

Computer Science Education Certificate

Department Information

- **Program Information:**
ndsu.edu/programs/graduate/computer-science-education (<http://ndsu.edu/programs/graduate/computer-science-education/>)
- **Department Web Site:**
ndsu.edu/computer-science (<http://ndsu.edu/computer-science/>)
- **Credential Offered:**
Certificate
- **English Proficiency Requirements:**
TOEFL iBT 79; IELTS 6.5

Apply Now (https://ndsugrad.my.site.com/Application/TX_SiteLogin/?startURL=/Application/TargetX_Portal__PB)

This certificate is primarily aimed at high school teachers in need of credentials to teach "dual credit" courses in their schools as well as AP Computer Science instructors. The graduate certificate in Computer Science Education is comprised of six 3-credit courses for a total requirement of eighteen credits, aimed at preparing for teaching high school Computer Science. The courses are selected for their content which covers the essential, core concepts of Computer Science, and how to teach them.

Required courses:

- **CSCI 641: Introduction to Computer Science Education (3 Credits)**
The course offers an overview of the main areas of Computer Science Education. The Active-Learning-Based Teaching Model; Research in Computer Science Education; Teaching Methods in Computer Science Education; and Lab-Based Teaching.
- **CSCI 642: Problem Solving in Computer Science Education (3 Credits)**
Introduction of essential Computer-Science concepts related to problem solving through a study of several different approaches. Specific problem-solving techniques such as Sequential Logic, Decision Logic, Looping Logic, and popular data structures are studied in detail. The course will focus on algorithms development and modeling techniques that can be applied to many programming languages.
- **CSCI 643: Introduction to Computer Programming (3 Credits)**
Introduction to computer science including problem solving, algorithm development, and structured programming in a high-level language. Emphasis on design, coding, testing, and documentation of programs using accepted standards of style.
- **CSCI 644: Data Structures and Algorithms (3 Credits)**
Continuation of CSCI 643 that emphasizes more advanced programming language features and basic data structures. Students will learn to incorporate advanced (will be loaded into Courseleaf in March 2022).

Elective courses:

Students must choose two of the following:

- **CSCI 605: Principles in Cyber Security (3 Credits)**
This course helps students become familiar with cybersecurity concepts, principles, terminology, technologies, and skills. Major security topics covered include threats, malware attacks, hacking, spyware, firewalls, network defense, database security, intrusion detection systems, security policies. Additionally, students learn about cyberstalking, cyber terrorism, and information warfare.
- **CSCI 650: Cloud Computing (3 Credits)**
The course discusses various topics and technologies related to Cloud Computing. Topics include distributed system models and enabling technologies, computer cluster, virtual machines, design of cloud computing platforms, cloud programming and software environments.
- **CSCI 713. Software Development Processes (3 Credits)**
This course is designed as a breadth course on the software engineering process. Basic concepts are reviewed and reassured to create a basis for higher concepts and techniques.
- **CSCI 773. Foundations of the Digital Enterprise (3 Credits)**
This course covers current and emerging digital technologies, including web development, security, server management, and privacy.
- Others (please discuss with your advisor)

Digital Portfolio:

As part of the Graduate Certificate Program every student will prepare a Digital Portfolio with artifacts of accomplishment that is shareable. This Digital Portfolio will document the information necessary to teach any Computer Science course needed in the high school. The following should be developed as part of the portfolio:

- Develop Course syllabus (with course outline) for the proposed class/topic. Document course description, objectives, textbook/ software/ hardware support, course learning goals, educational practices, and assessment criteria.
- Document with the set of home assignments, in-class problems, quizzes, and exams, with specific grading criteria such as what factors will be graded, how they will be weighted, and how they will be translated into the overall grade.
- Develop a set of problems and solutions for every topic. Develop grading Rubrics for every project.
- Portfolios will be used to evaluate students and bolster accreditation.

Admission and Application Requirements

Graduate School admission and application requirements are found on the Admission Information (<https://catalog.ndsu.edu/past-bulletin-archive/2025-2026/graduate/admission-information/>) page.