

DEPARTMENT OF COMPUTER SCIENCE

Undergraduate Degree(s):

- Bachelor of Science and Master of Science Accelerated 4+1 Computer Science (General CS Concentration) (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/computer-science/accelerated-41-computer-science-general-cs-concentration-ba-ms/>)
- Bachelor of Science in Computer Science (Computer Networks Concentration) (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/computer-science/computer-science-computer-networks-concentration-bs/>)
- Bachelor of Science in Computer Science (General CS Concentration) (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/computer-science/computer-science-general-cs-concentration-bs/>)

Minor(s):

- Computer Science (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/computer-science/computer-science-minor/>)

Graduate Degree(s):

- Master of Science in Computer Science Plan A. (Thesis Option) (<https://catalog.tsu.edu/graduate/schools-colleges/science-engineering-technology/computer-science/computer-science-thesis-option-ms/>)
- Master of Science in Computer Science Plan B. (Non-Thesis option) (<https://catalog.tsu.edu/graduate/schools-colleges/science-engineering-technology/computer-science/computer-science-non-thesis-option-ms/>)

The Department of Computer Science (<http://cs.tsu.edu>) prepares students for careers in the computing industries and advanced study. The curriculum ensures that students are exposed to the most current knowledge, theories, and principles in software development, embedded systems, hardware architectures, and network theory and applications. The curriculum provides for an understanding of the applications of theories and concepts by involving the students in research and applications development projects. The curriculum is designed to enhance the problem solving and creative thinking capabilities of students so that they have a set of skills that will increase their employment opportunities and provides the foundation for graduate study and research. The educational objectives of the Computer Science Program are as follows:

1. To prepare students to be capable of identifying and analyzing requirements for computing systems.
2. To produce graduates who are capable of designing and implementing solutions for rapidly changing computing problems and information system environments.
3. To prepare graduates with good communication skills and who are able to effectively work in teams.
4. To produce graduates who are capable of gauging the impact of computing on society, and possess knowledge of the ethical, social and professional implications and responsibilities of their work.

5. To prepare students to engage in life-long learning, to adapt to innovation and change, and to successfully pursue professional work and graduate studies.

The Department of Computer Science offers programs that lead to the Bachelor of Science in Computer Science degree and the Master of Science in Computer Science degree. Students majoring in other disciplines are encouraged to pursue a minor in Computer Science, since virtually all employers are critically dependent upon computers. Significant opportunities for employment and graduate study are also available for students in other information technology enabled fields and organizations for students with a minor in Computer Science.

These programs are designed to prepare graduates for productive work in highly complex computing environments in business, industry, and government. In recent years, many graduates of the program have obtained positions in business applications, software development, computational science and applied mathematics, and have gone to graduate school. Students majoring in computer science should set their goals to become expert software developers and to have developed the following abilities:

1. To apply knowledge of computing, mathematics, science, and business appropriate to the discipline, including the ability to analyze and evaluate performance tradeoffs of algorithms, data structures, and hardware solutions.
2. To analyze a problem, and identify and define the computing requirements appropriate to its solution.
3. To design, implement and evaluate computing systems, processes, components, or programs to meet desired needs.
4. To function effectively on teams to accomplish a common goal.
5. To understand the professional, ethical, legal, security, social issues and responsibilities of the profession.
6. To communicate effectively with a range of audiences.
7. To analyze the local and global impact of computing on individuals, organizations and society.
8. To recognize the need for, and an ability to engage in, continuing professional development.
9. To use current techniques, skills, and tools necessary for computing practices.
10. 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 risks and tradeoffs involved in design choices.
11. To apply design and development principles in the construction of software systems of varying complexity.

Realizing that students pursuing a bachelor's degree in computer science may have different career goals, the Department of Computer Science offers two concentrations to the Bachelor's degree in Computer Science.

Concentration 1: The Bachelor of Science in Computer Science with General CS Concentration is designed for students who plan to focus on software development have a broad fundamental education to allow them to address many areas of computing applications when they graduate. They may work in cooperation with professionals trained in areas other than computer science and may need to have knowledge in several subject areas. Students who major in Computer Science and prefer to follow this concentration will have elective courses that can be in computer science or any other academic discipline. The curriculum of this Concentration is designed to provide the students

with in-depth computer science knowledge but broadens it with additional knowledge from another field of their choice. This improves their competitiveness in the job market especially for jobs requiring interactions and communications with others of different educational backgrounds.

Concentration 2: The Bachelor of Science in Computer Science with Computer Networks Concentration is designed for students who plan to work in the rapidly growing field of computer networks. The curriculum of this Concentration is designed to provide the students with the same breadth of computer science knowledge as the other concentration but with more depth in the area of computer networks. Once they graduate, students pursuing this concentration will be ready to apply for leading industry certificates such as the Cisco Certified Network Associate (CCNA) certificate which improves their competitiveness in today's challenging job market where networking is an essential ingredient of almost every business.

The requirements for the Bachelor of Science in Computer Science are summarized at the end of this section along with the sequence in which major courses must be taken for each track. **Students must earn grades of "C" or better in all courses specific to their major in computer science.**

Each student must be admitted by the Department as a major, before attempting to meet all of the requirements for the degree. The admissions procedures are under continual review by the Departmental Curriculum and Admissions Committee. Interested students are asked to contact the Department Office during their freshman year in order to gain admission as majors. Students are responsible for completing ASSET requirements and prerequisites administered through the Student Academic Enhancement Services prior to admission to the department. The Department offices and facilities are housed on the third floor of New Technology Building with the Department Office located in Room 314. The Department website is <http://cs.tsu.edu>.

Students transferring to the University are cautioned that computer science credits transferred from other colleges and universities must be evaluated by the Department before being used to fulfill requirements for the major in Computer Science. These credits may or may not be acceptable. If these credits are judged to be unacceptable by the Department, students may be able to use them to fulfill some elective requirements.

Students pursuing the B.S. in computer science for the General CS Concentration should seek detailed advisement from their designated advisors when selecting the elective courses required for this concentration.

In order for students to pursue either majors or minors in the Department, they must petition for admission to the Department by completing the appropriate form which is available through the Department Office. The petition must be returned to the Department Office and must be reviewed by the Departmental Curriculum and Admissions Committee. Students must have completed the courses listed below or their equivalents:

Code	Title	Hours
ENGL 1301	Freshman English I	3
MATH 2312	Precalculus Math	3
CS 120	Introduction to Programming Using C++	3
CS 124	Fund Machine Computation	3

Each student applying for major or minor status must have an overall grade point average (GPA) of 2.50 or better and must have earned grades of "C" or better (grades of "C-" are unacceptable) in the above courses.

The petition must be returned to the Department Office by the appropriate deadlines given below to be considered by the Departmental Curriculum and Admissions Committee:

October 15 during Fall
March 15 during Spring
June 15 during Summer

The number of students admitted to major and minor status on an ongoing basis is dependent upon the availability of resources on a year-to-year basis, on performance in the four courses targeted above, and on overall GPA's earned. Preference will be given to students earning the highest overall GPAs above the required minimum of 2.50. Each student will be notified of the decision of the Departmental Curriculum Admissions Committee with regard to his/her status approximately one month after the above deadlines.

Once students have been admitted to the Department as major or minor status, they are each expected to maintain an overall GPA of 2.25 or better, or they could be dismissed from the Department if more than thirty (30) semester credit hours are still required for graduation. If individual GPA's fall below 2.25 and students are within thirty (30) semester credit hours of graduation, they must contact the Department Advisor for a plan of action.

Upon admission to the Department, students are each assigned an official advisor. They are expected to keep the Department Office informed of changes in address and/or telephone numbers up to the time of graduation.

In summary, an interested student must first gain admission to the University; must meet his/her ASSET responsibility; and finally, must apply for admission to the Department once prerequisites and ASSET requirements have been met. Acceptance to major standing is not automatic, but subject to the decision of a Departmental Curriculum and Admissions Committee. Each student is provided with extensive advisement once admitted to the Department before further progression toward the completion of degree requirements is undertaken. Questions may be directed to the Department Office at (713)-313-7991 or to cs@tsu.edu.

Accelerated 4+1 Bachelor and Master's in Computer Science

The 4+ 1 academic program is open to students in the College of Science, Engineering and Technology seeking a B.S. degree in Computer Science with General CS Concentration. Admission to this graduate programs is not automatic. The principal eligibility factors are the student's cumulative GPA and the Computer Science courses GPA. The five-year program includes 143 academic hours of coursework. Students entering the Master's program through the 4+1 are not required to complete the GRE.

Designed for the dedicated and driven TSU student, the accelerated 4+1 program combines graduate course work with advanced undergraduate course work, enabling students to earn both a bachelor and master degree within five years. It provides top undergraduate students the flexibility to begin taking classes toward their master's degree during

their senior year of undergraduate studies. It also allows students to share nine credit hours between their bachelor's and master's degrees.

The accelerated 4+1 programs in Computer Science (CS) is available for students currently admitted in the Bachelor of Science (B.S.) in Computer Science program. Students entering the 4+1 accelerated program will be admitted to the Master's of Science in Computer Science thesis program or the Master of Computer Science non-thesis program. Due to the research required for the thesis based program, it may take more than one year of graduate work to complete the Master's degree.

The integration between the two programs occurs when students select their CS elective courses. The courses elected to double count (CS5XX) will apply toward the 31-hour master's degree (in addition to applying toward the 121-hour bachelor's degree). Once the bachelor's degree is completed, students will need an additional 22 credit hours to earn the master's degree.

Students interested in this program must meet the following eligibility requirements to be considered for admission:

1. Have at least 90 credits completed.
2. Have a cumulative TSU GPA of 3.0.
3. Have grades posted for all 300 level required courses.
4. Have a cumulative GPA of 3.0 or higher for computer science courses.
5. Have two semesters left in undergraduate program at time of admission to the master's program (senior year course work).

Students earning a B.S. degree can use up to nine credits of course work which must be CS 5XX courses.

Students in the 4+1 accelerated program must follow all course requirements pertaining to both programs. Satisfactory progress in the program is achieved if the student maintains a 3.00 GPA in overall graduate course work in the student's master's program. The student may drop out of the 4+1 accelerated program and return to a regular B.S. program at any point of time. Students opting to not continue with the 4+1 accelerated program will no longer be able to double count the nine hours towards their graduate degree. Those nine hours will only count for undergraduate credit for their B.S. degree.

Students who are dismissed, or voluntarily withdraw, from the 4+1 accelerated program and return to undergraduate status, are eligible to apply for admission to the stand-alone master's program in Computer Science.

- Accelerated 4+1 Computer Science (General CS Concentration), BS MS (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/computer-science/accelerated-41-computer-science-general-cs-concentration-bs-ms/>)
- Computer Science (Computer Networks Concentration), Bachelor of Science (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/computer-science/computer-science-computer-networks-concentration-bs/>)
- Computer Science (General CS Concentration), Bachelor of Science (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/computer-science/computer-science-general-cs-concentration-bs/>)
- Computer Science Minor (<https://catalog.tsu.edu/undergraduate/schools-colleges/science-engineering-technology/computer-science/computer-science-minor/>)

Computer Science Undergraduate Courses

CS 116L Intro To Comp Science Lab I (1 Credits)

Lecture: 0, **Lab:** 1

Introduction to Computer Science Laboratory I 1 (1) Laboratory course designed to complement CS 116 and focuses on the fundamental concepts of computing such as how computers work, what they can do, and how they can be used effectively. Two hours of laboratory per week. Co-requisite: CS 116.

College/School: Col of Science, Engr & Tech

Department: Department of Computer Sci

CS 117 Intro To Comp Science II (3 Credits)

Lecture: 3, **Lab:** 0

Introduction to Computer Science II (non-majors) (3) Introduction to World Wide Web applications and design, including Web scripting languages and HTML editors. Three hours of lecture per week.

Prerequisite(s): CS 116

College/School: Col of Science, Engr & Tech

Department: Department of Computer Sci

TCCN: COSC 1301

CS 117L Intro To Comp Science II (1 Credits)

Lecture: 0, **Lab:** 1

Introduction to Computer Science Laboratory II† (1) Laboratory course designed to complement CS 117 and provides hands on activities that focus on World Wide Web applications and their design, including Web scripting languages and HTML. Two hours of laboratory per week. Co-requisite: CS 117.

College/School: Col of Science, Engr & Tech

Department: Department of Computer Sci

CS 120 Introduction to Programming Using C++ (3 Credits)

Lecture: 3

This course covers algorithms, flowcharts, pseudo code, number systems, types, decision making, loops, strings, arrays, and functions. Three credit hours credit.

College/School: Col of Science, Engr & Tech

Department: Department of Computer Sci

TCCN: COSC 1320

CS 120L Intro to Comp & Problem Lab (1 Credits)

Lab: 1

College/School: Col of Science, Engr & Tech

Department: Department of Computer Sci

CS 122 Microcomputer App (3 Credits)

Lecture: 3, **Lab:** 0

Prerequisite(s): (CS 116)

College/School: Col of Science, Engr & Tech

Department: Department of Computer Sci

CS 124 Fund Machine Computation (3 Credits)

Lecture: 3, **Lab:** 0

Fundamentals of Machine Computation (3) Study of the theory and applications of discrete mathematical structures as a foundation for topics in computer science. Required for computer science majors and minors. Three hours of lecture per week. Prerequisite: MATH 136.

Prerequisite(s): MATH 136

College/School: Col of Science, Engr & Tech

Department: Department of Computer Sci

TCCN: COSC 1315

CS 140 Computer Programming in Java (3 Credits)**Lecture:** 3

Computer Programming in Java (3) Introduction to the JAVA programming language that covers the use of object oriented programming methodologies such as class inheritance, polymorphism, multithreading, generics, GUI components, and exceptions. Required for computer science majors and minors. Three hours of lecture per week. Prerequisite: CS 120.

Prerequisite(s): CS 120**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 140L Computer Programming using Java Lab (1 Credits)****Lab:** 1

A laboratory course in computer programming in Java. Complements the concepts covered in CS 140. Helps students gain hands-on programming experience through examples and exercises tailored for CS 140 lectures. Topics include data types, variables, input/output, conditional statements, loops, arrays, and functions. Two contact hours per week. Co-Requisite: CS 140.

College/School: Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 216 Advanced Applications I (3 Credits)****Lecture:** 3, **Lab:** 0

Advanced Applications I (non-majors) (3) Designed for students interested in learning computer programming applications using VISUAL BASIC. Design, implementation, and testing of programs and graphical user interfaces. Process of using VISUAL BASIC to access object oriented model of other applications also considered. Three hours of lecture per week. Prerequisite: CS 117.

Prerequisite(s): CS 117**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 216L Advanced Applications I (1 Credits)****Lecture:** 0, **Lab:** 1

Advanced Applications Laboratory I 2 (1) Laboratory course designed to complement CS 216. Provides hands on experience that focuses on the study of computer programming using VISUAL BASIC. Two hours of laboratory per week. Corequisite: CS 216.

College/School: Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 217 Advanced Applications II (2 Credits)****Lecture:** 2, **Lab:** 0

Advanced Applications II (3) This course is a continuation of CS 216 providing advanced study of software application development in the WINDOWS environment. Students develop customized software products with applications related to subject area matter studied. Two hours of lecture and one hour of lab per week. Prerequisite: CS 216.

Prerequisite(s): CS 216**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 217L Advance Applications Lab II (1 Credits)****Lecture:** 0, **Lab:** 1

Advanced Applications Laboratory II (1) Laboratory course designed to complement CS 217. Provides hands on experience that focuses on software application development in the WINDOWS environment. Two hours of laboratory per week. Co-requisite: CS 217.

College/School: Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 224 Prog PASCAL (3 Credits)****Lecture:** 3, **Lab:** 0**Prerequisite(s):** (CS 120)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 241 Advanced OOP Using C++ (3 Credits)****Lecture:** 3, **Lab:** 0

Object Oriented Programming Using JAVA (3) The use of modern object oriented programming methodologies such as class inheritance, polymorphism, multithreading, generics, GUI components, and exceptions. JAVA programming language is used. Required for computer science majors and minors. Three hours of lecture per week. Prerequisite: CS 140.

Prerequisite(s): (CS 120)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 243 Computer Organization (3 Credits)****Lecture:** 3, **Lab:** 0

Computer Organization (3) Basic concepts of digital computers: Boolean algebra, combinatorial and sequential logic design, arithmetic/logic units, control units, memory units, and input/output units, flip flops, synchronized and asynchronous counters. Required for computer science majors and minors. Three hours of lecture per week. Prerequisites: CS 124 and CS 140.

Prerequisite(s): (CS 124)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**TCCN:** COSC 2325**CS 246 Data & File Structures (3 Credits)****Lecture:** 3, **Lab:** 0

Data and File Structures (3) Advanced programming techniques and data structures including tables, linked lists, queues and stacks. Abstract data types, recursion, searching and sorting, hashing, binary trees. External storage devices and sequential and direct file organization, file processing techniques. Required for computer science majors and minors. Three hours of lecture per week. Prerequisites: CS 124, CS 140.

Prerequisite(s): (CS 124 and CS 140)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 248 Theory of Computation (3 Credits)****Lecture:** 3, **Lab:** 0

Theory of Computation (3) Introduction to automata and languages, computability and complexity of algorithms. This course covers graph theory, finite state automata, determinism non-determinism, regular expressions, context free and non-context free grammars, algorithm definition, algorithm complexity, class P, class NP algorithms and NP-completeness. Required for computer science majors. Three hours of lecture per week. Prerequisites: MATH241, CS 243. Corequisite: CS246

Prerequisite(s): (MATH 241 and CS 243)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci

CS 250 Computer Networks Fundamentals (3 Credits)**Lecture:** 3

Computer Networks Fundamentals (3) Introduction to the fundamental networking concepts and technologies focusing on both the conceptual and practical skills needed to understand basic networking. Students will gain an understanding of the "layered" approach to networks and examine the OSI and TCP/IP layers in detail to understand their functions and services. It provides an overview to various network devices, network addressing schemes and, finally, the types of media used to carry data across the network. Required for computer science majors and concentration II minors. Three hours of lecture per week. Prerequisite: CS 120.

Prerequisite(s): (CS 120)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 251 Internetworking & Routing (3 Credits)****Lecture:** 3

Internetworking and Routing Basics (3) A comprehensive study of internetworking as well as routing concepts and protocols is presented to develop an understanding of how networks are linked together. An introduction to routers, their role in the network, their main hardware and software components, and the packet forwarding process is included. This course covers the foundations of static and dynamic routing protocols. It provides a detailed study of various Distance Vector as well as Link State protocols and examines their characteristics, operations, limitations, configuration, and troubleshooting techniques. Required for computer science concentration II majors and concentration II minors. Three hours of lecture per week. Prerequisite: CS 250.

Prerequisite(s): (CS 250)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 342 Prog Lang & Design (3 Credits)****Lecture:** 3, **Lab:** 0

Programming Languages and Design (3) Introduction to the structure and design of the programming language paradigm, formal specification of syntax, semantics, functional languages, logic languages, parallel languages, data types and interfacing procedures. Required for computer science majors. Three hours of lecture per week. Prerequisites: CS 241, CS 248.

Prerequisite(s): (CS 241 and CS 248)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 343 Assembly & Comp Archi (3 Credits)****Lecture:** 3, **Lab:** 0

Assembly and Computer Architecture (3) Rigorous study of the architecture, applications, programming, and interfacing of current microprocessors, co-processors, and controllers. Hardware and software structures found in modern digital computer systems. Parallel architectures included. Required for computer science majors. Three hours of lecture per week. Prerequisite: CS 243.

Prerequisite(s): (CS 243)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 344 Compiler Des & Const (3 Credits)****Lecture:** 3, **Lab:** 0

Compiler Design and Construction (3) Concepts, design, implementation and construction techniques for programming language translators, simple one-pass compiler; lexical analysis; semantics analysis, top-down, bottom-up and operator precedence parsing, left-left and left-right parser techniques. Three hours of lecture per week. Prerequisite: CS342

Prerequisite(s): CS 342**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 346 Database Mgmt System (3 Credits)****Lecture:** 3, **Lab:** 0

Database Management Systems (3) Theory and current practices in database management systems, data organizational models, including hierarchical and networked, with relational and semantic models stressed. Required for computer science majors. Three hours of lecture per week. Prerequisites: CS246, CS 248.

Prerequisite(s): (CS 246 and CS 248)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 350 LAN Fundamentals (3 Credits)****Lecture:** 3

Local Area Network Fundamentals (3) This course covers an introduction to LAN switching and wireless LANs and. in depth examination of the underlying concepts and processes of the common Layer 2 switching protocols and technologies. It provides the necessary knowledge required to implement, verify, and troubleshoot Local Area Networks. It also covers wireless LAN standards and concepts required to design, implement and troubleshoot wireless LANs. Required for computer science concentration II majors and concentration II minors. Three hours of lecture per week. Prerequisite: CS 250.

Prerequisite(s): (CS 251)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 351 WAN Technologies (3 Credits)****Lecture:** 3

Wide Area Network Technologies (3) This course is an introduction to the various wide area networks (WANs) access technologies used to connect small-to medium-sized business networks. This course introduces WAN converged applications and quality of service (QoS). It focuses on WAN technologies including PPP, Frame Relay, broadband links, and WAN security concepts. It covers the principles of traffic control and access control lists and describes how to implement IP addressing services for an Enterprise network, including how to configure NAT and DHCP. Finally, students learn how to detect, troubleshoot and correct common Enterprise network implementation issues. Required for computer science concentration II majors and concentration II minors. Three hours of lecture per week. Prerequisite: CS 251.

Prerequisite(s): (CS 350)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci

CS 354 Web Appl Development (3 Credits)**Lecture:** 3, **Lab:** 0

Logic Programming Using Prolog (3) A thorough introduction to logic programming using Prolog. Includes a description of Prolog data objects such as predicates, clauses, facts, and queries and introduces the concepts of goal resolution through unification and negation as failure. Programming techniques using control, meta-logical and extra-logical predicates and arithmetic operations are also studied. Three hours of lecture per week. Prerequisite: CS 342.

Prerequisite(s): (CS 250 and CS 346)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 356 Numerical Analysis (3 Credits)****Lecture:** 3, **Lab:** 0

Numerical Analysis (3) Numerical solution of nonlinear equations, integration, interpolation and data smoothing, systems of linear and nonlinear equations. Three hours of lecture per week. Prerequisites: MATH 242, MATH 330, and CS 140.

Prerequisite(s): (MATH 242 and MATH 330 and CS 140)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 415 Comp Ethics & Society (3 Credits)****Lecture:** 3

Computer Ethics and Society (3) This course is a study of the ethical and social issues related to computers and computer networks. It provides an introduction to the legal, social, and ethical issues surrounding information technology and to the societal risks addressed in software testing and reliability standards. Safety and relevant legal cases will be covered. Required for computer science majors. Two hours of lecture per week. Prerequisite: Junior level standing.

College/School: Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 434 Wireless Programming (3 Credits)****Lecture:** 3

Wireless Programming (3) This course involves a thorough introduction to wireless device programming with a focus on Wireless application development and Wireless Internet programming. After an overview of the elements and dynamics of the Wireless Internet landscape, the course focuses on the skills required for content development and management of wireless media applications. Emphasis is on developing applications that can be accessed remotely using the Wireless Application Protocol (WAP) and the Wireless Markup Language (WML) as well as standalone applications that run on platforms such as Android. Three hours of lecture per week. Prerequisite: CS 354 or instructor consent.

College/School: Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 444 Operating Systems (3 Credits)****Lecture:** 3, **Lab:** 0

Operating Systems (3) Introduction to the function, internal data structures, and operations of operating systems and their associated file systems. Required for computer science majors. Three hours of lecture per week. Prerequisites: CS 343 and CS 346

Prerequisite(s): (CS 343 and CS 346)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 445 Multimedia Applications (3 Credits)****Lecture:** 3

Multimedia Applications (3) This course focuses on the fast emerging field of multimedia authoring and application development. It covers multimedia representation, storage, and communication. It provides students with the basics of integrating audio, video, and textual sources into multimedia objects. Software and hardware issues related to multimedia are studied in this class. Required for computer science concentration II majors. Three hours of lecture per week. Prerequisite: CS 354.

Prerequisite(s): (CS 354)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 448 Computer Networking (3 Credits)****Lecture:** 3, **Lab:** 0

Computer Networking (3) Study of current practices in computer networking including ISO standards, layered models, and protocols. Required for computer science majors. Three hours of lecture per week. Prerequisite: CS 444.

Prerequisite(s): (CS 444)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 450 Network Management & Security (3 Credits)****Lecture:** 3

Network Management and Security (3) This course provides an introduction to the basic concepts of the network-management architectures and protocols. It covers, in detail, the implementation, operation, security, management and support of complex LAN and WAN networks to develop an understanding of the tools, procedures and standards needed for network administration. Students will learn common network management concepts and protocols such as Structure of Management Information (SMI), Management Information Base (MIB), Simple Network Management Protocol (SNMP), Remote Monitoring (Rmon), and Common Management Information Protocol (CMIP). Required for computer science concentration II majors. Three hours of lecture per week. Prerequisite: CS 351.

Prerequisite(s): (CS 351)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 451 Intro to Wireless&Mobile Nets (3 Credits)****Lecture:** 3

Introduction to Wireless and Mobile Networks (3) This course provides an introduction to wireless and mobile networks and covers the following topics: mobile radio propagation; traffic engineering; cellular concepts; multiple radio access; multiple division techniques; channel allocation; mobile communication systems; existing wireless systems; network protocols; Ad Hoc and sensor networks; and wireless LANs and PANS. Required for computer science concentration II majors. Three hours of lecture per week. Prerequisite: CS 350.

Prerequisite(s): (CS 350)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci

CS 456 Soft Eng (3 Credits)**Lecture:** 3, **Lab:** 0

Software Engineering and Testing (3) Study of the principles and practices of software engineering. Topics include software quality concepts, process models, and analysis of software requirements, design methodologies, software testing, and software maintenance. Required for computer science majors. Three hours of lecture per week. Prerequisite: CS 444

Prerequisite(s): (CS 444)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 457 Artificial Intel (3 Credits)****Lecture:** 3, **Lab:** 0

Artificial Intelligence (3) Introduction to the fundamental theories, algorithms and representational structures underlying Artificial Intelligence and practice techniques for programming AI applications using Prolog. General areas covered include search techniques, production systems, planning, learning, and connectionist systems. Three hours of lecture per week. Prerequisites: CS 354 and CS 346

Prerequisite(s): (CS 342)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 460 Computer Graphics (3 Credits)****Lecture:** 3, **Lab:** 0

Computer Graphics (3) Basic concepts of computer graphics, including programming, hardware, display technology, and data structures for both micros and high-performance workstations. Three hours of lecture per week. Prerequisites: CS 248, CS 356 and MATH 333

Prerequisite(s): (CS 248 and CS 356)**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 497 Adv Topics (3 Credits)****Lecture:** 3, **Lab:** 0

Advanced Topics (3) Presentation of advanced topics in computer science by faculty and students. Three hours of lecture per week. Corequisite: CS 456.

College/School: Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 498 Sen Comp (0 Credits)****Lecture:** 0**College/School:** Col of Science, Engr & Tech**Department:** Department of Computer Sci**CS 499 Capstone Proj (3 Credits)****Lecture:** 0, **Lab:** 9

Capstone Project (3) A CS required capstone design course to encourage independent study, project design, and development. Proposal must be submitted and approved during term preceding enrollment. Required for computer science concentration I majors. Three hours of lecture per week. Prerequisites: Consent of the Faculty Chair and Senior Level standing.

College/School: Col of Science, Engr & Tech**Department:** Department of Computer Sci