UNIVERSITY OF GHANA

COLLEGE OF BASIC AND APPLIED SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
FIRST SEMESTER, 2023/2024
COURSE OUTLINE

Course Code: DCIT 105
Course Title: Maths for IT professionals
Credit Hours: Three (3)
Day & Time: Thursday @ 5:30pm – 7:20pm
Venue: JQB 19

Lecturer: Solomon Mensah (PhD)
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Course Description:

DCIT105 will cover some particularly important concepts used in computer science. Graph theory concepts are used in networks, operating systems, and compilers. Set theory concepts are used in software engineering and in databases. Topics to be covered include Number Systems, Propositional and Predicate logic, Sets: Cartesian product, Power sets, Cardinality of finite sets; Vectors and Matrices; Graphs: Trees, Properties, Traversal strategies, Undirected graphs, Directed graphs; Functions: Surjections, injections, bijections, Inverse, Composition; Recursions; Relations: Reflexivity, symmetry, transitivity, closures; Differentiation and Integration.

Recommended Textbooks and Resource Materials:

- Rosen K. H. (2012). "Discrete Mathematics and its Applications", Seventh edition, McGraw Hill, ISBN 978-0-07-338309-5
- Batty, M. (2011). *"Essential Engineering Mathematics". Michael Batty & Ventus Publishing ApS.* ISBN 978-87-7681-735-0
- Haggard, G., Schlipf, J. and Whitesides, S. (2006). "Discrete Mathematics for Computer Science". *Thomson Brooks/Cole: Bob Pirtle.* ISBN 0-534-49501-X
- Lex de Haan, Toon Koppelaars (2007), Applied Mathematics for Database Professionals, New York, Apress, ISBN-10: 1590597451, ISBN-13: 978-1590597453
- Maini, A. K. (2007). "Digital Electronics: Principles, Devices and Applications". *John Wiley & Sons, Ltd.* ISBN: 978-0-470-03214-5
- Steele, J. M. (2010), Stochastic Calculus and Financial Application (Stochastic Modelling and Applied Probability), Berlin: Springer, ISBN-10: 1441928626, ISBN13: 978-1441928627
- Other resource materials will be provided to students in electronic format.

Course Learning Outcomes/ Objectives:

Upon successful completion of this course, the student will be able to:

- demonstrate good understanding of a given problem and how to apply logical reasoning to solve such problems
- explain the notations of key discrete mathematic concepts such as sets, relations, graphs, functions and recursion
- perform discrete mathematics for problem solving tasks
- present mathematical solutions in a concise and informative manner.

Methodology:

Lecture slides will be used and will be made available to students after each class. Using Lecture notes, tutorials and assignments, students will be able to understand the core concepts and techniques pertaining to the course. Students will be divided into groups and assignments will be given them to build on their team working spirit preparing them toward the industry. Weekly assignments and tutorials comprising practical questions and reading of chapters in the recommended text book(s) will be given to students.

Sakai LMS:

All lecture materials will be made available in a shared folder on Sakai LMS.

Grading Scale:

Please refer to the student handbook for details on grades.

Grading Determination:

The final grade will be evaluated on the following basis:

- Final Exams   50%
- Mid-semester Quiz   20%
- Take-Home Assignments   15%
- Lab Assignments   15%

Course Outline

Session	Topic
1	Number Systems I: Radix • Decimal Number Systems • Binary Number Systems • Octal Number Systems • Hexadecimal Number Systems • Binary coded decimals • Number Conversions
2	Number Systems II: Arithmetic Computation • Complements • Signed Binary Numbers • Floating-Point Numbers • Digital Arithmetic – Addition, Subtraction, Multiplication and Division of Binary numbers • Assignment I
3 & 4	Logic: Propositional and Predicate Logic • Predicates • Quantifiers • Application of Predicates and Quantifiers • Assignment II • Tutorial/Lab 1
5	Set • Power set • Cartesian Product • Cardinality • Computer Representation • Assignment III • Tutorial/Lab 2

6	Functions
	• One to One Functions
	• Bijective Functions
	• Unto Functions
	• Composite
	• Application of functions
7	Vectors and Matrices
	• Determinant
	• Singular and Non-singular Matrix
	• Difference between vectors and matrices
	• Identity/Unit Matrix
	• Transpose
	• Inverse of a Matrix
	• Assignment IV
	• Tutorial/Lab 3
8 & 9	Recursion and Relations
	• Recursive Functions
	• Recursive Sets
	• Reflexive Property
	• Symmetric Property
	• Anti-Symmetric Property
	• Transitive Property
	• Closures
	• Equivalent Relations
10	Graphs
	• Trees
	• Traversal properties
	• Directed/Undirected graphs
	• BFS
	• DFS
	• Assignment V
	• Tutorial/Lab 4
11 & 12	Differentiation and Integration
	• Limits
	• Direct substitution
	• Leibniz notation
	• Extreme, Intermediate & Mean value theorem
	• Product, Quotient & Chain rule
	• Anti-derivatives
	• Definite and Indefinite Integrals
	• Tutorial/Lab 5
	• Assignment VI
13	Recap & Revision

Guidelines for Success:
- Be in class on time in every scheduled class meeting with materials needed to facilitate learning.
- Take good notes.
- Read and understand the resource materials from the textbooks. If the material is not understood ask questions in class so the whole class can hear the answer.
- Complete and submit assignments when they are due, not later.
- Turn cell phones to "silent" during class and tutorial sessions.

Plagiarism policy:

Plagiarism in any form is unacceptable in the University of Ghana and shall be treated as a serious offence. Student with plagiarism score more than 20% in any course work assignment will be penalized.

Policies:

<u>Testing</u>: Class Tests/Assignments are expected to be taken at the times scheduled, and make-up work will be permitted only for the following reasons:
- Death of an immediate family member
- Personal illness requiring attention by Physician
- Illness of an immediate family requiring your personal attention
- Unplanned holidays/ interruption by other College activities
- Travel out-of-town required by your employer (with proof)
- An emergency and/or situation at the discretion of the instructor

<u>Attendance</u>: Regular class attendance is expected. If a student misses class session, the student is responsible for obtaining class notes from another student.