COMP 2247-01   Algorithms and Data Structures

Fall 2022   **4 Credit Hours**   **Delivery Method: Mostly Online**

This is a synchronous online class. It requires computer, Internet, video, and microphone capabilities. Classes will be held via Zoom meetings at the times listed on the schedule, the ability to meet at the scheduled times online is a requirement.
Exams are In-Person exams.

Monday and Wednesday: 4:00 – 5:50 PM	**Office Hours via Zoom**
Classroom Location: Zoom **Instructor:** Jim Ma **Office:** M2401T **Phone:** 529-2799 **Email:** jim.ma@rctc.edu	Monday 11:00 AM – 12:00 PM and 3:00 – 4:00 PM Tuesday 9:00 – 10:00 AM Wednesday 11:00 AM – 12:00 PM and 3:00 – 4:00 PM Thursday 9:00 – 10:00 AM For other times, please make an appointment with me via email: jim.ma@rctc.edu

Textbook
Starting Out with Java – From Control Structures through Data Structures   4th Edition
Author: Tony Gaddis and Godfrey Muganda

Other Materials
Other materials may include notes and program examples.
Java Development Kit (JDK) and Integrated Development Environment (IDE) are required, which can be free downloaded from Internet.

Catalog Description
This course covers the principles of complexity of algorithms and problem solving techniques with data structures. Topics include analysis of algorithm, array lists, linked lists, stacks, queues, binary search trees, sorting searching, and recursive algorithms. In-depth study of object-oriented programming concepts is covered. Additional topics may include iterators, heaps and priority queues, balanced binary search trees, dictionary, hashing and graph algorithms.

Course Prerequisites
COMP 1150, 2243; College level reading.

Recommended Entry Skills/Knowledge
The student should already have the ability to:
- Design algorithms using stepwise refinement.
- Document algorithms using flowcharts or pseudo code.
- Write and document programs using simple data types and arrays.
- Use standard input & output devices, and file input & output in programs.
- Use selection and repetition control structures, and user-defined methods in programs.
- Design, write, and document programs using object-oriented programming concepts including class, encapsulation, and information hiding.
- Compile, link and run programs.
- Test and debug programs.

Learning Outcomes/Competencies

After completing this course, students will be able to:
- Analyze complexity of algorithms.
- Design and write programs using object-oriented concepts including inheritance, polymorphism, abstract method/class, and interface.
- Design and implement data structures including array lists, linked lists, stacks and queues.
- Use sorting and search algorithms in programs.
- Solve problems using recursive algorithms.
- Design and implement binary search trees.
- Implement a dictionary data type incorporating hashing algorithms and collision avoidance.

Assessment/Evaluation and Grading

The grading scale used to assign the course grade will depend on a number of factors including, but not limited to, difficulty and length of exams and assignments, and the overall ability of the students in the class as a whole to demonstrate a good understanding of the course material.

The students must receive a passing score (>=60) on the average of three tests to get a passing grade. Once the student received the passing score (>=60) on the average of three tests, the actual grade is calculated based on the following scale:

Test 1 (Up to Exception Handling) Test 2 (Up to Stack) Final Test (Comprehensive Test)	50%
Homework Assignments	40%
Lab Exercises / Class Activities	10%

The letter grade will be determined based on the following table:

>= 90%	A
>= 80% and < 90%	B
>= 70% and < 80%	C
>= 60% and < 70%	D
< 60%	F

Attendance Policy

Attendance is required for successful completion of this course. Other materials include handouts, class notes and program examples will be used, therefore, students will benefit greatly by attending class. If a student misses a class, it is the student's responsibility to get those materials. To receive full credit, each assignment must be submitted by the due date. Late submissions will be penalized. See the individual assignment sheet for details. Unexcused absences from exams will result in a score of 0 for that exam. No make-up exams will be given without prior arrangement (unless due to documented illness or emergency).

- If a student has 3 unexcused absences, up to 5% of total points may be deducted.
- If a student has 5 unexcused absences, up to 10% of total points may be deducted.
- If a student is absent for 25% or more of the course, the instructor reserves the right to assign an F, regardless of work completed.

Academic Integrity Statement

The primary academic mission of Rochester Community and Technical College (RCTC) is the exploration and dissemination of knowledge, and academic honesty and integrity are integral to the academic process. Academic dishonesty - cheating, plagiarism, and collusion - is a serious offense which undermines the educational process and the learning experience for the entire college community. RCTC students are expected to understand and adhere to the concept of academic integrity and to the standards of conduct prescribed by the College's Academic Integrity Policy. Any act of academic dishonesty attempted by a student at Rochester Community and Technical College is unacceptable and will not be tolerated.

Americans with Disability Act

Rochester Community and Technical College is committed to ensuring its programs, services and activities are accessible to individuals with disabilities, through its compliance with state and federal laws, and System Policy. Appropriate accommodations are provided to those qualified students with disabilities. If you believe you qualify for an academic accommodation, please contact the Director of Disability Support Services, Travis Kromminga at 507-280-2968 or through the Minnesota relay TTY 1-800-627-3529. The office can also be reached via e-mail at DisabilityServices@rctc.edu

Military Friendly Statement

Rochester Community and Technical College (RCTC) is a military friendly campus, pledging to do all we can to help military veterans transition into college to complete their educational goals. RCTC is proud to be a Beyond the Yellow Ribbon campus, serving and honoring our veterans, military service members and their families. Through the Veterans Resource Center, RCTC offers student veterans an on-campus point of contact with other veterans, and program information to assist them in making a successful transition into college. For assistance, students are encouraged to contact the Veterans Assistant Coordinator, Mark Larsen, at 507-779-9375 or e-mail at mark.larsen@state.mn.us, or Othelmo da Silva, RCTC's VA certifying official at 507-285-7566 or email at VeteranServices@rctc.edu.

Title IX Statement

Sexual violence and other forms of sexual misconduct is prohibited at Minnesota State colleges and universities (Minnesota State). Any individual who has been, or is being, subjected to conduct prohibited by the Sexual Violence Policy is encouraged to report the incident. Individuals may choose to file a complaint anonymously using the online reporting tool (https://www.rctc.edu/services/student-affairs/title-ix/). Individuals who choose to file anonymous reports are advised that it may be difficult for the college to follow up or take specific action, where information is limited. For additional information please see the RCTC Sexual Violence Policy, http://www.rctc.edu/policies/system/sexual-violence or contact Teresa Brown, Title IX Coordinator, at 507-285-7108 or email at TitleIX@rctc.edu.

Calendar of Assignments, Exams, and Due Dates (Tentative)

Assignment 1 – Review of COMP 2243 Materials	Due 8/31/22
Assignment 2 – Array List	Due 9/7/22
Assignment 3 – Aggregation	Due 9/14/22
Assignment 4 – OOP Inheritance	Due 9/21/22
Assignment 5 – OOP Polymorphism, Abstract, and Interface	Due 9/28
Test 1	10/5/22
Assignment 6 – Exception Handling	Due 10/12/22
Assignment 7 – Recursion	Due 10/19/22
Assignment 8 – Sorting, Searching, and Big O	Due 11/2/22
Assignment 9 – Linked List	Due 11/9/22
Test 2	11/14/22
Assignment 10 – Stack	Due 11/23/22
Assignment 11 – Queue	Due 11/30/22
Assignment 12 – Tree, Heap, and Priority Queue	Due 12/7/22
Final Exam	12/12/22

Important Dates

Monday, September 5: Labor Day (No Class)
Wednesday, September 14: Student Success Day (No Class)
Wednesday, November 23: Full-Term Course Withdraw Deadline

Course Topics and Tentative Schedule

	Monday	Wednesday
Week 1	8/22 Video Link: Review COMP 2243 Materials	8/24 Video Link: Review COMP 2243 Materials Chapter 7 Section 7.13 ArrayList
Week 2	8/29 Chapter 7 Section 7.13 ArrayList	8/31 Chapter 8 Section 8.7 Aggregation Assignment 1 (Review of COMP2243 Materials) Due
Week 3	9/5 **Labor Day (No Class)**	9/7 Chapter 8 Section 8.7 Aggregation Assignment 2 (ArrayList) Due
Week 4	9/12 Chapter 10 Section 10.1, 10.2, 10.3, 10.4, and 10.5 Inheritance	9/14 **Student Success Day (No Class)** Assignment 3 (Aggregation) Due
Week 5	9/19 Chapter 10 Section 10.1, 10.2, 10.3, 10.4, and 10.5 Inheritance	9/21 Chapter 10 Section 10.7 Polymorphism Section 10.8 Abstract Classes and Methods Section 10.9 Interfaces Assignment 4 (Inheritance) Due
Week 6	9/26 Chapter 10 Section 10.7 Polymorphism Section 10.8 Abstract Classes and Methods Section 10.9 Interfaces	9/28 Chapter 11 Exception Handling Assignment 5 (Polymorphism Abstract Interface) Due
Week 7	10/3 Chapter 11 Exception Handling Review for Test 1	10/5 **Test 1**
Week 8	10/10 Chapter 15 Recursion	10/12 Chapter 15 Recursion Assignment 6 (Exception Handling) Due
Week 9	10/17 Chapter 16 Section 16.1 Soring Algorithms Section 16.2 Searching Algorithms	10/19 Chapter 16 Section 16.1 Soring Algorithms Section 16.2 Searching Algorithms Assignment 7 (Recursion) Due

Week 10	10/24
	
	Chapter 16
	    Section 16.3 Algorithm Analysis and Big O
		10/26
		
		Chapter 16
		    Section 16.3 Algorithm Analysis and Big O
		
		Chapter 17 Generics*
		Chapter 18 Java Collection*

Week 11	10/31 Chapter 19 Linked List	11/2 Chapter 19 Linked List Chapter 20 Stack Assignment 8 (Sorting Searching) Due
Week 12	11/7 Chapter 20 Stack	11/9 Chapter 20 Stack Assignment 9 (Linked List) Due Review for Test 2
Week 13	11/14 **Test 2**	11/16 Chapter 20 Queue
Week 14	11/21 Chapter 20 - Queue	11/23 Chapter 21 – Trees Assignment 10 (Stack) Due Full-Term Course Withdraw Deadline
Week 15	11/28 Chapter 21 - Trees	11/30 Chapter 21 – Trees Assignment 11 (Queue) Due
Week 16	12/5 Chapter 21 - Trees	12/7 Additional Topics Assignment 12 (Tree) Due
Week 17	12/12 Final Test	12/14

ROCHESTER COMMUNITY AND TECHNICAL COLLEGE — COMMON COURSE OUTLINE

Course discipline/number/title: COMP 2247: Algorithms and Data Structures

A. CATALOG DESCRIPTION
1. Credits: 4
2. Hours/Week: 4
3. Prerequisites (Course discipline/number): COMP 1150, COMP 2243
4. MnTC Goals (if any): NA

This course covers the principles of complexity of algorithms and problem solving techniques with data structures. Topics include analysis of algorithm, array lists, linked lists, stacks, queues, binary search trees, sorting searching, and recursive algorithms. In-depth study of object-oriented programming concepts is covered. Additional topics may include iterators, heaps and priority queues, balanced binary search trees, dictionary, hashing and graph algorithms. College level reading is required.

B. DATE LAST REVISED (Month, year): December, 2017

C. OUTLINE OF MAJOR CONTENT AREAS:
1. Object-Oriented Programming concepts including inheritance, polymorphism, abstract method/class, and interface
2. Analysis of complexity of algorithms
3. Linked lists
4. Stacks
5. Queues
6. Sorting algorithms
7. Searching algorithms
8. Recursion
9. Binary search trees

D. LEARNING OUTCOMES (GENERAL): The student will be able to:
1. Analyze complexity of algorithms.
2. Design and write programs using object-oriented concepts including inheritance, polymorphism, abstract method/class, and interface.
3. Design and implement data structures including array lists, linked lists, stacks and queues.
4. Use sorting and search algorithms in programs.
5. Solve problems using recursive algorithms.
6. Design and implement binary search trees.
7. Implement a dictionary data type incorporating hashing algorithms and collision avoidance.

E. LEARNING OUTCOMES (MNTC): NA

F. METHODS FOR EVALUATION OF STUDENT LEARNING:
Methods may include but are not limited to:
1. Tests
2. Lab exercises
3. Programming assignments
4. Comprehensive final exam

G. RCTC CORE OUTCOME(S) ADDRESSED:
- ☐ Communication
- ☒ Critical Thinking
- ☐ Global Awareness/Diversity
- ☐ Civic Responsibility
- ☐ Personal/Professional Accountability
- ☐ Aesthetic Response

H. SPECIAL INFORMATION (if any): None