Motivation: We live in an exciting era thanks to ever-increasing advancements in communication and computing technologies. Consider, for example, how big data mining and DNA analysis have affected modern medicine, or smart search algorithms have made instantaneous availability of accurate information possible, or how cell phones, twitter, social networks have influenced political and social events.

Course Objectives: The objective in this class is for students to become familiar with Algorithms Design and Analysis concepts. The student who completes this course:

- shall understand the concepts and design techniques for algorithms used in diverse applications.
- shall get familiar with techniques of analyzing different algorithms theoretically as well as in real life settings of diverse application domains.
- shall be able to implement algorithms using a programming language and evaluate their comparative performance.
- shall get an understanding of how algorithms form a powerful lens through which to view problem solving in general.

Specific Course Information:

a. Catalog Description: Introduction to algorithm design and analysis. Topics include advanced data structures, amortized analysis, dynamic programming, graph algorithms, intractability and applications.

b. Prerequisite: CPSC 2120

c. Co-requisite: None

d. Course Type: Selected Elective

Textbook:

The MIT Press. [Note: Any of these three books is more than enough to cover the materials of this course; we will not follow any particular textbook in class.]

**Tentative Outline of Topics:**

1. Design techniques: Greedy approach, Divide-and-conquer, Dynamic programming
2. Applications: Sorting, Long Integer Multiplication, Activity Selection (Interval Scheduling), Knapsack, Huffman Coding, Offline Caching, Matrix Chain Multiplication, Longest Common Subsequence, Sequence Alignment, Convex Hull
3. Analysis Tools: Recurrence relations, Average case analysis, Amortization, Lower bounds
4. Advanced Data structures: Balanced Trees, Heap and search tree variations, Union-Find, Hash tables
5. Graph Algorithms: Shortest Path, Minimal Spanning Tree (Kruskal & Prim),
6. NP completeness and approximation algorithms (Time permitting)

**Tentative Grading (subject to change):**

The final grade for the course will be computed based upon the following distribution (tentative):

- Homework + In Class quizzes – 30%
- 2 Tests – 40%
- Comprehensive Final Exam – 30%

**Note:** Homework may include programming assignments.

**Class Policy on submission:** You cannot turn in work that you have already turned in for credit in another course.

**Grade Appeal:**

Any grade challenges regarding exams, quizzes, exercises, or programs must be emailed to the instructor, with detailed justifications, within one week of the date the grades are posted on Canvas. No exceptions.

**Attendance**

*Attendance is expected, but not required.* We may cover material in an order different from any textbook. You are responsible for any material covered in class. You are responsible for any announcements, assignments or assignment modifications that are announced in class whether you are present or not. This also applies to arriving late to class or leaving early. *We will have unannounced*
**quizzes during class; 5 to 8 quizzes are expected during the semester. No make-ups will be given.**

**Deadlines**

Work is due at the specified deadline. **Late work will not be accepted.** If a project (homework, programming assignment, etc.) is only partially completed you should submit what you have by the deadline. You should expect very little to no credit for programming assignments that still generate syntax errors.

**Instructor Late:** If the instructor is late for class, students are expected to wait for 15 minutes before they leave.

**Cancellation of Class:** If classes are cancelled by the university on the day of a scheduled test, we will reschedule the test.

**Academic Integrity**

As members of the Clemson University Community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning". Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. [Read the university academic integrity statement](https://www.clemson.edu/academics/studentaccess/) (along with other important information). Unless otherwise specified in an assignment, you are expected to work independently on projects, assignments, tests and labs. **If you are in doubt about the type of help you may give or receive on a project: ASK!**

**University Accessibility Statement:**

Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to this class should let the professor know, and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848, by emailing [mailto:studentaccess@lists.clemson.edu](mailto:studentaccess@lists.clemson.edu), or by visiting Suite 239 in the Academic Success Center building. Appointments are strongly encouraged – drop-ins will be seen if at all possible, but there could be a significant wait due to scheduled appointments. Students who receive Academic Access Letters are strongly encouraged to request, obtain and present these to their professors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student’s responsibility to follow this process each semester. You can access further information here: [https://www.clemson.edu/academics/studentaccess/](https://www.clemson.edu/academics/studentaccess/)
The Clemson University Title IX (Sexual Harassment) Statement

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran’s status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus-life/campus-services/access/title-ix/. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 110 Holtzendorff Hall, 864.656.3184 (voice) or 864.656.0899 (TDD).

Spring 2020 Academic Calendar

Jan 6, Mon       Orientation
Jan 6, 7         Late enrollment
Jan 8, Wed       Classes begin
Jan 14,          Last day to register or add a class or declare Audit
Jan 20,          Martin Luther King Jr. holiday
Jan 22,          Last day to drop a class or withdraw from the University without a W grade
Jan 29,          Last day to apply for May commencement

Feb 28           Last day for instructors to issue midterm evaluations

Mar 13           Last day to drop a class or withdraw from the University without final grades
Mar 16 – 20      Spring break

Apr 4,- 11,      Honors and Awards Week
Apr 6, Mon       Registration for fall term begins
Apr 23, 24       Classes meet; exams permitted in labs and one-hour courses only

Apr 27 – May 1   Final Examinations

May 4, Mon       9:00 A.M.–Deadline to submit candidate grades
May 6, Wed       9:00 A.M.–Deadline to submit other grades
May 6, Wed       Candidates for commencement may access grades
May 7, 8         Commencement