

## Syllabus

**Course Number: CS 324**

**Course Title: Algorithms and Analysis**

### Course Description:

CS 324. ALGORITHMS AND ANALYSIS (3). Studies advanced data structures (balanced trees, heaps, graphs, etc) and advanced algorithm analysis. Examines algorithm design techniques (greedy, dynamic programming, and divide-and-conquer, including the Master Theorem) and algorithm complexity.

### Prerequisite Courses

CS202 Computational Foundations  
and  
CS390 Principles of Programming Languages  
and  
MT320 Introduction to Discrete Mathematics

### Course Overview

CS324 covers advanced data structure, algorithms, and algorithm complexity analysis. Students may require a *significant* amount of time each week to understand and complete the assignments. If you are not willing or able to spend the necessary time, please reconsider whether this is the correct time to attend this class.

### Course Outcomes

After completion of this course, the student shall be able to:

- Know the big-O, omega, and theta notations and their usage to give asymptotic upper, lower, and tight bounds on time and space complexity of algorithms.
- Evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Demonstrate use of balanced binary tree, heap, priority queue, and graph data structures and their algorithms.
- Describe major algorithmic techniques (divide-and-conquer, greedy method, and dynamic programming) and understand what type of problem each technique is suitable for.
- Compare and choose the appropriate data structures and algorithmic design techniques for solutions to real-world problems.

- Explain the difference between tractable and intractable problems, and identify the basic complexity classes, such as P, NP and NP-complete.

## Course Materials

### Required Text:

Goodrich, M.T. & Tamassia, R. (2015). *Algorithm Design and Applications*. John Wiley & Sons. ISBN-10: 1118335910 and ISBN-13: 978-1118335918.

### Technology Tools:

1. A PC-compatible computer system running a version of the Windows operating system, and administrator rights to install new software.
2. Java Development Kit (JDK) with NetBeans, which can be installed from: <http://www.oracle.com/technetwork/java/javase/downloads/index.html>

## Pre-Assignment

Complete the following tasks:

Students will read the first week's assigned reading in the textbook (listed in the Course Assignments grid on the next page) before the day of class. Be prepared to ask questions on unclear areas and to respond to questions about information in the assigned reading.

**Online Format:** Sign on to WorldClass and become familiar with the course navigation of the Web Curriculum.

## Course Assignments and Activities:

Week	Topics	Textbook Readings*	Activities Assignments and Associated Points*
1	1: Algorithm Analysis 2: Data Structures Review	Chap 1, all Chap 2, all and Chap 3: sec 3.1 ( <i>review of data structures</i> )	Participation in Discussions 10% for entire course Assn 1 ≈ 7%
2	3: Balanced Binary Search Trees	Chap 3: sec 3.2 – 3.4 Chap 4, sec 4.1 – 4.2	Participation in Discussions Assn 2 ≈ 8%
3	4: Priority Queues and Heaps 5: Heapsort	Chap 5, sec 5.1 – 5.4 Chap 8: all ( <i>review of <math>O(n \log n)</math> sorts</i> )	Participation in Discussions Assn 3 ≈ 8%
4	6: Linear Sorts 7: Fundamental Techniques (Greedy Method)	Chap 9, sec 9.1 – 9.1.2 Chap 10	Participation in Discussions Assn 4 ≈ 6% Midterm Exam – 19%

5	8: Fundamental Techniques (Divide-and-and-Conquer) 9: Graphs	Chap 11 Chap 13	Participation in Discussions Assns 5 ≈ 8%
6	10: Fundamental Techniques (Dynamic Programming) 11: Shortest Paths	Chap 12 Chap 14	Participation in Discussions Assns 6 ≈ 8%
7	12: Minimal Spanning Trees 13: String Algorithms	Chap 15, sec 15.1 – 15.3 Chap 23	Participation in Discussions
8	14: NP-Completeness	Chap 17	Participation in Discussions Assns 7 ≈ 8% Final Exam – 19%
<b>Total</b>			<b>100%</b>

*\*Note to Classroom sections only:* Exact dates for reading assignments and programming assignments may differ from the above grid. The faculty syllabus, handed out the first night of class, will indicate any changes.

#### Summary of Assignments and Percentage Weight towards course grade

Assignment	Value (percent of overall course grade)
Homework Assignments (7 assns @ 6% – 8% each) Total for all Homework Assns	54%
Midterm Exam	18%
Final Exam	18%
Participation	<u>10 %</u>
<b>Course Total</b>	<b>100 %</b>

#### **Homework Assignments**

Each assignment will involve solving problems, tracing algorithms, and writing programs that implement the concepts discussed in the online content and the textbook.

#### **Late Assignment Policy for Homework Assignments**

Late homework assignments will be graded and then 2% will be deducted for each day the assignment is late, *up to 5 days late*.

No homework assignment will be accepted more than **5 days** after the official due date. Therefore, any homework assignment turned in more than **5 days** late will be given a grade of **zero**, and no feedback will be given.

#### **Exams**

There will be a midterm exam and a final exam. Exam questions will be cumulative, taken from reading assignments and course content. **Exams will not be accepted late.**

### ***Participation***

Class participation/effort is important because we can all learn from each other. Your participation points can make a difference in the final grade. Participation means:

1. a. Present in class every session (classroom)  
b. Present in the forum every week (online)
2. a. Effectively responds to questions from the facilitator (classroom)  
b. Regularly checks forum and posts all required items by the deadlines (online)
3. Interacts/replies to other students in classroom/forum discussions.

### ***Online Sections:***

See your instructor's syllabus for Online Weekly Discussion points distribution and Rubrics that will be used for grading discussion questions and test cases.

## **Course Policies and Procedures**

### ***Adding this course during the Drop/Add Period***

If you added this course during the drop/add period, after class began on Monday, you are responsible for ***immediately*** notifying the instructor that you joined the course late. None of the course due dates will be extended for you. Even if a due date already passed when you added the course, late points will still be deducted.

### ***Repeating the course***

If you are repeating this course (due to a previous withdraw or low grade), you are responsible for ***immediately*** notifying the instructor. Course assignments that you submitted when you last took the course cannot be repeated -- you will be required to complete alternate assignments.

### ***Plagiarism***

Plagiarism includes submitting code or anything else that was obtained from any other person, publication, or any internet web source. ***All work submitted in CS449 must be your own.***

In cases of suspected cheating or plagiarism, the instructor will discuss the matter with the student(s) involved. The instructor reserves the right to question any student orally or in writing about any assignment, and to use the evaluation of the student's understanding of the assignment and of the submitted solution as evidence of cheating. All cheating incidents will be reported to the Computer Science department, and may also be reported to the Academic Integrity Board for further action.

**CC&IS Grading Scale**

<b>Letter Grade</b>	<b>Percentage</b>	<b>Grade Point</b>
A	93 to 100	4.00
A-	90 to less than 93	3.67
B+	87 to less than 90	3.33
B	83 to less than 87	3.00
B-	80 to less than 83	2.67
C+	77 to less than 80	2.33

C	73 to less than 77	2.00
C-	70 to less than 73	1.67
D+	67 to less than 70	1.33
D	63 to less than 67	1.00
D-	60 to less than 63	.67
F	Less than 60	0

*Additional information about grading can be found in the latest edition of the University Catalog, available at <http://www.regis.edu/Academics/Course%20Catalog.aspx>.*

## CC&IS Policies and Procedures

Each of the following CC&IS Policies & Procedures is incorporated here by reference. Students are expected to review this information each term, and agree to the policies and procedures as identified here and specified in the latest edition of the University Catalog, available at <http://www.regis.edu/Academics/Course%20Catalog.aspx> or at the link provided.

- The CC&IS Academic Integrity Policy.
- The Student Honor Code and Student Standards of Conduct.
- Incomplete Grade Policy, Pass / No Pass Grades, Grade Reports.
- The Information Privacy policy and FERPA. For more information regarding FERPA, visit the [U.S. Department of Education](http://www.ed.gov).
- The HIPAA policies for protected health information. The complete Regis University HIPAA Privacy & Security policy can be found here: <http://www.regis.edu/About-Regis-University/University-Offices-and-Services/Auxiliary-Business/HIPAA.aspx>.
- The Human Subjects Institutional Review Board (IRB) procedures. More information about the IRB and its processes can be found here: <http://regis.edu/Academics/Academic-Grants/Proposals/Regis-Information/IRB.aspx>.

The CC&IS Policies & Procedures Syllabus Addendum summarizes additional important policies including, Diversity, Equal Access, Disability Services, and Attendance & Participation that apply to every course offered by the College of Computer & Information Sciences at Regis University.

A copy of the CC&IS Policies & Procedures Syllabus Addendum can be found here: <https://in2.regis.edu/sites/ccis/policies/Repository/CCIS%20Syllabus%20Addendum.docx>.