STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

CYBR 153, Computer Logic & Algorithms

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SCHOOL OF SCIENCE, HEALTH, & CRIMINAL JUSTICE
CYBERSECURITY DEPARTMENT
FALL 2024

A. **TITLE**: Computer Logic & Algorithms

B. **COURSE NUMBER:** CYBR 153

C. **CREDIT HOURS: 3**

D. **WRITING INTENSIVE COURSE**: n/a

E. **GER CATEGORY:** n/a

F. **SEMESTER(S) OFFERED:** Fall and Spring

G. **COURSE DESCRIPTION:** Computer Logic & Algorithms" is a core course tailored for undergraduate data science students. It focuses on the foundational principles of computer logic and essential algorithms, with a special emphasis on their applications in data analysis and data processing. The course is designed to bridge the gap between theoretical understanding and practical implementation, essential for future data scientists.

H. **PRE-REQUISITES/CO-REQUISITES:**

a. Pre-requisite(s): None.

I. **STUDENT LEARNING OUTCOMES:**

Course Student Learning Outcome [SLO]	***PSLO ()***	***GER***	***ISLO***
a. **Describe** and **summarize** computer logic principles.		2. Critical Thinking [CA]	
b. **Identify** and **explain** basic algorithms.		2. Critical Thinking [CA]	
c. **Employ** algorithmic thinking to **solve** data analysis problems.		2. Critical Thinking [PS]	
d. **Integrate** appropriate data structures in algorithm design.		2. Critical Thinking [PS]	
e. **Implement** and **compare** the efficiency of sorting and searching algorithms.		2. Critical Thinking [PS]	
f. **Construct** efficient algorithms for processing data.		2. Critical Thinking [PS]	
g. **Break down** complex problems and **devise** algorithmic solutions.		2. Critical Thinking [PS]	
h. **Evaluate** ethical considerations in the use of algorithms.		2. Critical Thinking [PS]	

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL],* *Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

J. APPLIED LEARNING COMPONENT: Yes_____ No_X_____

If Yes, select one or more of the following categories:

Classroom/Lab___
Internship___
Clinical Practicum___
Practicum___
Service Learning___
Community Service___
Civic Engagement___
Creative Works/Senior Project___
Research___
Entrepreneurship___
(program, class, project)

K. Suggested TEXTS:

1. "Algorithms" by Robert Sedgewick and Kevin Wayne
   - This book provides an in-depth look at the most important and commonly used algorithms. It is well-suited for students new to the subject, offering practical information and examples in Java.
2. "The Algorithm Design Manual" by Steven S. Skiena
   - This manual is known for its effective approach to understanding algorithms, offering a mix of theory and practical advice, along with real-world examples.

L. REFERENCES: n/a

M. EQUIPMENT: n/a

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Participation Assignments**
- **Challenge Assignments**
- **Quizzes**
- **Exams**

P. DETAILED COURSE OUTLINE:

Week 1: Introduction to Computer Logic in Data Science
- Overview of computer logic and its significance in data science.
- Introduction to the course, objectives, and expectations.

Week 2: Basic Number Systems
- Understanding binary and decimal systems.
- Simple exercises on number conversions.

Week 3: Introduction to Logic Gates
- Basic concepts of logic gates (AND, OR, NOT).
- Simple exercises using truth tables.

Week 4: Fundamentals of Data Representation
- How data is represented in computers (bytes, characters).
- Understanding binary arithmetic at a basic level.

Week 5: Introduction to Algorithms and Pseudocode
- What are algorithms and why they are important in data science.
- Writing simple algorithms in pseudocode.

Week 6: Basic Algorithm Analysis
- Introduction to the concept of algorithm efficiency.
- Simple examples to understand the efficiency of algorithms.

Week 7: Introduction to Sorting Algorithms
- Understanding simple sorting algorithms (e.g., Bubble Sort).
- Practical exercises to implement basic sorting.

Week 8: Basic Searching Algorithms
- Overview of basic searching techniques (e.g., Linear Search).
- Classroom exercises on implementing searching algorithms.

Week 9: Introduction to Data Structures
- Basic data structures: Arrays and Lists.
- Simple applications of these data structures in data science.

Week 10: Practical Applications of Stacks and Queues
- Understanding stacks and queues with practical examples.
- Classroom activities to implement stacks and queues.

Week 11: Exploring Trees in Data Structures
- Basic introduction to trees (Binary Trees).
- Simple exercises involving tree structures.

Week 12: Introduction to Graphs and Their Uses
- Basics of graph theory.
- Understanding simple graph traversal techniques.

Week 13: Simplified Algorithm Design Techniques
- An introduction to basic algorithm design techniques like recursion.
- Classroom exercises to apply these techniques.

Week 14: Algorithms in Data Science – A Practical Approach
- Discussing the use of algorithms in data processing and analysis.
- Simple case studies and examples.

Week 15: Course Review and Project Discussions
- Recap of key concepts covered in the course.
- Discussions and presentations of mini-projects or assignments.

Q. LABORATORY OUTLINE:

n/a