LOS MEDANOS COLLEGE

ARTICULATION AGREEMENT **DATE DRAFTED**: May 16, 2019
VALID ACADEMIC YEAR(S): 2019-2020 & 2020-21

LMC COURSE: COMSC-122 "Programming Concepts & Methodologies I"
HIGH SCHOOL COURSE: AP Computer Science A
School: Heritage High School
Address: 101 American Ave., Brentwood, CA 94513

A. **COLLEGE COURSE DESCRIPTION:** This course introduces the discipline of computer science with practical hands-on problem solving using a "high-level" computer programming language. The course will include basic syntax and semantics of a "high-level" language, variables, types, expressions, assignment, basic computation, simple I/O, conditional and iterative control structures, functions and parameter passing, structured decomposition, program design, programming style, algorithms and problem solving strategies, overview of programming languages, binding, visibility, scoping, and lifetime management.

B. **UNITS: 3**
C. **PRE-REQUISITES:** NA
D. **REQUIRED CONTENT FOR ARTICULATION:**

1. INTRODUCTION
   1.1 Understand the Social and ethical ramifications of computer use.
   1.2 Understand the ACM's Code of Ethics and Professional Conduct
   1.3 This chapter helps students understand the activity of programming.
   1.4 They will learn about the architecture of computers.
   1.5 They will learn about machine code and high-level programming languages.
   1.6 They will recognize compile-time and run-time errors and write pseudocode for simple algorithms.
2. USING OBJECTS
   2.1 In this section of the course, students will learn about variables and understand the concepts of classes and objects.
   2.2 Students will be able to call methods learn about parameters and return values and be able to browse the API documentation.
   2.3 They will learn to implement test programs.
   2.4 They will understand the difference between objects and object references.
3. IMPLEMENTING CLASSES
   3.1 In this chapter, students will become familiar with the process of implementing classes.
   3.2 They will understand software copyright laws, intellectual property, freeware, and shareware.
   3.3 They will be able to implement simple methods.
   3.4 They will understand the purpose and use of constructors.
   3.5 They will understand how to access instance variables and local variable and to be able to write javadoc comments.

4. FUNDEMENTAL DATA TYPES

4.1 Students will understand integer and floating-point numbers and recognize the limitations of the numeric data types.

4.2 They will become aware of causes for overflow and roundoff errors.

4.3 They will understand the proper use of constants.

4.4 They will write arithmetic expressions in Java.

4.5 They will use the String type to manipulate character strings.

4.6 They will learn how to read program input and produce formatted output.

5. DECISIONS

5.1 Students will be able to implement decisions using if statements.

5.2 They will effectively group statements into blocks.

5.3 The will learn how to compare integers, floating-point numbers, strings, and objects

5.4 They will correctly order decisions in multiple branches and nested branches

5.5 They will program conditions using Boolean operators and variables.

5.6 They will be able to design tests that cover all parts of a program.

6. ITERATION

6.1 Students will be able to program loops with the while and for statements

6.2 They will be able to avoid infinite loops and off-by-one errors

6.3 They will be able to use common loop algorithms.

6.4 They will understand nested loops, be able to implement simulations, and learn to use a debugger to locate errors in a running program.

7. ARRAYS AND ARRAY LISTS

7.1 Students will become familiar with using arrays and array lists.

7.2 They will learn about wrapper classes, auto-boxing, and the enhanced for loop.

7.3 They will study common array algorithms and learn how to use two-dimensional arrays.

7.4 They will understand when to choose array lists and arrays in their programs.

7.5 They will learn to implement partially filled arrays and understand the concept of regression testing.

8. DESIGNING CLASSES

8.1 Students will learn how to choose appropriate classes for a given problem.

8.2 They will understand the concepts of cohesion and coupling.

8.3 They will learn how to minimize the use of side effects.

8.4 They will understand the need for computer reliability and software redundancy in various computing environments.

8.5 They will document the responsibilities of methods and their callers with preconditions and postconditions.

8.6 They will understand static methods and variables.

8.7 They will understand the scope rules for local variable and instance variables.

8.8 They will learn about packages and learn about unit testing frameworks.

9. INTERFACES AND POLYMORPHISM

9.1 Students will be able to declare and use interface types.

9.2 The will understand the concept of polymorphism.

9.3 They will appreciate how interfaces can be used to decouple classes.

9.4 They will learn how to implement helper classes as inner classes.

9.5 They will implement event listeners in graphical applications.

10. INHERITANCE

10.1 Students will learn about inheritance and how to inherit and override superclass methods.

10.2 They will be able to invoke superclass constructors.

10.3 They will learn about protected and package access control.

10.4 They will understand the common superclass Object and how to override its toString and equals methods.

10.5 They will learn how to use inheritance for customizing user interfaces.

11. I/O AND EXCEPTION HANDLING

11.1 Students will be able to read and write text files.

11.2 They will learn how to throw and catch exceptions.

11.3 They will be able to design their own exception classes.

11.4 They will understand the difference between checked and unchecked exceptions.

11.5 They will know when and where to catch an exception.

12. OBJECT ORIENTED DESIGN

12.1 Students will learn about the software life cycle.

12.2 They will learn how to discover new classes and methods.

12.3 They will learn how to use CRC cards for class discovery.

12.4 They will be able to identify inheritance, aggregation, and dependency relationships between classes.

12.5 They will master the use of UML class diagrams to describe class relationships.

12.6 They will learn how to use object-oriented design to build complex programs.

13. RECURSION

13.1 Students will learn about the technique of recursion.

13.2 They will understand the relationship between recursion and iteration.

13.3 They will analyze problems that are much easier to solve by recursion than by iteration.

13.4 They will learn to “think recursively”

13.5 They will be able to use recursive helper methods.

13.6 They will understand when the use of recursion affects the efficiency of an algorithm.

14. SORTING AND SEARCHING

14.1 Students will once again familiarize themselves with the Documents and materials addressing privacy issues, legal issues, and intellectual property

14.2 Students will study several sorting and searching algorithms.

14.3 They will appreciate that algorithms for the same task can differ widely in performance.

14.4 They will understand the big-Oh notation.

14.5 They will learn how to estimate and compare the performance of algorithms.

14.6 They will learn how to measure the running time of a program.

15. INTRODUCTION TO DATA STRUCTURES

15.1 Students will learn how to use the linked lists provided in the standard library.

15.2 They will be able to use iterators to traverse linked lists and understand the implementation of linked lists.

15.3 They will distinguish between abstract and concrete data types.

15.4 They will know the efficiency of fundamental operations of lists and arrays.

15.5 They will become familiar with the stack and queue data types.

16. GRIDWORLD CASE STUDY OR (MAGPIE, PICTURE, ELEVENS LABS)

Gridworld Case Study and Magpie, Picture, and Elevens Labs expose students to large programs with multiple classes that interact with each another. These lab projects review most topics presented in this course.

E. REQUIRED COMPETENCIES (PERFORMANCE OBJECTIVES) FOR ARTICULATION

Students will be able to:

1. Design and implement solutions to problems by writing, running, and debugging computer programs.
2. Use and implement commonly used algorithms and data structures.
3. Develop and select appropriate algorithms and data structures to solve problems.
4. Code fluently in an object-oriented paradigm using the programming language Java. Students are expected to be familiar with and be able to use standard Java library classes from the AP Java subset.
5. Read and understand a large program consisting of several classes and interacting objects.
6. Recognize the ethical and social implications of computer use.

F. METHODS FOR END OF COURSE ASSESSMENT:

TEACHING STRATEGIES AND PROCEDURES

Lectures, demonstrations, and hand-outs
Programming by imitation
Analysis of teacher provided materials
Study assignments from texts and quizzes
Classroom discussions
Role Plays
Individual and team programming on selected projects

GRADING CRITERIA:

Homework 10%

Programming Projects 10%
Programming Exercises 10%
Final Exam 20%
Tests/Quizzes 50%

G. PROCEDURES AND/OR CRITERIA FOR COURSE ARTICULATION:

1. Complete the AP Computer Science A course at Heritage High School with a grade of "B" or better (unless otherwise indicated).
2. Complete the LMC "Credit by Exam" procedure **(for this class, it is the high school class final)** with a grade of "B" or better.
3. Apply for admission at Los Medanos College.
4. Register for CATEMA for electronic submission of college credit **OR** complete an LMC HS/Adult Ed. Grade Verification Form , obtain copy of high school transcript and articulation agreement and submit to the LMC Office of Admissions & Records.
5. Upon completion of the above, the student will receive on his/her LMC and CCCCD (California Community College District) transcripts the grade of "A", "B" or "P" and the unit credit for the LMC COMSC-122 course. Transcripts will reflect the grade on the final exam and be notated as *Credit by Exam.

H. TEXTBOOKS OR OTHER SUPPORTING MATERIALS

Horstmann, Cay. Java Concepts 6th Edition Hoboken, N.J.: Wiley 2010

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COLLEGE SIGNATURES

Sally Montemayor Lenz, Ed.D.
Sally Montemayor Lenz, Ed.D. (Jun 3, 2019)

Sally Montemayor Lenz — Date
LMC Interim Vice President of Instruction

Ryan Pedersen
Ryan Pedersen (May 30, 2019)

Ryan Pedersen — Date
LMC Dean of Mathematics and Sciences

Louie M. Giambattista
Louie M. Giambattista (May 21, 2019)

Louie Giambattista — Date
LMC Computer Science Department Chair

HIGH SCHOOL/AEC/ROP/DISTRICT SIGNATURES

Carrie J Wells
Carrie J Wells (Jul 26, 2019)

Carrie Wells — Date
Principal, Heritage High School

Erik Faulkner
Erik Faulkner (Jul 26, 2019)

Erik Faulkner — Date
LUHSD Asst. Superintendent, Educational Services

Robert Pardi
Robert Pardi (Jul 25, 2019)

Robert Pardi — Date
Faculty, Heritage High School

Cc: LMC Director of Admissions and Records
LMC K-12 Senior Program Coordinator
LMC Pathways Counselor/LMC CTE Counselor
School District Educational Services Dept.
High School Principal
High School CATEMA Contact

HHS COMSC-122 Artic 2019-21 FINAL

Final Audit Report 2019-07-26

Created:	2019-05-21
By:	Colleen Grim (cgrim@losmedanos.edu)
Status:	Signed
Transaction ID:	CBJCHBCAABAA2OU4B1ktNtaBV8_hYwtH0wtH2Pc7wwxf

"HHS COMSC-122 Artic 2019-21 FINAL" History

Document created by Colleen Grim (cgrim@losmedanos.edu)
2019-05-21 - 9:23:20 PM GMT- IP address: 207.62.229.215

Document emailed to Louie M. Giambattista (lgiambattista@losmedanos.edu) for signature
2019-05-21 - 9:24:20 PM GMT

Email viewed by Louie M. Giambattista (lgiambattista@losmedanos.edu)
2019-05-22 - 0:06:48 AM GMT- IP address: 130.212.184.67

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Signature Date: 2019-05-22 - 0:07:29 AM GMT - Time Source: server- IP address: 130.212.184.67

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Email viewed by Ryan Pedersen (rpedersen@losmedanos.edu)
2019-05-30 - 5:53:36 PM GMT- IP address: 207.62.228.222

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Signature Date: 2019-05-30 - 5:54:13 PM GMT - Time Source: server- IP address: 207.62.228.222

Document emailed to Sally Montemayor Lenz, Ed.D. (smontemayor@losmedanos.edu) for signature
2019-05-30 - 5:54:15 PM GMT

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2019-06-03 - 5:55:59 PM GMT- IP address: 207.62.227.253

Document e-signed by Sally Montemayor Lenz, Ed.D. (smontemayor@losmedanos.edu)
Signature Date: 2019-06-03 - 5:56:21 PM GMT - Time Source: server- IP address: 207.62.227.253

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2019-06-03 - 5:56:24 PM GMT

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2019-07-25 - 5:54:08 PM GMT- IP address: 169.199.155.65

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Signature Date: 2019-07-25 - 5:55:28 PM GMT - Time Source: server- IP address: 169.199.155.65

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2019-07-25 - 5:55:31 PM GMT

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2019-07-25 - 7:06:03 PM GMT- IP address: 172.58.37.206

Document e-signed by Carrie J Wells (wellsc@luhsd.net)
Signature Date: 2019-07-26 - 8:03:14 PM GMT - Time Source: server- IP address: 169.199.155.65

Document emailed to Erik Faulkner (faulkner@luhsd.net) for signature
2019-07-26 - 8:03:17 PM GMT

Email viewed by Erik Faulkner (faulkner@luhsd.net)
2019-07-26 - 9:56:02 PM GMT- IP address: 169.199.155.65

Document e-signed by Erik Faulkner (faulkner@luhsd.net)
Signature Date: 2019-07-26 - 9:56:30 PM GMT - Time Source: server- IP address: 169.199.155.65

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2019-07-26 - 9:56:30 PM GMT