MIDTERM EXAM GUIDE

The exam is **a closed book and notes exam**, and focuses on material covered in the lectures, labs, and assignments. But you are allowed to have **a single-page A4 sized copy sheet** during the exam (you can use both sides of these sheets). The exam questions will require you to demonstrate a good understanding of the key concepts and the ability to analyze a particular situation and apply your knowledge.

Material Covered: The first half of the class concentrates on the following three modules:

1. Data Representations,
2. Introduction to C

Hence, the midterm exam will cover all materials contained in Lectures 2-15. Topics covered in the lectures are listed in detail below:

Data Representations

- Lecture 2: Bits & Bytes, Representing and Operating on Integers
  bits and bytes, hexadecimal, integer representations, unsigned integers, signed integers, overflow, casting and combining types
- Lecture 3: Bits and Bitwise Operators
  bitwise operators, bitmasks, bit shift operators
- Lecture 4: Floating Point
  representing real numbers, fixed point, floating point, tiny floating point, floating point arithmetic, floating point in C

Introduction to C

- Lecture 5: Chars and Strings in C
  characters, string, common string operations (comparing, copying, concatenating, substrings)
- Lecture 6: More Strings in C, Pointers
  searching in strings, points, printing the value of a pointer, strings in memory
- Lecture 7: Arrays and Pointers
  pointers and parameters, double pointers, arrays in memory, arrays of pointers, pointer arithmetic
- Lecture 8: The Stack and The Heap
  the stack, the heap and dynamic memory, realloc, calloc, strdup, freeing the memory with free, stack vs. heap
- Lecture 9: Realloc, Memory Bugs
  realloc, memory leakage, and other errors common when working with pointers
- Lecture 10: void*, Generics
  generic swap, generic pitfalls, generic array swap
- Lecture 11: Function Pointers
  generic bubble sort, function pointers, generic printing, counting matches, function pointers as variables, generic C standard library functions

- Lecture 12: const, Structures
  const, struct, generic stack

Introduction to x86-64

- Lecture 13: Compiling C programs
  what really happens in GCC, make and makefiles
- Lecture 14: Introduction to x86-64, Data Movement
  gcc and assembly, looking at an executable, registers, the mov instruction, operand forms, data and register sizes, mov and data sizes
- Lecture 15: Arithmetic and Logic Operations
  the lea instruction, logical and arithmetic operations, reverse engineering assembly code