

COURSE SYLLABUS

# Course Prefix, Number, and Title

CSC 404, Foundations of Computation

# Credits

3 Credits

# University Name

Dakota State University

# Academic Term/Year

Spring 2024

## Last date to Drop and receive 100% refund

Wednesday January 17, 2024

## Last date to Withdraw and earn a grade of 'W'

Tuesday April 2, 2024

# Course Meeting Time and Location

DT1/DT2 – Online

# Instructor Information

## Name

[Youssef Harrath](https://scholar.google.com/citations?user=UKAIc04AAAAJ&hl=en), Ph.D.

## Office

East Hall 323

## Phone Number(s)

(605) 256-5838

## Email Address

[Youssef.harrath@dsu.edu](mailto:Youssef.harrath@dsu.edu)

## Office Hours

Available for online meetings through zoom or teams upon email request.

# Approved Course Description

## Catalog Description

An overview algorithms and approaches to solving cyber operations problems, which include essential underlying concepts drawn from discrete mathematics, algorithms analysis, and finite automaton.  Topics may include, but not limited to, searching and sorting algorithms, complexity theory, regular expressions, computability, mathematical foundations of cryptography, and entropy. (2019-2020 DSU Undergraduate Catalog).

## Additional Course Information

None

# Prerequisites

## Course Prerequisite(s)

CSC 300 and MATH 201

## Technology Skills

This course will make use of Desire2Learn (D2L) and other appropriate tools.

# Student Learning Outcomes

Upon completion of the course, learners will be able to understand and apply theoretical concepts related to:

Topic 1 – Algorithms, Complexity, and Optimization

* Section 1.1 – Introduction to Analysis and design of algorithms
* Section 1.2 – Fundamentals of the Analysis of Algorithm Efficiency
* Section 1.3 – Sorting algorithms
* Section 1.4 – Divide-and-Conquer
* Section 1.5 – Graphs and Network Flows

Topic 2 – Automata Theory to Turing Machines

* Section 2.1 - Deterministic Finite Automata
* Section 2.2 - Nondeterministic Finite Automata
* Section 2.3 - Regular Expressions and their applications
* Section 2.4 - Pushdown Automaton
* Section 2.5 - The Turing Machine

### Topic 3 – Information Theory and Cryptography

* Section 3.1 – Efficient Coding of Information
* Section 3.2 – Perfect Secrecy
* Section 3.3 – Data Compression and Shannon’s Source Coding Theorem
* Section 3.4 – Public Key Cryptosystems
* Section 3.5 – Digital Signatures

# Course Materials

## Suggested Textbook(s)

1. Introduction to Algorithms (3rd Edition – 2009) – Cormen, Leiserson, Rivest, Stein
2. The Nature of Computation (2011) – Moore and Mertens
3. Automata Theory, Languages, and Computation (3rd Edition – 2006) – Hopcroft, Motwani, and Ullman
4. Introduction to the Theory of Computation (3rd Edition – 2013) – Sipser
5. Discrete Mathematics and Its Applications, (7th Edition – 2012 or 8th Edition – 2019) – Rosen
6. Introduction to Theoretical Computer Science (2019) – Barak

## Required Supplementary Materials

Slides, handouts, and video recordings provided by the instructor.

## Optional Materials

None

# Course Delivery and Instructional Methods

This course will use video lectures, power point slides, written homework, and written activities to introduce material to students. Students are expected to watch the videos and work through the lessons and activities.

# Communication and Feedback

## Preferred Email Contact Method

Send all e-mail communications to my [youssef.harrath@dsu.edu](mailto:youssef.harrath@dsu.edu) account. Please do not send me e-mail through D2L.

## Email Response Time

Generally, within 48 hours between 8:00am – 5:00pm. Weekends, holidays, and travel may result in delayed responses.

## Feedback on Assignments

For written assessments (homework, quizzes, or projects), I will return graded work or solutions within one week of receiving an assignment. For exams, you will see an exam score within two business days of receiving the exam; however, you will only see comments/solutions after all students have submitted exams. If I expect a delay, I will notify you.

## Requirements for Course Interaction

For many of you this will be your first CSC/Mathematics course focused on pulling together prior knowledge and applications [i.e., the good stuff!]. While I will cover material each day (via recorded videos), the majority of your time in the course will be devoted to working through a variety of neat activities, exercises, and problems [I truly believe that to learn and understand mathematics, you must engage in the process of doing computer science and mathematics.] These activities and projects have been designed to give you the opportunity to explore CS/Mathematics in a variety of applications and extensions (within mathematics/computer science as well as business/industry). For each of these activities you will receive detailed feedback on your work as well as a copy of my solutions.

As you work through course material, you are strongly encouraged to discuss any questions on the course material with me (via e-mail or zoom/teams meeting). To easily discuss activities, homework, or coding challenges, we will make use of the Discussion Board within D2L. You are expected to meaningfully and civilly contribute to the course discussion. Moreover, you are encouraged to not only take advantage of these opportunities in your own work, but also, learn from the information and ideas shared by other students.

# Evaluation Procedures

## Assessments

Homework: 20%

Quizzes: 20%

Projects: 20%

Midterm exam: 20%

Final Exam: 20%

## Final Examination

April 29 (Mon), 2:00-4:00 pm

## Performance Standards and Grading Policy

100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, 59%-0% F.

# Tentative Course Outline and Schedule

| Week | Date | Topics, Assignments, Quizzes, Tests, Deadlines |
| --- | --- | --- |
| 1 | Jan. 8 | Section 1.1 – Introduction to Analysis and design of algorithms  (**Quiz 1**) |
| 2 | Jan. 15 | Section 1.2 – Fundamentals of the Analysis of Algorithm Efficiency  (**HW1**) |
| 3 | Jan. 22 | Section 1.3 – Sorting algorithms  (**Project 1**) |
| 4 | Jan. 29 | Section 1.4 – Divide-and-Conquer  (**Quiz 2**) |
| 5 | Feb. 5 | Section 1.5 – Graphs and Network Flows  (**HW2**) |
| 6 | Feb. 12 | Section 2.1 - Deterministic Finite Automata  (**Quiz 3**) |
| 7 | Feb. 19 | Section 2.2 - Nondeterministic Finite Automata  (**HW3**) |
| 8 | Feb. 26 | Section 2.3 - Regular Expressions and their applications  (**Midterm Exam**) |
| 9 | Mar. 4 | Section 2.4 - Pushdown Automaton  (**Project 2**) |
| 10 | Mar. 11 | Spring break |
| 11 | Mar. 18 | Section 2.5 - The Turing Machine  (**Quiz 4**) |
| 12 | Mar. 25 | Section 3.1 – Efficient Coding of Information  (**HW4**) |
| 13 | Apr. 1 | Section 3.2 – Perfect Secrecy  (**Quiz 5**) |
| 14 | Apr. 8 | Section 3.3 – Data Compression and Shannon’s Source Coding Theorem  (**HW5**) |
| 15 | Apr. 15 | Section 3.4 – Public Key Cryptosystems  (**Quiz 6**) |
| 16 | Apr. 22 | Section 3.5 – Digital Signatures  (**HW6**) |

# Student Success Services and Supports

## ADA Accommodations

Dakota State University strives to ensure that physical resources, as well as information and communication technologies, are reasonably accessible to users to provide equal access to all. If you encounter any accessibility issues, you are encouraged to immediately contact the instructor of the course and Dakota State University's Office of Disability Services, which will work to resolve the issue as quickly as possible.

DSU's Office of Disability Services is located in the Learning Engagement Center and can be contacted by calling 605-256-5121 or emailing [dsu-ada@dsu.edu](mailto:dsu-ada@dsu.edu). Students seeking ADA accommodations (such as non-standard note taking or extended time and/or a quiet space taking exams and quizzes) can access the DSU website <https://dsu.edu/student-life/disability-services/index.html> for additional information and the link to the Disability Services Request Form. You will need to provide documentation of your disability and the ADA Coordinator must confirm the need before officially authorizing accommodations.

## DSU Knowledge Base

The DSU Knowledge Base contains links and resources to help students by providing information about the following topics: User Accounts & Passwords, Academic Tools & Resources, Software & Apps Support, WiFi & Network Access, Campus Emergency Alert System, Campus Printing, IT Security & Safe Computing, and the Support Desk (which is there to help both on and off-campus students). The Knowledge Base can be accessed through the link below:

* [DSU Knowledge Base](https://support.dsu.edu/TDClient/KB/)

## D2L Support for Students

The D2L Support for Students site is designed to provide DSU students a D2L support resource center that contains user guides, tutorials, and tips for using the D2L learning environment. The D2L Support for Students site can be accessed through the link below:

* [DSU D2L Support Resources for Students](https://d2l.sdbor.edu/d2l/home/606414)

# Classroom Policies

## Attendance and Make-up Policy

The course is comprised of fifteen sections, each of them is assigned to a given week. During each week, the students are required to watch the recordings and study the submitted material for a given section. Each section is concluded with homework, a quiz, or a project. The material for a given late homework or a project can still be turned in for credit but receives 10% credit removal every 24 hours late. If homework or a project is turned in after 10 days past the due date, the student receives a 0% for that assessment. Too many assessments with a score of 0% will most probably result in an F for the course (See *Evaluation Procedures*).

# DSU Policies

## Complaint Procedure

Dakota State University seeks to resolve student concerns and complaints in a fair and prompt manner. Students may file a complaint using the [DSU Concerns and Feedback form](https://forms.office.com/Pages/ResponsePage.aspx?id=JbW1y5U7k02UF027PIlRLsCgZAGe_JRCsnPJANK2HOlUN1dBWFI4NTZXVzZBSkkwMjdUREtNMkUzTC4u). SARA complaints from out-of-state students may be filed using the procedures noted [here](https://public-info.dsu.edu/sd-sara/complaint-procedures/).

## Grade Appeal Policy

If a student believes the final grade assigned in a course was inappropriate, he/she may appeal that grade by filing a formal grade appeal within 15 days of the start of the next academic session. Please see the [Undergraduate Catalog](https://catalog.dsu.edu/content.php?catoid=35&navoid=1614&hl=grade+appeal&returnto=search#Grade_Appeal_Process) or [Graduate Catalog](https://catalog.dsu.edu/content.php?catoid=36&navoid=1666#grade-appeal-process) for the required process to appeal a final grade.

## Student Verification Statement and Proctoring Policy

Federal law requires that universities verify the identity of students when course materials and/or course assessment activities are conducted either partially or entirely online. A student’s Desire2Learn (D2L) login and password are intended to provide the student with secure access to course materials and are also intended to help the university meet this federal mandate. Some DSU Faculty also require the use of a proctor for exams in distance-delivered (Internet) courses and this requirement provides a second level of student identity verification. Students are responsible for any proctoring fees, if applicable. Finally, an instructor who uses web conferencing technology may require students to use a webcam during exams as another means of student identity verification through voice and visual recognition.

# South Dakota Board of Regents Policy Statements

## Freedom in Learning Statement

Under Board of Regents and Regental Institutions policy, student academic performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards. Discussion and debate are critical to education and professional development. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. While the exploration of controversial topics may be an important component of meeting the student learning outcomes in a course, no student will be compelled or directed to personally affirm, adopt, or adhere to any divisive concepts (as defined in SDCL 13-1-67). Students who believe that an academic evaluation reflects prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards should contact their home institution to initiate a review of the evaluation.

## ADA Statement

The Regental Institutions strive to ensure that physical resources, as well as information and communication technologies, are reasonably accessible to users to provide equal access to all. If you encounter any accessibility issues, you are encouraged to immediately contact the instructor of the course and the Office of Disability Services, which will work to resolve the issue as quickly as possible. Please note: if your home institution is not the institution you are enrolled at for a course (host institution), then you should contact your home institution’s Office of Disability services. The disability services at the home and host institution will work together to ensure your request is evaluated and responded to in a timely manner.

## Academic Dishonesty and Misconduct

Cheating and other forms of academic dishonesty and misconduct run contrary to the purposes of higher education and will not be tolerated. Academic dishonesty includes, but is not limited to, AAC Guideline 5.3.A – Syllabi BOR Required Policy Statements (Last Revised 01/2023) Page 2 of 2 plagiarism, copying answers or work done by another student (either on an exam or an assignment), allowing another student to copy from you, and using unauthorized materials during an exam. The Regental Institution’s policy and procedures on cheating and academic dishonesty can be found in your home institution’s Student Handbook and the governing Board of Regents policies can be found in BOR Policy 2:33 and BOR Policy 3:4. The consequences for cheating and academic dishonesty are outlined in policy.

## Acceptable Use of Technology

Acceptable Use of Information Technology Resources: While Regental Institutions strive to provide access to computer labs and other technology, it is the student’s responsibility to ensure adequate access to the technology required for a course. This may include access to a computer (not Chromebooks, iPads, etc.), webcam, internet, adequate bandwidth, etc. While utilizing any of the information technology systems students, faculty and staff should observe all relevant laws, regulations, BOR Policy 7.1, and any institutional procedural requirements.

## Emergency Alert Communication

In the event of an emergency arising on campus under BOR Policy 7:3, your Regental Home Institution will notify the campus community via the emergency alert system. It is the responsibility of the student to ensure that their information is updated in the emergency alert system. The student’s cell phone will be automatically inserted if available and if not, their email address is loaded. Students can at any time update their information in the student alert system.