COURSE OUTLINE

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<th>Course Number</th>
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<td>COS 102</td>
<td>Computer Science 1 Algorithms and Programming</td>
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**Hours:** 3 lecture / 2 Lab

**Pre-requisite:** COS 101, IST 107, IST 108, IST 109, or IST 123 or equivalent

**Co-requisite:** MAT 146 or higher

**Implementation:** Spring 2019

**Catalog description:**
Algorithm design and object-oriented programming in the Java language. Topics include data representation, input/output, control structures, exception handling, classes, methods, inheritance, polymorphism, encapsulation, overloading and dynamic memory.

**Required texts/other materials:** “Java Software Solutions Foundations of Program Design”, Lewis and Loftus, Pearson.

**Revision date:** Spring 2019  
**Course coordinator:** Meimei Gao, x3483, gaom@mccc.edu

**Information resources:**
- Textbook
- Java Development Kit (JDK)
- JGrasp Integrated Development Environment

**Other learning resources:** Learning Management Systems, e.g. BLACKBOARD
Course Competencies/Goals (CC/G)

The student will be able to:
1. Be able to design algorithms and then develop solutions using a formal programming language.
2. Have refreshed basic programming skills including sequence, selection, iteration and functions.
3. Have an understanding of the fundamental object-oriented programming (OOP) concepts.
4. Comprehend OOP concepts of inheritance, polymorphism, encapsulation and overloading.
5. Understand and implement basic data types, classes and methods.
6. Understand and be able to write programs that work with streams, files and input/output.
7. Implement simple examples of arrays, and strings.

Course-specific General Education Knowledge Goals and Core Skills

General Education Knowledge Goals (GEKG)
Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

MCCC Core Skills (CS)
Goal B. Critical Thinking and Problem-solving. Students will use critical thinking and problem solving skills in analyzing information.
Goal D. Information Literacy. Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
Goal E. Computer Literacy. Students will use computers to access, analyze or present information, solve problems, and communicate with others.

Units of study in detail

Unit I  Introduction to Java
Learning Objectives
The student will be able to…
Explain the history of Java (CC/G 2)
State the importance of portability (CC/G 3)
Understand programming languages and coding styles (CC/G 2)
Explain the fundamentals of OOP concepts (CC/G 3)
Write their first “hello world” Java programs (CC/G 1, GEKG 4, CS B)

Unit II Primitive types, Strings, Simple I/O
Learning Objectives (All use GEKG 4, CS Goal B)
The student will be able to...
Understand literals and primitive types (CC/G 1, 5)
Write assignment statements and declare and initialize variables (CC/G 1, 5)
Explain arithmetic operators and the precedence rules (CC/G 5)
Calculate accuracy, floating point inaccuracies, conversions and detect overflow (CC/G 5)
Work with the java.lang.String class and basic string class operations (CC/G 7)

Unit III Flow of Control
Learning Objectives (All use GEKG 4, CS Goal B)
The student will be able to...
Describe expression statements versus selection statements versus looping statements (CC/G 2)
Unit IV Classes and Methods
Learning Objectives (All use GEKG 4, CS Goal B)
The student will be able to...
- Write class and method definitions (CC/G 5)
- Invoke methods, use return values, void methods and return statements (CC/G 5)
- Understand the “this” object (CC/G 5)
- Use local variables, blocks and scope (CC/G 5)
- Utilize information hiding and encapsulation (CC/G 5)
- Explain access modifiers and accessor methods versus mutator methods (CC/G 5)
- Describe objects and reference, memory addresses, reference types and the new operator (CC/G 5)
- Write methods that call other methods (CC/G 5)
- Understand method overloading (CC/G 5)
- Write constructors (CC/G 5)

Unit V Arrays
Learning Objectives (All use GEKG 4, CS Goal B)
The student will be able to...
- Describe arrays as objects
- Create, initialize and access arrays
- Understand array indices, stepping through with loop statements, and the length instance variable
- Pass arrays as method arguments and use methods that return arrays
- Search through and sort the elements of an array
- Work with multidimensional arrays

Unit VI Inheritance and Polymorphism
Learning Objectives (All use GEKG 4, CS Goal B)
The student will be able to...
- Understand inheritance, parent/child relationships, base/derived classes
- Use the extends keyword
- Explain the parent class java.lang.Object
- Override a method and describe overriding versus overloading
- Use static and final modifiers
- Write constructors in derived classes and the super() method
- Call an overridden method
- Differentiate between the “is-a” and “has-a” relationships
- Describe polymorphism, dynamic binding

Unit VII Exception Handling
Learning Objectives (All use GEKG 4, CS Goal B)
The student will be able to...
- Describe exceptions in Java, try-catch blocks, throw statements
- View exceptions as objects
- Use the getMessage() method
Code multiple catches per try block
Use java.io package; work with IOException; code to read from/write to files.

**Evaluation of student learning:** Specific methods for evaluating student progress through the course is up to the discretion of the instructor. In general, exams are intended to assess a student’s knowledge of the learning objectives described above. Labs and homework assess a student’s ability to solve problems using a formal programming language (CC/G 1). Below are two examples used in past COS-102 courses balancing lab, lecture, and homework.

**Example 1:**
- Midterm Exam = 30% of the grade
- Ten Labs = 30% of the grade
- Homework = 10% of the grade
- Final Exam = 30% of the grade

**Example 2:**
- Three 1-Hour Exams = 45% of the grade
- Ten Labs = 30% of the grade
- Final Exam = 25% of the grade

**Academic Integrity Statement:** Mercer County Community College is committed to Academic Integrity—the honest, fair and continuing pursuit of knowledge, free from fraud or deception. This implies that students are expected to be responsible for their own work and that faculty and academic support services staff members will take reasonable precautions to prevent the opportunity for academic dishonesty.

See [http://www.mccc.edu/admissions_policies_integrity.shtml](http://www.mccc.edu/admissions_policies_integrity.shtml) for a complete explanation of policies and procedures regarding academic integrity and academic integrity violation.