.** Three credits. Prerequisite: CSCI 3250. Topics include concurrent processes, name management, resource allocation, protection, advanced computer architecture, and operating systems implementation.
- 6260 Advanced Computer Graphics.** Three credits. Prerequisite: CSCI 4250/5250. Topics include three-dimensional curves and surfaces, projections, hidden line and surface elimination, raster graphics systems, and shading techniques.
- 6300 Networks.** Three credits. Prerequisite: CSCI 4300/5300. Computer communications, network architectures, protocol hierarchies, and the open systems interconnection model. Modeling, analysis, and specification of hardware and software on a computer network. Wide area networks and local area networks including rings, buses, and contention networks.
- 6330 Parallel Processing Concepts.** Three credits. Prerequisites: CSCI 3130, 3250, and a working knowledge of either C or C++ . Parallel processing and programming in a parallel environment. Topics include classification of parallel architectures, actual parallel architectures, design and implementation of parallel programs, and parallel software engineering.
- 6350 Selected Topics in Artificial Intelligence.** Three credits. Prerequisites: CSCI 3110 and 4350/5350. In-depth study of the principal areas of the field: artificial intelligence programming, problem-solving methods, knowledge representation methods, deduction and reasoning, and applications such as natural language processing and expert systems. Repeatable up to 6 hours.
- 6450 Operating System Design.** Three credits. Prerequisite: CSCI 6250. Definition, design, and implementation of a significant operating system examining such areas as file systems, process management, memory management, input/output device management, and user interface.
- 6550 Introduction to Symbolic and Algebraic Manipulation.** Three credits. Prerequisites: CSCI 3110 and 4350/5350. Techniques for algebraic manipulation on the computer. Includes symbolic differentiation and integration, extended precision arithmetic, polynomial manipulation; introduces one or more symbolic manipulation systems. Automatic theorem provers considered.
- 6560 Selected Topics in Database.** Three credits. Prerequisite: CSCI 4560/5560. An in-depth investigation of one or more topics in database. Topic(s) to be selected by the professor. Possible topics include object-oriented database systems, distributed database systems, client-server database systems, deductive databases, multimedia databases, and database theory (concurrency, query optimization, recovery, security). Repeatable up to 6 hours.
- 6600 Selected Topics in Computer Science.** Three credits. May be repeated for up to six credits total. Prerequisites: A solid foundation in undergraduate computer science and any prerequisites determined by the instructor. An in-depth investigation of one or more topics in computer science. Topic(s) to be selected by the professor. Possible topics include search techniques, for example genetic algorithms, soft computing, object-oriented software engineering, expert systems, program verification, software quality, knowledge discovery in databases, and design of embedded software systems.
- 6620 Research Methods in Computer Science.** Three credits. Prerequisite: Twelve hours of graduate work in computer science. Emphasizes communication skills, creative thinking, problem solving, and integration of knowledge from prior computer science courses. Includes a study of computer science research tools. Students will select a research problem with approval of the instructor, review pertinent literature, and produce a report using the manual of thesis writing currently approved by the College of Graduate Studies.
- 6640 Thesis Research.** One to six credits. Selection of a research problem, review of pertinent literature, collection and analysis of data, and composition of thesis. Once enrolled, student should register for at least one credit hour of master's research each semester until completion. S/U grading.

- 6700 Selected Topics in Software Engineering.** Three credits. Prerequisite: CSCI 4700/5700 or equivalent. In-depth investigation of one or more topics in software engineering selected by the professor. Possible topics include rewriting system, graph grammar, formal method, source transformation, software architecture, and reverse engineering. Repeatable up to 6 hours.
- 7300 Scientific Visualization and Databases.** Four credits. Prerequisites: Fundamental courses in the Computational Science Ph.D. program and CSCI 6020 or equivalent or consent of instructor. Introduction to the concepts, theories, and applications of database and visualization methodologies for scientific data. Relational database design along with relational algebras, data independence, functional dependencies, inference rules, normal forms, schema design, modeling language, and query languages discussed. Methods corresponding to the visualization of scalar, vector, and tensor fields as well as multifield problems discussed. Database and visualization discussed in the context of scientific applications.
- 7350 Data Mining.** Three credits. Prerequisite: Fundamental courses in the Computational Science Ph.D. program and CSCI 6020 or equivalent or consent of instructor. Introduction to concepts, theories, techniques, issues, and applications of data mining. Data preprocessing, association rule analysis, classification analysis, cluster and outlier analysis, deviation detection, statistical modeling, consideration of emergent technologies.

