Student Guidelines for the Senior Exam in Computing

ETSU Department of Computing

Contents

Exam Information

All students who have declared one of the concentrations housed in the Department of Computing and are enrolled in CSCI 4350 - Software Engineering II or who enrolled at East Tennessee State University under the 2022 catalog or later are required to take the Department's Senior Exam.

The exam consists of approximately 150 multiple-choice, multiple-select, matching, ordering, and true/false questions. All tests are to be taken at the University's testing center.

Registering for the Exam

To take the exam, each student must make an appointment with the University's testing center to take the test during the assigned dates. Simply go to the Center for Academic Achievement web site (https://www.etsu.edu/students/cfaa/), select "Testing", and then select "Start Here for an Appointment" in order to register to take the test.

- Under "1 - Choose a group," the student should select, "ETSU Major Field Tests (MFT) and College/Departmental Exit Exams."
- Under "2 - Choose a group," the student should select, "CBAT Business Major Field Tests."
- Under "3 - Choose a group," the student should select, "CBAT Senior Computing Exam."
- Under "4 - Choose an exam," the student should select the exit exam that corresponds to their concentration.
- The student should complete the remaining fields based on their own availability and registration details.

Note that the only place that the student can take the test is in the University's testing center. There is no time limit on the test.

If you have any questions regarding registering for the test, please email Laura Bennington (benningtonl@mail.etsu.edu).

General Instructions for the Exam

All tests are to be taken at the University's testing center. There is no time limit per se. A recommended time limit of two hours has been set, however, but is not enforced.

The testing center will provide scrap paper if needed. All scrap paper must be turned back into the testing center upon completion of the test. No phones, calculators, or other devices are allowed in the testing center.

An additional set of questions titled, "SCE Survey," is included where each student will answer questions pertaining to demographics, their perceptions of the Department, and their utilization of University services.

What the Exam Covers

This section presents a summary of the skills and topics the Department of Computing feels is important to the graduates of each concentration. This section is broken into the following subsections:

1. All Concentrations Courses – Courses pertaining to ALL Computing undergraduate students
2. Computer Science (CS) Concentration Courses
3. Information Technology (IT) Concentration Courses
4. Information Systems (IS) Concentration Courses
5. Cybersecurity and Modern Networks (CSMN) Concentration Courses

All Concentrations (Computing Core)

These courses are common to all undergraduate computing students.

CSCI 1250 - Intro to Computer Science I

- Students will be able to define primitive and non-primitive variables, explain their differences, and describe when to use each.
- Students will understand the concept of "looping" and be able to turn any "for" loop into a "while" loop and vice versa.
- Students will know how to handle decision-making: using "if/else" and the different constructs, "if/else if" and "switch".
- Students will be able to describe the difference between static and non-static methods.

CSCI 1260 - Intro to Computer Science II

- Given a set of requirements, the student will be able to identify appropriate classes with their responsibilities and behaviors.
- Students will be able to demonstrate an understanding of object-oriented concepts such exception handling, inheritance, interfaces, subtype polymorphism, abstract classes, text file handling, and class libraries.
- Student will be able to use simple data structures such as strings, arrays, and ArrayLists and at least one search and sort algorithm.

CSCI 1400 - PC Setup and Maintenance

- Students will be able to identify and install various hardware components of a PC.
- Students will be able to troubleshoot hardware related problems in PCs.

- Students will be able to demonstrate an understanding of common Windows PC troubleshooting techniques.

CSCI 1900 - Math for Computer Science

- The student will be able to perform operations on sets, functions, relations.
- The student will be able to use propositional and predicate logic, and matrices using the appropriate terminology.
- The student will be able to model problems in computer science using graphs and trees.

CSCI 2020 - Database Fundamentals

- The students will be able to understand the concepts of relational database model and design a database using entity-relationship (ER) diagram
- The students will be able to convert an ER diagram to relational tables in 3NF and implement the tables in a schema.
- The students will be able to write SQL queries involving multiple tables and filtering criteria.

CSCI 2150 - Computer Organization

- The student will be able to decipher and manipulate values of different data types at the binary level.
- The student will be able to create and simplify logical expressions.
- The student will be able to demonstrate an understanding of the memory hierarchy.

CSCI 4250 - Software Engineering I

- Students will be able to explain each of the stages of the software development lifecycle.
- Students will be able to explain plan-driven and agile development models.
- Students will be able to make ethical decisions when creating a complex piece of software.

CSCI 4350 - Software Engineering II

- Students will be able to explain basic software project management techniques.
- Students will be able to explain the DevOps organizational culture.
- Student will be able to explain software development from a security perspective.

CSCI 3400 - Networking Fundamentals

- The student will be able to demonstrate an understanding of the 5-layer TCP/IP model.
- The student will be able to demonstrate an understanding of different protocols on each layer.
- The student will be able to implement the Dijkstra's and Bellmen-Ford Algorithm.

CSCI 3500 - Information Security and Assurance

- The student will be able to demonstrate an understanding of general security concepts and terminology
- The student will be able to discuss ethical issues in information security
- The student will be able to translate legal and policy matters into actionable security solutions

Computer Science (CS) Concentration

These courses are for students in the Computer Science concentration.

CSCI 2160 - Assembly Language

- The student will understand the basics of an assembly language instruction set.
- The student will be able to modify data and take advantage of addressing modes using techniques such as bitwise operations.
- The student will understand how higher-level language constructs are implemented at the assembly language level.

CSCI 2200 - Unix Fundamentals

- The student will be able to learn the basic Unix command set including passwd, man, pwd, ls, cd, cat, more, cp, mv, rm, rmdir, mkdir, and touch.
- The student will be able to demonstrate a working knowledge of mechanisms of Unix pathname resolution (absolute path expression vs relative path expression).
- The student will be able to demonstrate the ability to write bash shell scripts.

CSCI 2210 - Data Structures

- The student will be able to select an appropriate data structure to use in common scenarios
- The student will be able to analyze common algorithms and identify common performance characteristics such as big-Oh
- The student will be able to demonstrate understanding of common algorithms including various sorting algorithms, binary tree traversals, navigating a B-tree, and implementation of a priority-queue using a binary heap

CSCI 3230 – Algorithms

- Students should be able to explain the use of big omega, big theta, and little o notation to describe the amount of work done by an algorithm.
- Students should be able to demonstrate the use and solve recurrence relations to determine the time complexity of recursively defined algorithms.
- Students should be able to determine an appropriate algorithmic strategy and appropriate data structure to solve problems efficiently.
- Students should be able to demonstrate an understanding of algorithms to calculate powers of numbers (exponentiation).

CSCI 4717 - Computer Architecture

- The student will be able to identify how certain architectural features affect different areas of performance at the single-core level.
- The student will possess an understanding of how interrupts work and the ways in which they are used.
- The student will be able to identify performance obstacles in parallel computing and suggest ways to address them

CSCI 4727 - Operating Systems

- The student will understand how an operating system manages, schedules, and services resources.
- The student will understand how to use operating system services for inter-process and inter-thread communication.
- The student will understand how to synchronize process and thread operation via operating system services.

Information Systems (IS) Concentration

These courses are for students in the Information Systems concentration.

CSCI 1710 - Essentials of Web Development

- The student will understand the dynamics of modern, dynamic, and responsive web development and the development process.
- The student will be able to express the relative responsibilities of the HTML and CSS languages with respect to modern web design; and that they represent two of the three core technologies in web development (HTML, CSS, and JavaScript).
- The student will understand and be able to express the importance of utilization of a systematic approach to the conceptualization of, gathering of requirements, application of those requirements, understanding the needs/requirements of end users, and interaction with clients with the design, testing, accessibility, deployment, and maintenance of a successful product on behalf of a client.

CSCI 2910 - Server-Side Web Programming

- The student will be able to program in at least one current server-side scripting language.
- The student will be able to describe basic architecture of a server-side application.
- The student will be able to properly access data submitted from a client.
- The student will be able to execute basic SQL from server-side scripting.

CSCI 3020 - Database Advanced Topics

- Students will be able to solve problems using stored procedures, functions, and triggers.
- Students will be able to explain and use data warehousing and extract-transform-load processes.
- Students will be able to manipulate data in document-based NoSQL databases.

CSCI 3720 - Fundamentals of Business Information Systems

- The student will be able to demonstrate an understanding of enterprise information systems within a business context.
- The student will be able to understand a standard business process during its lifecycle in an enterprise information system.

- The student will be able to understand the interconnection between business process modeling and enterprise information systems.

CSCI 4757 - Information Systems Implementation

- The student will be able to demonstrate an understanding of common key configuration decision points in enterprise software systems decision.
- The student will be able to demonstrate an understanding of the interconnectivity of business processes in an enterprise system configuration.
- The student will be able to demonstrate an understanding of configuration processes in an enterprise system.

CSCI 4767 - Enterprise Programming

- The student will be able to explain the role and importance of a data dictionary in enterprise information system development and use this knowledge in programs.
- The student will be able to explain the difference between an internal table and a database table in ABAP development, provide scenarios for the use of each, and effectively use these in programs.
- The student will be able to compare and contrast the roles of development, quality assurance, production, and training systems in enterprise information system development.

CSCI 4770 - IS Strategy and Management

- A student will be able to write a professional resume.
- A student will have good oral and written communication skills.
- A student will be able to function and behave properly in a professional work environment.

Information Technology (IT) Concentration

These courses are for students in the Information Technology concentration.

CSCI 2200 - Unix Fundamentals

- The student will be able to learn the basic Unix command set including passwd, man, pwd, ls, cd, cat, more, cp, mv, rm, rmdir, mkdir, and touch.
- The student will be able to demonstrate a working knowledge of mechanisms of Unix pathname resolution (absolute path expression vs relative path expression).
- The student will be able to demonstrate the ability to write bash shell scripts.

CSCI 2910 - Server-Side Web Programming

- The student will be able to program in at least one current server-side scripting language.
- The student will be able to describe basic architecture of a server-side application.
- The student will be able to properly access data submitted from a client.
- The student will be able to execute basic SQL from server-side scripting.

CSCI 3020 - Database Advanced Topics

- Students will be able to solve problems using stored procedures, functions, and triggers.
- Students will be able to explain and use data warehousing and extract-transform-load processes.
- Students will be able to manipulate data in document-based NoSQL databases.

CSCI 3110 - Advance Topics in Web Design

- The student will be able to implement and work with complex data models. A data model is complex if it involves three or more entities and has many-to-many relationships.
- The student will be able to send and process asynchronous HTTP requests and responses.
- The student will be able to create accessible and responsive web pages.

CSCI 3720 - Fundamentals of Business Information Systems

- The student will be able to demonstrate an understanding of enterprise information systems within a business context.
- The student will be able to understand a standard business process during its lifecycle in an enterprise information system.
- The student will be able to understand the interconnection between business process modeling and enterprise information systems.

CSCI 4417 - Intro to System Administration

- The student will be able to explain best practices for system administration.
- The student will be able to compare and contrast Unix and Windows system administration.
- The student will be able to interpret and explain basic network design.

CSCI 4800 - Senior Project

- A student will be able to write a professional resume.
- A student will have good oral and written communication skills.
- A student will be able to function and behave properly in a professional work environment.

CSCI 4927 - Human Computer Interaction

- A student will be able to describe design principles and apply them to the creation of user interfaces.
- A student will be able to describe the stages and techniques of user interface design and explain how they fit in the software development lifecycle.
- A student will be able to identify and describe the key components of usability and accessibility as they apply to user interfaces.

Cybersecurity and Modern Networks (CSMN) Concentration

These courses are for students in the Cybersecurity and Modern Networks concentration.

CSCI 3510 - Network Security

- The students will be able to do Classical Encryption Techniques such as Symmetric Cipher Model, Substitution Techniques, and Transposition Techniques.
- The students will know the concept of Public key Cryptography and RSA.
- The students will know the concept and application of Hash function.

CSCI 3600 - Computer Scripting

- The student will be able to describe the significance of parameter $0 in bash, i.e., the command used to invoke bash proper.
- The student will be able to describe the standard numbering conventions for the standard input, standard output, and standard error streams (0, 1, 2).
- The student will be able to describe the difference between > and >> (create output, append output)
- The student will be able to describe the difference between type systems in scripting languages and compiled languages (Scripting languages - "duck" - i.e., latent - typing; declarations optional; heterogeneity not an issue as in compiled languages, where upcasting to object and downcasting is needed to achieve heterogeneity).
- The student will be able to describe the "root sources" of typelessness in scripting languages - lack of declarations, support for executing dynamically created code.

CSCI 3610 - Secure Coding

- The student shall understand the importance of sanitizing all user inputs.
- The student shall understand the root causes of common memory corruption vulnerabilities.
- The student shall understand the role testing and code analysis play in secure software development.

CSCI 4507 - Computer Forensics

- The student will be able to list and explain the three phases digital forensics
- The student will be able to define the order of volatility and classify digital evidence into the types of volatility (volatile and non-volatile)
- The student will be able to list, explain, and apply native OS commands (such as netstat, tasklist, etc.) to collect digital evidence such as the running processes, their names, PIDs, and memory usage.

CSCI 4537 - Ethical Hacking

- The student will be able to define and distinguish between the types of injection attacks (XSS and SQL) and explain where (client- or server-side) each attack is executed.
- The student will be able to scan for system software vulnerabilities and provide full analysis of their impact in terms of Confidentiality, Integrity, and Availability.

- The student will be able to explain how buffer overflow attacks work in a step-by-step manner including the details of memory, pointers and registers, and access violation errors.

CSCI 4607 - Information Risk Management

- The student will be able to define cyber risk, list the steps in the risk management process and provide examples for each step in the risk management process.
- The student will be able to define risk treatment and argue, given a practical scenario, the type of risk treatment that is cost-effective given a particular risk.
- The student will be able to rank any given set of software vulnerabilities based on their risk and priority to treat considering their potential impact, likelihood of being exploited, and the available budget.

CSCI 4637 - Wireless and Mobile Computing

- The student will be able to identify the cellular system infrastructure.
- The student will be able to identify technical differences between adhoc-network and sensor network.
- The student will be able to identify the various layers of network protocols.

CSCI 4657 - Cloud Computing

- The student will be able to employ virtualization technologies used in cloud computing.
- The student will be able to evaluate constraint and opportunities provided in cloud storage.
- The student will be able to compare and contrast core concepts and applications of the cloud-computing paradigm.

CSCI 4677 - Internet of Things

- The student will be able to identify the hardware and software requirements that distinguish an IoT device from a general-purpose device.
- The student will be able to differentiate connectivity requirements for IoT at board-level, local area network level, and cloud level.
- The student will be able to describe security mechanisms essential to IoT applications.