THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Systems I: Introduction to Low-Level Programming and Computer Organization

CSE 2421

Credit Hours:
4.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture

Course Description:
Introduction to computer architecture at machine and assembly language level; pointers and addressing; C programming at machine level; computer organization.

Prerequisites and Co-requisites:
Prereq: 2122, 2123, or 2231; and 2321 or Math 2566; and enrollment in CSE, CIS, Data Analytics, Music (BS), Eng Physics, or Math major.

Course Goals / Objectives:
- Master programming with pointers in C
- Be competent with application development and debugging in Unix environments
- Be competent in programming with dynamic data structures in C, and in using C string and I/O features, bit operations, and function pointers
- Be familiar with overall organization and design of computer systems
- Be competent with representation and manipulation of information in computer systems
- Be familiar with machine encoding of instructions, and be competent with a particular real or hypothetical instruction set
- Be familiar with programming in assembly language
- Be familiar with Linking (static linking, relocatable object files, symbols and symbol tables, symbol resolution, relocation, loading executable object files)

Course Topics:

- Transitioning from Java to C, Basic C syntax, working in Unix Environments
- C pointers and memory allocation/deallocation. Programming dynamic data structures with C (linked lists, arrays, including multi-dimensional arrays accessed through pointers, trees), string manipulation, pointer casting, null/void pointers.
- Other misc C features: I/O operations, bit operations, function pointers, command line argument passing
- Debugging in Unix with gdb/xgdb, Use of Makefile, Other Unix features
- Computer Systems Organization
- Representation and manipulation of information (information storage, integer representation, integer arithmetic, floating point)
- Machine level representation of programs (program encoding, data formats, accessing information, arithmetic and logical operations, control, procedures, array allocation and access, alignment)
- Programming with an assembly language: simple use of registers and arithmetic operations, conditionals and loops, accessing arrays in assembly, procedure calls in assembly.
- Linking (static linking, relocatable object files, symbols and symbol tables, symbol resolution, relocation, loading executable object files

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Designation:
Required