COURSE OUTLINE: MTH123 - COMPUTER MATH

Prepared: The Mathematics Department
Approved: Karen Hudson, Dean, Community Services and Interdisciplinary Studies

Course Code: Title	MTH123: COMPUTER MATHEMATICS
Program Number: Name	2095: COMPUTER PROGRAMMING
Department:	MATHEMATICS
Academic Year:	2024-2025
Course Description:	Learners in this course explore mathematical concepts that strengthen understanding of the computer programming skills acquired in this program. Number systems, linear algebra, discrete mathematics, graphs, and statistics are investigated with regard to their application in computer programming, data analysis, and machine learning. Emphasis is placed on developing logical thinking skills and an algorithmic approach to problem-solving.
Total Credits:	3
Hours/Week:	3
Total Hours:	42
Prerequisites:	There are no pre-requisites for this course.
Corequisites:	There are no co-requisites for this course.
Substitutes:	MTH122
Vocational Learning Outcomes (VLO's) addressed in this course: **Please refer to program web page for a complete listing of program outcomes where applicable.**	**2095 - COMPUTER PROGRAMMING** VLO 10 Contribute to the development, documentation, implementation, maintenance and testing of software systems by using industry standard software development methodologies based on defined specifications and existing technologies/frameworks. VLO 11 Apply one or more programming paradigms such as, object-oriented, structured or functional programming, and design principles, as well as documented requirements, to the software development process. VLO 12 Model, design, implement, and maintain basic data storage solutions.
Essential Employability Skills (EES) addressed in this course:	EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems.
Course Evaluation:	Passing Grade: 50%, D A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
Other Course Evaluation & Assessment Requirements:	Students are expected to be present to write all tests in class, unless otherwise specified. If a student is unable to write a test due to illness or a legitimate emergency, that student must contact the professor prior to class and provide reasoning. Should the student fail to contact the

professor, the student shall receive a grade of zero on the test.

If a student is not present 10 minutes after the test begins, the student will be considered absent and will not be given the privilege of writing the test.
Students exhibiting academic dishonesty during a test will receive an automatic zero. Please refer to the College Academic Dishonesty Policy for further information.

In order to qualify to write a missed test, the student shall have:
a.) attended at least 75% of the classes to-date.
b.) provide the professor an acceptable explanation for his/her absence.
c.) be granted permission by the professor.

NOTE: The missed test that has met the above criteria will be an end-of-semester test.

Labs / assignments are due on the due date indicated by the professor. Notice by the professor will be written on the labs / assignments and verbally announced in advance, during class.

Labs and assignments that are deemed late will have a 10% reduction per academic day to a maximum of 5 academic days at 50% (excluding weekends and holidays). Example: 1 day late - 10% reduction, 2 days late, 20%, up to 50%. After 5 academic days, no late assignments and labs will be accepted. If you are going to miss a lab / assignment deadline due to circumstances beyond your control and seek an extension of time beyond the due date, you must contact your professor in advance of the deadline with a legitimate reason that is acceptable.

It is the responsibility of the student who has missed a class to contact the professor immediately to obtain the lab / assignment. Students are responsible for doing their own work. Labs / assignments that are handed in and are deemed identical or near identical in content may constitute academic dishonesty and result in a zero grade.

Students are expected to be present to write in-classroom quizzes. There are no make-up options for missed in-class quizzes.

Students have the right to learn in an environment that is distraction-free, therefore, everyone is expected to arrive on-time in class. Should lectures become distracted due to students walking in late, the professor may deny entry until the 1st break period, which can be up to 50 minutes after class starts or until that component of the lecture is complete.

Books and Required Resources:

Mathematics for Computer Technology by Robert McCullough
Publisher: Morton Publishing Company Edition: 3rd
ISBN: 9780895827005

Calculator-SharpEL-520XTB (available in the bookstore)

Course Outcomes and Learning Objectives:

Course Outcome 1	Learning Objectives for Course Outcome 1
1. Discuss practical considerations when representing mathematics using computers	1.1 State the accuracy and precision of a quantity and round off to a given accuracy 1.2 Use the one-byte method and two`s complement form for negatives to store an integer 1.3 Decode digital data in both big-endian and little-endian formats 1.4 Discuss the nature and limitations of the IEEE 754 standard for floating-point arithmetic 1.5 Represent a real number using the IEEE 754 standard

Course Outcome 2	Learning Objectives for Course Outcome 2
2. Apply fundamental discrete mathematics concepts	2.1 Define sets using both elements in the set, set builder notation, and Venn diagrams 2.2 Determine subsets, proper subsets, unions, intersections, differences, and complements of sets 2.3 Explain the components of a compound propositional logic statement 2.4 Analyze propositional logic statements using truth tables
Course Outcome 3	**Learning Objectives for Course Outcome 3**
3. Explain how Boolean logic applies in computer software and hardware	3.1 Evaluate Boolean algebra expressions 3.2 Draw network diagrams using logic gates to represent Boolean expressions 3.3 Discuss how computer processors use networks of logic gates to perform computations 3.4 Calculate the output of half- and full-adder circuits
Course Outcome 4	**Learning Objectives for Course Outcome 4**
4. Perform calculations using matrices and vectors	4.1 Identify the properties and components of matrices 4.2 Use matrices and vectors to represent data for use in computation 4.3 Perform addition, subtraction, and multiplication using matrices and vectors
Course Outcome 5	**Learning Objectives for Course Outcome 5**
5. Represent and analyze data using graphs	5.1 Discuss the kinds of information that graphs may represent 5.2 Define basic graph terminology, (vertices, edges, paths, cycles, etc.) and types (un/directed, a/cyclic, tree, binary tree, etc.) 5.3 Represent graphs using adjacency lists and matrices 5.4 Define what an algorithm is 5.5 Perform graph-based algorithms (BFS, DFS, Binary Search, Dyjkstra`s, etc.) 5.6 Discuss at a high level how the choice of data representation and algorithm can affect computation and storage requirements
Course Outcome 6	**Learning Objectives for Course Outcome 6**
6. Analyze data using statistical techniques	6.1 Explain the difference between correlation and causation 6.2 Analyze the meaning of common data visualizations (charts, histograms, scatter plots, etc.) 6.3 Calculate measures of central tendency (mean, median, mode) and dispersion (range, standard deviation) 6.4 Define basic probability concepts (sample space, event, variable, in/dependence, etc.) 6.5 Calculate basic probabilities 6.6 Discuss at a high level the nature of common probability distributions, and when they typically manifest 6.7 Use linear regression to analyze the relationship between two variables
Course Outcome 7	**Learning Objectives for Course Outcome 7**

7. Discuss mathematical concepts related to machine learning	7.1 Discuss the difference between supervised and unsupervised machine learning 7.2 Discuss approaches to training and evaluating regression and classification models 7.3 Use feature vectors to numerically describe an object 7.4 List the steps of the k-means clustering algorithm 7.5 Describe at a high level the process of training deep learning models

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Attendance/Assignments/Quizzes	20%
Tests (possibly 6)	80%

Date: June 28, 2024

Addendum: Please refer to the course outline addendum on the Learning Management System for further information.